

ภาคผนวก ค

ใบรับรองผลการตรวจวิเคราะห์ผลกระทบสิ่งแวดล้อม

คุณภาพอากาศในบรรยากาศ



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2220010

Date Received : Mar 01, 2022

Date Reported : Mar 04, 2022

Report Number: 2232598-1

Page 1 of 1

Sample Description Air Quality
Location ตำนานวง (GPS 47P 0724377, 1402458)
Parameter Nitrogen dioxide (ppm)
Measurement Date Feb 21, 2022 - Feb 28, 2022
Measurement by Anurak Tongkhajonsakda

Time	2220010-1 Feb 21, 2022	2220010-2 Feb 22, 2022	2220010-3 Feb 23, 2022	2220010-4 Feb 24, 2022	2220010-5 Feb 25, 2022	2220010-6 Feb 26, 2022	2220010-7 Feb 27, 2022
11:00 AM - 12:00 PM	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001
12:00 PM - 01:00 PM	<0.001	0.008	<0.001	<0.001	<0.001	<0.001	<0.001
01:00 PM - 02:00 PM	<0.001	0.007	<0.001	<0.001	<0.001	0.002	<0.001
02:00 PM - 03:00 PM	<0.001	0.013	<0.001	<0.001	0.002	0.001	<0.001
03:00 PM - 04:00 PM	<0.001	0.004	<0.001	0.008	<0.001	<0.001	0.002
04:00 PM - 05:00 PM	<0.001	0.003	<0.001	0.002	<0.001	<0.001	0.001
05:00 PM - 06:00 PM	<0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001
06:00 PM - 07:00 PM	<0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001
07:00 PM - 08:00 PM	<0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001
08:00 PM - 09:00 PM	<0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001
09:00 PM - 10:00 PM	<0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001
10:00 PM - 11:00 PM	<0.001	0.004	0.001	<0.001	<0.001	<0.001	<0.001
11:00 PM - 12:00 AM	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001
12:00 AM - 01:00 AM	<0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001
01:00 AM - 02:00 AM	<0.001	0.004	0.002	<0.001	<0.001	<0.001	<0.001
02:00 AM - 03:00 AM	<0.001	0.004	0.002	0.001	0.001	0.001	<0.001
03:00 AM - 04:00 AM	<0.001	0.004	0.002	<0.001	0.001	0.001	<0.001
04:00 AM - 05:00 AM	<0.001	0.003	0.001	0.004	<0.001	0.001	<0.001
05:00 AM - 06:00 AM	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001
06:00 AM - 07:00 AM	0.004	0.002	0.001	<0.001	<0.001	<0.001	0.001
07:00 AM - 08:00 AM	0.008	0.001	0.001	<0.001	<0.001	<0.001	0.002
08:00 AM - 09:00 AM	0.008	0.001	<0.001	<0.001	<0.001	<0.001	0.001
09:00 AM - 10:00 AM	0.007	0.001	<0.001	<0.001	<0.001	<0.001	0.001
10:00 AM - 11:00 AM	0.011	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Average	0.002	0.004	0.001	0.001	<0.001	<0.001	<0.001
1hr - Maximum	0.011	0.013	0.002	0.008	0.002	0.002	0.002
Standard 1hr - Average	0.170	0.170	0.170	0.170	0.170	0.170	0.170

Standard : Notification of the National Environment Board No. 33, 2009 (B.E. 2552).

Reference Method : US EPA Method Part 50 App. F (Chemiluminescence)

Approved by

Sarat Mongkonjirawut

Sarat Mongkonjirawut
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant



TESTING

No.0042

Lot ID: 2220021

Date Received : Mar 01, 2022

Date Reported : Mar 04, 2022

Report Number: 2232604-1

Page 1 of 1

Sample Description Air Quality
Location ตำนานวง (GPS 47P 0724377, 1402458)
Date Analysis Commenced Mar 01, 2022
Condition of Sample Drawn into one glass filter paper (8x10 inch) placed in plastic bag

Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
2220021-1	Feb 21 - Feb 22, 2022	0.026	758	31
2220021-2	Feb 22 - Feb 23, 2022	0.034	758	31
2220021-3	Feb 23 - Feb 24, 2022	0.037	758	31
2220021-4	Feb 24 - Feb 25, 2022	0.051	758	31
2220021-5	Feb 25 - Feb 26, 2022	0.040	758	31
2220021-6	Feb 26 - Feb 27, 2022	0.042	758	31
2220021-7	Feb 27 - Feb 28, 2022	0.031	758	31
Guideline		0.33	-	-

Reference Method

Total Suspended Particulate : US EPA 40 CFR Part 50 Appendix B

Guideline : Notification of the National Environment Board. No.24, 2004 (B.E.2547) dated September 22, 2004

Sampled By : Anurak Tongkhajonsakda

Approved by

Thanita K.

Thanita Kulsumwong
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2220405

Date Received : Mar 01, 2022

Date Reported : Mar 07, 2022

Report Number: 2233716-1

Page 1 of 1

Sample Description Air Quality
Location กรุงเทพมหานคร (GPS 47P 0730826, 1407366)
Parameter Nitrogen dioxide (ppm)
Measurement Date Feb 21, 2022 - Feb 28, 2022
Measurement by Anurak Tongkhajonsakda

	2220405-1	2220405-2	2220405-3	2220405-4	2220405-5	2220405-6	2220405-7
Time	Feb 21, 2022	Feb 22, 2022	Feb 23, 2022	Feb 24, 2022	Feb 25, 2022	Feb 26, 2022	Feb 27, 2022
09:00 AM - 10:00 AM	0.008	0.005	0.006	0.008	0.006	0.006	0.007
10:00 AM - 11:00 AM	0.009	0.005	0.004	0.006	0.005	0.005	0.005
11:00 AM - 12:00 PM	0.009	0.003	0.004	0.005	0.003	0.004	0.004
12:00 PM - 01:00 PM	0.009	0.002	0.003	0.004	0.003	0.003	0.003
01:00 PM - 02:00 PM	0.007	0.003	0.002	0.003	0.003	0.004	0.003
02:00 PM - 03:00 PM	0.005	0.003	0.003	0.003	0.003	0.003	0.004
03:00 PM - 04:00 PM	0.005	0.003	0.010	0.004	0.004	0.005	0.005
04:00 PM - 05:00 PM	0.007	0.003	0.014	0.007	0.005	0.006	0.008
05:00 PM - 06:00 PM	0.012	0.006	0.011	0.011	0.011	0.008	0.010
06:00 PM - 07:00 PM	0.011	0.006	0.009	0.010	0.011	0.006	0.014
07:00 PM - 08:00 PM	0.012	0.008	0.011	0.011	0.012	0.010	0.015
08:00 PM - 09:00 PM	0.013	0.008	0.014	0.009	0.014	0.014	0.014
09:00 PM - 10:00 PM	0.007	0.005	0.015	0.012	0.011	0.008	0.012
10:00 PM - 11:00 PM	0.005	0.005	0.010	0.006	0.005	0.006	0.012
11:00 PM - 12:00 AM	0.004	0.003	0.008	0.004	0.003	0.006	0.010
12:00 AM - 01:00 AM	0.003	0.002	0.009	0.004	0.005	0.004	0.009
01:00 AM - 02:00 AM	0.002	0.002	0.011	0.003	0.004	0.004	0.008
02:00 AM - 03:00 AM	0.002	0.002	0.008	0.003	0.004	0.004	0.007
03:00 AM - 04:00 AM	0.002	0.002	0.008	0.003	0.004	0.004	0.006
04:00 AM - 05:00 AM	0.003	0.003	0.007	0.004	0.004	0.007	0.006
05:00 AM - 06:00 AM	0.004	0.006	0.009	0.005	0.004	0.006	0.007
06:00 AM - 07:00 AM	0.005	0.014	0.011	0.009	0.006	0.006	0.009
07:00 AM - 08:00 AM	0.008	0.016	0.014	0.013	0.012	0.009	0.011
08:00 AM - 09:00 AM	0.006	0.008	0.009	0.008	0.009	0.010	0.010
Average	0.007	0.005	0.009	0.006	0.006	0.006	0.008
1hr - Maximum	0.013	0.016	0.015	0.013	0.014	0.014	0.015
Standard 1hr - Average	0.170	0.170	0.170	0.170	0.170	0.170	0.170

Standard : Notification of the National Environment Board No. 33, 2009 (B.E. 2552).

Reference Method : US EPA Method Part 50 App. F (Chemiluminescence)

Approved by

Saranya C.

Saranya Chalemtamrong

Scientist (4)



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant



TESTING

No.0042

Lot ID: 2220412

Date Received : Mar 01, 2022

Date Reported : Mar 03, 2022

Report Number: 2233724-1

Page 1 of 1

Sample Description Air Quality
Location กรุงเทพมหานคร (GPS 47P 0730826, 1407366)
Date Analysis Commenced Mar 01, 2022
Condition of Sample Drawn into one glass filter paper (8x10 inch) placed in plastic bag

Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
2220412-1	Feb 21 - Feb 22, 2022	0.043	758	31
2220412-2	Feb 22 - Feb 23, 2022	0.060	758	31
2220412-3	Feb 23 - Feb 24, 2022	0.063	758	31
2220412-4	Feb 24 - Feb 25, 2022	0.075	758	31
2220412-5	Feb 25 - Feb 26, 2022	0.061	758	31
2220412-6	Feb 26 - Feb 27, 2022	0.084	758	31
2220412-7	Feb 27 - Feb 28, 2022	0.078	758	31
Guideline		0.33	-	-

Reference Method

Total Suspended Particulate : US EPA 40 CFR Part 50 Appendix B

Guideline : Notification of the National Environment Board. No.24, 2004 (B.E.2547) dated September 22, 2004

Sampled By : Anurak Tongkhajonsakda

Approved by

Thanita K.

Thanita Kulsumwong

Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID : 2220410

Date Received : Mar 01, 2022

Date Reported : Mar 09, 2022

Report Number : 2233721-1

Page 1 of 2

Sample Number : 2220410-1 to 7

Parameter : Wind Speed / Wind Direction

Location : กรุงเทพมหานคร (GPS 47P 0730826, 1407366)

Sampling Date : Feb 21 - Feb 28, 2022

Sampling by : Anurak Tongkhajonsakda

Time	Feb 21 - Feb 22, 2022		Feb 22 - Feb 23, 2022		Feb 23 - Feb 24, 2022		Feb 24 - Feb 25, 2022		Feb 25 - Feb 26, 2022		Feb 26 - Feb 27, 2022		Feb 27 - Feb 28, 2022		
	WS (m/s)	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)	WD (deg)	
09:00 AM - 10:00 AM	1.2	317.0	NW	1.4	73.0	ENE	2.6	61.0	ENE	1.9	74.0	ENE	3.4	59.0	ENE
10:00 AM - 11:00 AM	1.1	269.0	W	0.7	99.0	E	1.7	68.0	ENE	2.1	101.0	E	4.8	115.0	ESE
11:00 AM - 12:00 PM	0.4	195.0	SSW	1.1	69.0	ENE	2.6	57.0	ENE	2.1	76.0	ENE	3.0	88.0	E
12:00 PM - 01:00 PM	0.6	253.0	WSW	0.7	41.0	NE	2.7	101.0	E	1.2	80.0	E	1.6	70.0	ENE
01:00 PM - 02:00 PM	0.5	210.0	SSW	0.0	-	-	1.0	58.0	ENE	1.3	279.0	W	0.8	33.0	NNE
02:00 PM - 03:00 PM	0.3	217.0	SW	0.2	-	-	0.5	32.0	NNE	1.0	214.0	SW	0.4	68.0	ENE
03:00 PM - 04:00 PM	2.0	199.0	SSW	0.3	325.0	NW	0.6	221.0	SW	0.6	334.0	NNW	1.5	71.0	ENE
04:00 PM - 05:00 PM	1.3	215.0	SW	0.6	299.0	WNW	0.4	336.0	NNW	0.0	-	-	1.0	70.0	ENE
05:00 PM - 06:00 PM	0.0	-	-	0.0	-	-	0.0	-	-	0.5	84.0	E	0.0	-	-
06:00 PM - 07:00 PM	0.4	40.0	NE	0.0	-	-	0.0	-	-	0.7	90.0	E	0.0	-	-
07:00 PM - 08:00 PM	0.3	74.0	ENE	0.0	-	-	0.8	72.0	ENE	0.8	76.0	ENE	0.6	84.0	E
08:00 PM - 09:00 PM	0.9	79.0	E	0.0	-	-	0.7	86.0	E	0.9	75.0	ENE	0.0	-	-
09:00 PM - 10:00 PM	0.4	92.0	E	0.0	-	-	0.6	69.0	ENE	1.4	77.0	ENE	0.2	-	-
10:00 PM - 11:00 PM	0.3	69.0	ENE	0.0	-	-	0.6	80.0	E	1.1	66.0	ENE	0.2	-	-
11:00 PM - 12:00 AM	0.5	70.0	ENE	0.0	-	-	0.6	66.0	ENE	2.0	55.0	NE	1.6	104.0	ESE
12:00 AM - 01:00 AM	0.8	92.0	E	0.0	-	-	1.0	73.0	ENE	2.7	78.0	ENE	0.5	72.0	ENE
01:00 AM - 02:00 AM	1.1	79.0	E	0.0	-	-	1.9	78.0	ENE	1.6	68.0	ENE	1.1	75.0	ENE
02:00 AM - 03:00 AM	1.3	72.0	ENE	0.8	64.0	ENE	0.8	62.0	ENE	1.1	65.0	ENE	1.6	88.0	E
03:00 AM - 04:00 AM	1.2	68.0	ENE	0.8	47.0	NE	2.1	63.0	ENE	1.0	79.0	E	1.0	69.0	ENE
04:00 AM - 05:00 AM	2.6	73.0	ENE	1.3	71.0	ENE	1.2	96.0	E	1.8	64.0	ENE	1.2	85.0	E
05:00 AM - 06:00 AM	2.0	72.0	ENE	1.6	113.0	ESE	1.0	81.0	E	1.5	69.0	ENE	2.3	82.0	E
06:00 AM - 07:00 AM	1.4	72.0	ENE	1.1	57.0	ENE	1.3	78.0	ENE	2.1	81.0	E	1.2	81.0	E
07:00 AM - 08:00 AM	2.6	72.0	ENE	2.1	76.0	ENE	1.2	98.0	E	2.1	67.0	ENE	2.1	68.0	ENE
08:00 AM - 09:00 AM	2.5	79.0	E	2.5	74.0	ENE	2.1	66.0	ENE	3.9	72.0	ENE	2.5	88.0	E

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by

Sarayuth Jitranont
Assistant General Manager

ADDRESS 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand | PHONE +66 0 2760 3000 | FAX +66 0 2760 3197
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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

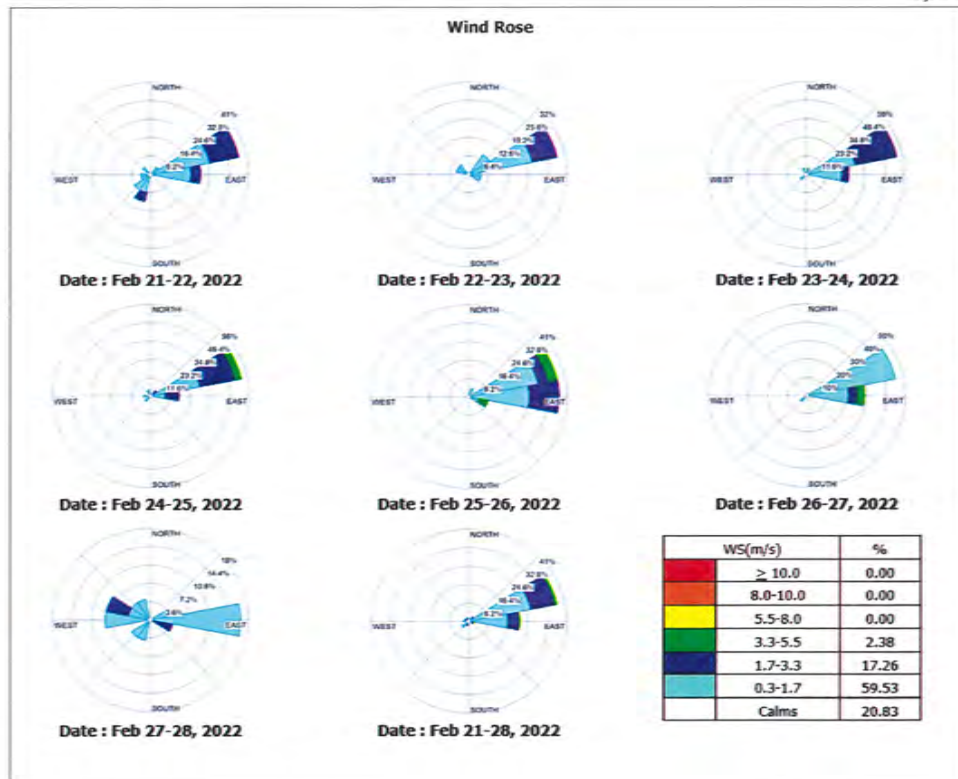
Lot ID : 2220410

Date Received : Mar 01, 2022

Date Reported : Mar 09, 2022

Report Number : 2233721-1

Page 2 of 2



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Approved by

Sarayuth Jitranont
Assistant General Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2220417

Date Received : Mar 01, 2022

Date Reported : Mar 07, 2022

Report Number: 2233727-1

Page 1 of 1

Sample Description Air Quality
Location กรุงเทพมหานคร (GPS 47P 0730048, 1409679)
Parameter Nitrogen dioxide (ppm)
Measurement Date Feb 21, 2022 - Feb 28, 2022
Measurement by Anurak Tongkhajonsakda

Time	2220417-1 Feb 21, 2022	2220417-2 Feb 22, 2022	2220417-3 Feb 23, 2022	2220417-4 Feb 24, 2022	2220417-5 Feb 25, 2022	2220417-6 Feb 26, 2022	2220417-7 Feb 27, 2022
12:00 PM - 01:00 PM	0.004	0.001	0.002	0.001	0.001	0.001	0.001
01:00 PM - 02:00 PM	0.011	0.001	0.003	0.003	0.002	0.001	0.001
02:00 PM - 03:00 PM	0.013	0.001	0.002	0.003	0.002	0.001	0.001
03:00 PM - 04:00 PM	0.015	0.001	0.002	0.003	0.001	0.001	0.001
04:00 PM - 05:00 PM	0.013	0.002	0.001	0.002	0.001	0.001	0.002
05:00 PM - 06:00 PM	0.013	0.002	0.001	0.001	0.001	0.001	0.001
06:00 PM - 07:00 PM	0.017	0.002	0.001	0.001	0.001	0.001	0.001
07:00 PM - 08:00 PM	0.015	0.002	0.001	0.002	0.001	0.001	0.001
08:00 PM - 09:00 PM	0.012	0.001	0.002	0.002	0.001	0.001	0.001
09:00 PM - 10:00 PM	0.009	0.001	0.002	0.002	0.001	0.001	0.002
10:00 PM - 11:00 PM	0.007	0.001	0.002	0.001	0.001	0.001	0.001
11:00 PM - 12:00 AM	0.003	0.002	0.002	0.001	0.001	0.001	0.001
12:00 AM - 01:00 AM	0.002	0.002	0.001	0.001	0.001	0.001	0.001
01:00 AM - 02:00 AM	0.002	0.002	0.001	0.001	0.001	<0.001	0.001
02:00 AM - 03:00 AM	0.002	0.002	0.001	0.001	0.001	0.001	0.001
03:00 AM - 04:00 AM	0.002	0.002	0.001	0.001	<0.001	<0.001	0.002
04:00 AM - 05:00 AM	0.002	0.001	0.001	0.001	0.001	0.001	0.002
05:00 AM - 06:00 AM	0.002	0.002	0.001	<0.001	0.001	<0.001	0.003
06:00 AM - 07:00 AM	0.002	0.002	0.001	<0.001	<0.001	<0.001	0.003
07:00 AM - 08:00 AM	0.003	0.002	0.001	0.001	0.001	0.001	0.003
08:00 AM - 09:00 AM	0.007	0.002	0.001	0.001	0.001	<0.001	0.005
09:00 AM - 10:00 AM	0.004	0.002	0.001	0.001	0.002	0.001	0.002
10:00 AM - 11:00 AM	0.002	0.001	0.001	0.002	0.002	0.018	0.001
11:00 AM - 12:00 PM	0.002	0.001	0.001	0.001	0.001	0.001	0.004
Average	0.007	0.002	0.001	0.001	0.001	0.002	0.002
1hr - Maximum	0.017	0.002	0.003	0.003	0.002	0.018	0.005
Standard 1hr - Average	0.170	0.170	0.170	0.170	0.170	0.170	0.170

Standard : Notification of the National Environment Board No. 33, 2009 (B.E. 2552).

Reference Method : US EPAMethod Part 50 App. F (Chemiluminescence)

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Approved by

Saranya C.

Saranya Chalemtamhong
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant



TESTING
No.0042

Lot ID: 2220421

Date Received : Mar 01, 2022

Date Reported : Mar 03, 2022

Report Number: 2233733-1

Page 1 of 1

Sample Description Air Quality
Location กรุงเทพมหานคร (GPS 47P 0730048, 1409679)
Date Analysis Commenced Mar 01, 2022
Condition of Sample Drawn into one glass filter paper (8x10 inch) placed in plastic bag

Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
2220421-1	Feb 21 - Feb 22, 2022	0.057	758	31
2220421-2	Feb 22 - Feb 23, 2022	0.055	758	31
2220421-3	Feb 23 - Feb 24, 2022	0.068	758	31
2220421-4	Feb 24 - Feb 25, 2022	0.091	758	31
2220421-5	Feb 25 - Feb 26, 2022	0.061	758	31
2220421-6	Feb 26 - Feb 27, 2022	0.078	758	31
2220421-7	Feb 27 - Feb 28, 2022	0.085	758	31
Guideline		0.33	-	-

Reference Method

Total Suspended Particulate : US EPA 40 CFR Part 50 Appendix B

Guideline : Notification of the National Environmental Board. No.24, 2004 (B.E.2547) dated September 22, 2004

Sampled By : Anurak Tongkhajonsakda

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

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ปริมาณสารอินทรีย์ระเหยในบรรยากาศ



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149452

Date Received : Jan 05, 2022

Date Reported : Jan 18, 2022

Report Number : 2184334-1C9

Page 1 of 3

Sample Number	21149452-1
Sampled Date	Jan 05, 2022
Sample Description	Air Quality
Location	บริเวณประตูหน้าโรงงาน
Date Analysis Commenced	Jan 06, 2022
Condition of Sample	Drawn into one 6-L Canister, one sorbent tube and one amber plastic bottle, refrigerated
Barometric Pressure	756 mmHg
Atmospheric Temperature	30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	05/01/22 - 06/01/22	ug/m3	0.20	0.60	<0.60	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	05/01/22 - 06/01/22	ug/m3	0.05	0.18	5.59	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	05/01/22 - 06/01/22	ug/m3	0.05	0.16	1.28	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	05/01/22 - 06/01/22	ug/m3	0.60	1.76	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	05/01/22 - 06/01/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA	-	Bangkok
Propene (Propylene)	05/01/22 - 06/01/22	ug/m3	0.30	0.86	1.14	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	05/01/22 - 06/01/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	05/01/22 - 06/01/22	ug/m3	0.60	1.88	2.71	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Prachin Mit Bamrung Community station has moderate traffic, Normal activity, Nearby school and temple.

Sampled By : Jakkarin Manwicha

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149452

Date Received : Jan 05, 2022

Date Reported : Jan 18, 2022

Report Number : 2184334-1C9

Page 2 of 3

Sample Number	21149452-2
Sampled Date	Jan 05, 2022
Sample Description	Air Quality
Location	บริเวณประตูหน้าโรงงาน
Date Analysis Commenced	Jan 06, 2022
Condition of Sample	Drawn into one 6-L Canister, one sorbent tube and one amber plastic bottle, refrigerated
Barometric Pressure	756 mmHg
Atmospheric Temperature	30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	05/01/22 - 06/01/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	05/01/22 - 06/01/22	ug/m3	0.05	0.18	8.77	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	05/01/22 - 06/01/22	ug/m3	0.05	0.16	1.53	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	05/01/22 - 06/01/22	ug/m3	0.60	1.76	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	05/01/22 - 06/01/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA	-	Bangkok
Propene (Propylene)	05/01/22 - 06/01/22	ug/m3	0.30	0.86	2.17	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	05/01/22 - 06/01/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	05/01/22 - 06/01/22	ug/m3	0.60	1.88	3.62	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Map Cha Lood Community station has moderate traffic, Normal activity, Nearby school, temple and community.

Sampled By : Jakkarin Manwicha

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149452

Date Received : Jan 05, 2022

Date Reported : Jan 18, 2022

Report Number : 2184334-1C9

Sample Number 21149452-3
Sampled Date Jan 05, 2022
Sample Description Air Quality
Location ทุ่งนา
Date Analysis Commenced Jan 06, 2022
Condition of Sample Drawn into one 6-L Canister, one sorbent tube and one amber plastic bottle, refrigerated
Barometric Pressure 756 mmHg
Atmospheric Temperature 30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	05/01/22 - 06/01/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	05/01/22 - 06/01/22	ug/m3	0.05	0.18	6.78	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	05/01/22 - 06/01/22	ug/m3	0.05	0.16	1.60	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	05/01/22 - 06/01/22	ug/m3	0.60	1.76	<1.76	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	05/01/22 - 06/01/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA	-	Bangkok
Propene (Propylene)	05/01/22 - 06/01/22	ug/m3	0.30	0.86	1.58	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	05/01/22 - 06/01/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	05/01/22 - 06/01/22	ug/m3	0.60	1.88	3.47	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Pa Yoon Community station has moderate traffic, Normal activity, Nearby school, temple and community

Sampled By : Jakkarin Manwicha

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O :

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149457

Date Received : Jan 06, 2022

Date Reported : Jan 14, 2022

Report Number : 2184344-1

Sample Number 21149457-1

Parameter Wind Speed / Wind Direction

Location ทุ่งนา

Sampling Date Jan 04 - Jan 05, 2022

Sampling by Thitipong Buadaeng

Time	Jan 04 - Jan 05, 2022		-		-		-		-		-		-		-	
	WS (m/s)	WD (deg)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM - 01:00 PM	4.5	54.0	NE	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 PM - 02:00 PM	4.1	90.0	E	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 PM - 03:00 PM	3.2	106.0	ESE	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 PM - 04:00 PM	3.5	255.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 PM - 05:00 PM	1.9	195.0	SSW	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 PM - 06:00 PM	2.4	330.0	NNW	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 PM - 07:00 PM	1.7	253.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 PM - 08:00 PM	3.9	286.0	WNW	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 PM - 09:00 PM	3.0	120.0	ESE	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 PM - 10:00 PM	1.9	32.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 PM - 11:00 PM	2.9	292.0	WNW	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 PM - 12:00 AM	2.5	350.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 AM - 01:00 AM	3.2	307.0	NW	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 AM - 02:00 AM	4.0	11.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 AM - 03:00 AM	2.4	339.0	NNW	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 AM - 04:00 AM	2.7	318.0	NW	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 AM - 05:00 AM	4.2	40.0	NE	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 AM - 06:00 AM	4.0	19.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 AM - 07:00 AM	4.0	30.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 AM - 08:00 AM	3.6	13.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 AM - 09:00 AM	3.1	25.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 AM - 10:00 AM	3.9	20.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 AM - 11:00 AM	3.2	25.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM - 12:00 PM	2.4	32.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by

Sarayuth Jitranont
Assistant General Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O :

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

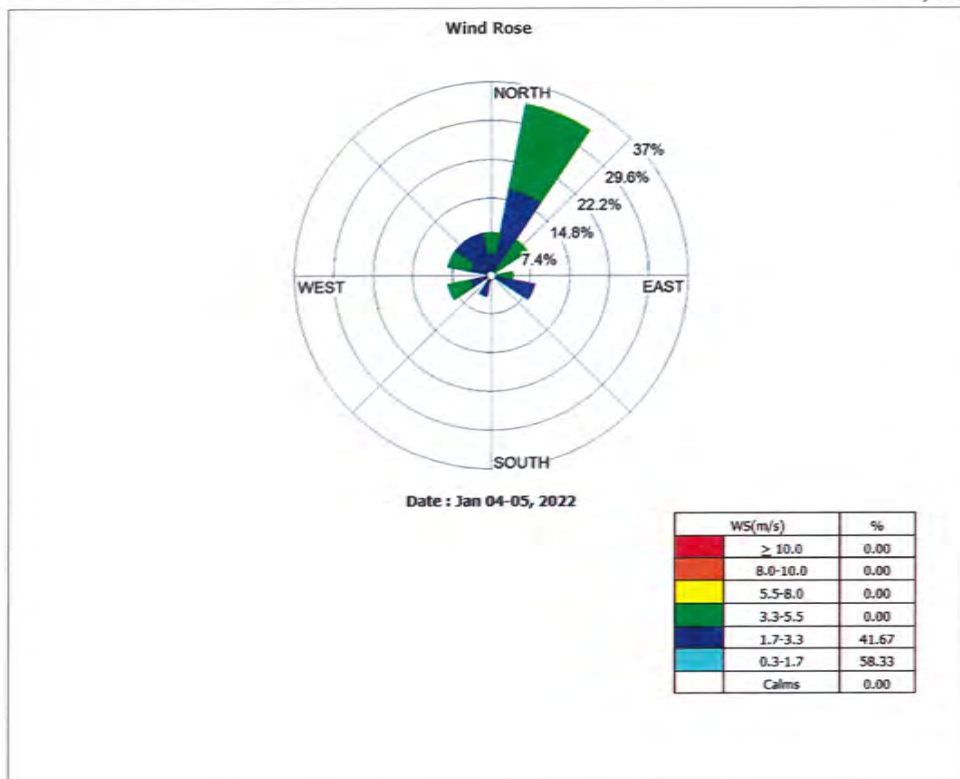
Lot ID : 21149457

Date Received : Jan 06, 2022

Date Reported : Jan 14, 2022

Report Number : 2184344-1

Page 2 of 2



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Approved by

Sarayuth Jitranont
Assistant General Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149850

Date Received : Feb 02, 2022

Date Reported : Feb 17, 2022

Report Number : 2185302-1C9 Rev. No.1

Page 1 of 3

Sample Number	21149850-1
Sampled Date	Feb 01, 2022
Sample Description	Air Quality
Location	ชุมชนประมงเมืองประจักษ์
Date Analysis Commenced	Feb 03, 2022
Condition of Sample	Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated
Barometric Pressure	758 mmHg
Atmospheric Temperature	31.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	01/02/22 - 02/02/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	01/02/22 - 02/02/22	ug/m3	0.05	0.18	2.99	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	01/02/22 - 02/02/22	ug/m3	0.05	0.16	0.26	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	01/02/22 - 02/02/22	ug/m3	0.60	1.76	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	01/02/22 - 02/02/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	01/02/22 - 02/02/22	ug/m3	0.30	0.86	<0.86	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	01/02/22 - 02/02/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	01/02/22 - 02/02/22	ug/m3	0.60	1.88	<1.88	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Prachum Mit Bamrung Community station has moderate traffic, Normal activity, Nearby temple

This Analysis test report is reissued to supersede report No. 2185302-1, Date Reported : Feb 14, 2022 due to revise sample information.

Sampled By : Kantaphon Maneesampan

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

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Approved by

Saranya Chalerthamrong
Scientist (4)

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8525-209/ENAB



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149850

Date Received : Feb 02, 2022

Date Reported : Feb 17, 2022

Report Number : 2185302-1C9 Rev. No.1

Page 2 of 3

Sample Number	21149850-2									
Sampled Date	Feb 01, 2022									
Sample Description	Air Quality									
Location	พื้นที่บริเวณ									
Date Analysis Commenced	Feb 03, 2022									
Condition of Sample	Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated									
Barometric Pressure	758 mmHg									
Atmospheric Temperature	31.0 °C									
Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location	
Air Testing										
1,4-Dichlorobenzene	01/02/22 - 02/02/22	ug/m3	0.20	0.60	<0.60	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong	
Acetaldehyde	01/02/22 - 02/02/22	ug/m3	0.05	0.18	2.85	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong	
Benzene	01/02/22 - 02/02/22	ug/m3	0.05	0.16	0.45	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong	
Hexane	01/02/22 - 02/02/22	ug/m3	0.60	1.76	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong	
Hydrogen Peroxide	01/02/22 - 02/02/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok	
Propene (Propylene)	01/02/22 - 02/02/22	ug/m3	0.30	0.86	4.41	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong	
Propylene Oxide	01/02/22 - 02/02/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok	
Toluene	01/02/22 - 02/02/22	ug/m3	0.60	1.88	<1.88	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong	

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Map Cha Lood Community station has moderate traffic, Normal activity, Nearby school, temple and community

This Analysis test report is reissued to supersede report No. 2185302-1, Date Reported : Feb 14, 2022 due to revise sample information.

Sampled By : Kantaphon Maneesampan

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Saranya C.

Saranya Chalerthamrong
Scientist (4)

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8525-209/EMAIL



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149850

Date Received : Feb 02, 2022

Date Reported : Feb 17, 2022

Report Number : 2185302-1C9 Rev. No.1

Page 3 of 3

Sample Number	21149850-3									
Sampled Date	Feb 01, 2022									
Sample Description	Air Quality									
Location	พื้นที่บริเวณ									
Date Analysis Commenced	Feb 03, 2022									
Condition of Sample	Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated									
Barometric Pressure	758 mmHg									
Atmospheric Temperature	31.0 °C									
Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location	
Air Testing										
1,4-Dichlorobenzene	01/02/22 - 02/02/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong	
Acetaldehyde	01/02/22 - 02/02/22	ug/m3	0.05	0.18	2.27	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong	
Benzene	01/02/22 - 02/02/22	ug/m3	0.05	0.16	0.26	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong	
Hexane	01/02/22 - 02/02/22	ug/m3	0.60	1.76	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong	
Hydrogen Peroxide	01/02/22 - 02/02/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok	
Propene (Propylene)	01/02/22 - 02/02/22	ug/m3	0.30	0.86	<0.86	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong	
Propylene Oxide	01/02/22 - 02/02/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok	
Toluene	01/02/22 - 02/02/22	ug/m3	0.60	1.88	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong	

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Pa Yoon Community station has moderate traffic, Normal activity, Nearby temple and community

This Analysis test report is reissued to supersede report No. 2185302-1, Date Reported : Feb 14, 2022 due to revise sample information.

Sampled By : Kantaphon Maneesampan

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Saranya C.

Saranya Chalerthamrong
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130

P/O :

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID : 21149855

Date Received : Feb 02, 2022

Date Reported : Feb 07, 2022

Report Number : 2185315-1

Page 1 of 2

Sample Number : 21149855-1
Parameter : Wind Speed / Wind Direction
Location : กรุงเทพมหานคร
Sampling Date : Feb 01 - Feb 02, 2022
Sampling by : Kantaphon Maneesampan

Time	Feb 01 - Feb 02, 2022													
	WS (m/s)	WD (deg)	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM - 01:00 PM	0.7	229.0	SW	-	-	-	-	-	-	-	-	-	-	-
01:00 PM - 02:00 PM	1.0	74.0	ENE	-	-	-	-	-	-	-	-	-	-	-
02:00 PM - 03:00 PM	0.5	217.0	SW	-	-	-	-	-	-	-	-	-	-	-
03:00 PM - 04:00 PM	0.4	210.0	SSW	-	-	-	-	-	-	-	-	-	-	-
04:00 PM - 05:00 PM	1.9	163.0	SSE	-	-	-	-	-	-	-	-	-	-	-
05:00 PM - 06:00 PM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 PM - 07:00 PM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 PM - 08:00 PM	0.6	181.0	S	-	-	-	-	-	-	-	-	-	-	-
08:00 PM - 09:00 PM	1.4	207.0	SSW	-	-	-	-	-	-	-	-	-	-	-
09:00 PM - 10:00 PM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 PM - 11:00 PM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 PM - 12:00 AM	0.4	175.0	S	-	-	-	-	-	-	-	-	-	-	-
12:00 AM - 01:00 AM	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 AM - 02:00 AM	0.6	303.0	WNW	-	-	-	-	-	-	-	-	-	-	-
02:00 AM - 03:00 AM	1.0	279.0	W	-	-	-	-	-	-	-	-	-	-	-
03:00 AM - 04:00 AM	0.3	240.0	WSW	-	-	-	-	-	-	-	-	-	-	-
04:00 AM - 05:00 AM	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 AM - 06:00 AM	1.3	314.0	NW	-	-	-	-	-	-	-	-	-	-	-
06:00 AM - 07:00 AM	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 AM - 08:00 AM	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 AM - 09:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 AM - 10:00 AM	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 AM - 11:00 AM	1.2	321.0	NW	-	-	-	-	-	-	-	-	-	-	-
11:00 AM - 12:00 PM	1.0	321.0	NW	-	-	-	-	-	-	-	-	-	-	-

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by

Sarayuth Jitranont
Assistant General Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130

P/O :

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

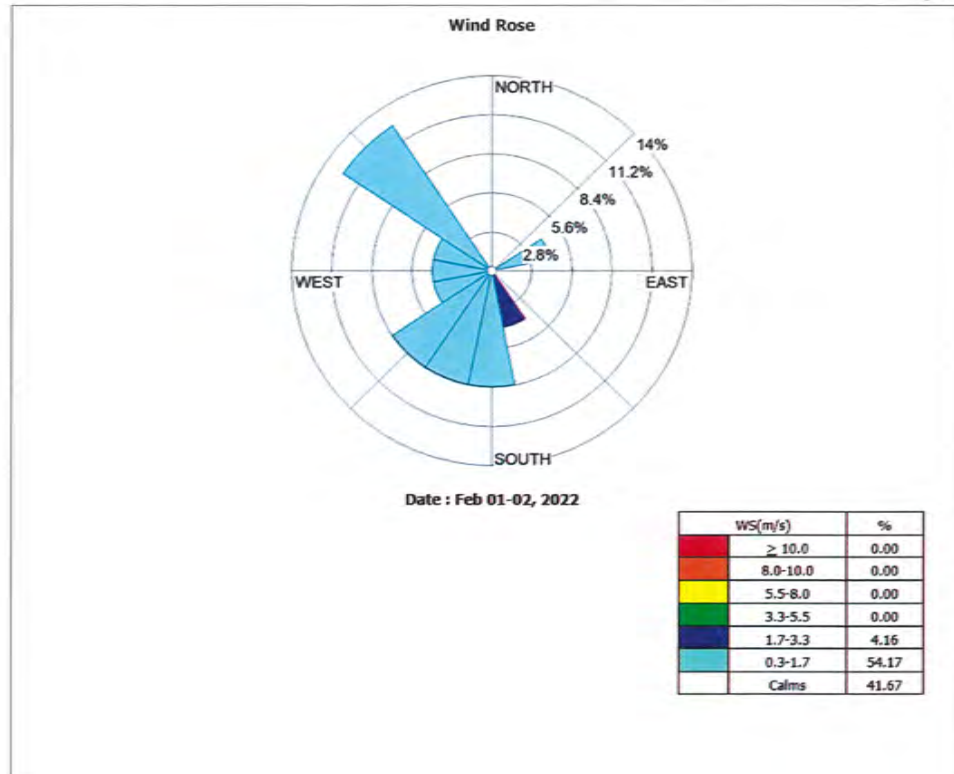
Lot ID : 21149855

Date Received : Feb 02, 2022

Date Reported : Feb 07, 2022

Report Number : 2185315-1

Page 2 of 2



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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2220431

Date Received : Mar 02, 2022

Date Reported : Mar 10, 2022

Report Number : 2233751-1C9

Page 1 of 3

Sample Number 2220431-1
Sampled Date Mar 01, 2022
Sample Description Air Quality
Location กรุงเทพมหานคร (GPS 47P 0726292, 1407282)
Date Analysis Commenced Mar 03, 2022
Condition of Sample Drawn into one 6-L Canister, two sorbent tubes and one amber plastic bottle, refrigerated
Barometric Pressure 757 mmHg
Atmospheric Temperature 29.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	01/03/22 - 02/03/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	01/03/22 - 02/03/22	ug/m3	0.05	0.18	3.39	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	01/03/22 - 02/03/22	ug/m3	0.05	0.16	0.45	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	01/03/22 - 02/03/22	ug/m3	0.60	1.76	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	01/03/22 - 02/03/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	01/03/22 - 02/03/22	ug/m3	0.30	0.86	<0.86	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	01/03/22 - 02/03/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	01/03/22 - 02/03/22	ug/m3	0.60	1.88	<1.88	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Prachum Mit Barrung Community station has moderate traffic. Normal activity, Nearby school and temple

Sampled By : Satcha Phetsawaeng

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2220431

Date Received : Mar 02, 2022

Date Reported : Mar 10, 2022

Report Number : 2233751-1C9

Page 2 of 3

Sample Number 2220431-2
Sampled Date Mar 01, 2022
Sample Description Air Quality
Location กรุงเทพมหานคร (GPS 47P 0730826, 1407366)
Date Analysis Commenced Mar 03, 2022
Condition of Sample Drawn into one 6-L Canister, two sorbent tubes and one amber plastic bottle, refrigerated
Barometric Pressure 757 mmHg
Atmospheric Temperature 29.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	01/03/22 - 02/03/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	01/03/22 - 02/03/22	ug/m3	0.05	0.18	2.49	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	01/03/22 - 02/03/22	ug/m3	0.05	0.16	0.38	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	01/03/22 - 02/03/22	ug/m3	0.60	1.76	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	01/03/22 - 02/03/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	01/03/22 - 02/03/22	ug/m3	0.30	0.86	1.79	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	01/03/22 - 02/03/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	01/03/22 - 02/03/22	ug/m3	0.60	1.88	<1.88	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Map Cha Lood Community station has moderate traffic. Normal activity, Nearby school and temple

Sampled By : Satcha Phetsawaeng

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130
P/O : 4510824480
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPO-TPO Plant

Lot ID: 2220431
Date Received : Mar 02, 2022
Date Reported : Mar 10, 2022
Report Number : 2233751-1C9

Sample Number 2220431-3
Sampled Date Mar 01, 2022
Sample Description Air Quality
Location เขตอุตสาหกรรม (GPS 47P 0724377, 1402458)
Date Analysis Commenced Mar 03, 2022
Condition of Sample Drawn into one 6-L Canister, two sorbent tubes and one amber plastic bottle, refrigerated
Barometric Pressure 757 mmHg
Atmospheric Temperature 29.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	01/03/22 - 02/03/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	01/03/22 - 02/03/22	ug/m3	0.05	0.18	2.16	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	01/03/22 - 02/03/22	ug/m3	0.05	0.16	0.19	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	01/03/22 - 02/03/22	ug/m3	0.60	1.76	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	01/03/22 - 02/03/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	01/03/22 - 02/03/22	ug/m3	0.30	0.86	<0.86	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	01/03/22 - 02/03/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	01/03/22 - 02/03/22	ug/m3	0.60	1.88	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)
PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Pa Yoon Community station has moderate traffic. Normal activity, Nearby school and temple

Sampled By : Satcha Phetsawaeng

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sarat Mongkonjirawut
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPO-TPO Plant

Lot ID : 2220432
Date Received : Mar 02, 2022
Date Reported : Mar 09, 2022
Report Number : 2233753-1

Sample Number 2220432-1
Parameter Wind Speed / Wind Direction
Location เขตอุตสาหกรรม (GPS 47P 0730826, 1407366)
Sampling Date Mar 01 - Mar 02, 2022
Sampling by Satcha Phetsawaeng

Time	Mar 01 - Mar 02, 2022		-		-		-		-		-		-		-	
	WS (m/s)	WD (deg)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 AM - 11:00 AM	0.8	228.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM - 12:00 PM	0.9	248.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM - 01:00 PM	0.5	125.0	SE	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 PM - 02:00 PM	1.0	206.0	SSW	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 PM - 03:00 PM	1.2	213.0	SSW	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 PM - 04:00 PM	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 PM - 05:00 PM	0.6	147.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 PM - 06:00 PM	1.4	194.0	SSW	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 PM - 07:00 PM	1.6	194.0	SSW	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 PM - 08:00 PM	0.9	193.0	SSW	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 PM - 09:00 PM	0.4	201.0	SSW	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 PM - 10:00 PM	0.5	253.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 PM - 11:00 PM	0.6	235.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 PM - 12:00 AM	0.4	248.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 AM - 01:00 AM	1.2	245.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 AM - 02:00 AM	1.2	243.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 AM - 03:00 AM	0.6	235.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 AM - 04:00 AM	1.4	227.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 AM - 05:00 AM	0.9	220.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 AM - 06:00 AM	0.7	246.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 AM - 07:00 AM	1.6	285.0	WNW	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 AM - 08:00 AM	1.4	255.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 AM - 09:00 AM	0.9	229.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 AM - 10:00 AM	0.5	230.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Sarayuth Jitranont
Assistant General Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID : 2220432

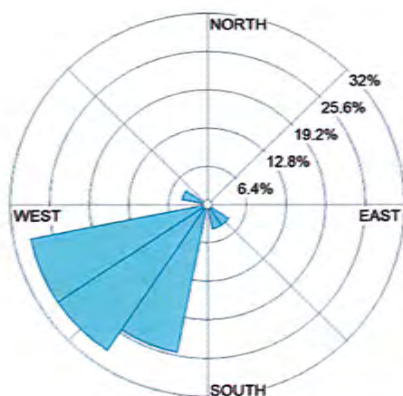
Date Received : Mar 02, 2022

Date Reported : Mar 09, 2022

Report Number : 2233753-1

Page 2 of 2

Wind Rose



Date : Mar 01-02, 2022

WS(m/s)	%
> 10.0	0.00
8.0-10.0	0.00
5.5-8.0	0.00
3.3-5.5	0.00
1.7-3.3	0.00
0.3-1.7	95.83
Calms	4.17

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2235298

Date Received : Apr 05, 2022

Date Reported : Apr 21, 2022

Report Number : 2263545-1C9

Page 1 of 3

Sample Number : 2235298-1
Sampled Date : Apr 04, 2022
Sample Description : Air Quality
Location : กรุงเทพมหานคร (GPS 47P 0726292, 1407282)
Date Analysis Commenced : Apr 06, 2022
Condition of Sample : Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated
Barometric Pressure : 756 mmHg
Atmospheric Temperature : 32.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	04/04/22 - 05/04/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	04/04/22 - 05/04/22	ug/m3	0.05	0.18	3.28	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	04/04/22 - 05/04/22	ug/m3	0.05	0.16	0.77	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	04/04/22 - 05/04/22	ug/m3	0.60	1.76	<1.76	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	04/04/22 - 05/04/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	04/04/22 - 05/04/22	ug/m3	0.30	0.86	1.20	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	04/04/22 - 05/04/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	04/04/22 - 05/04/22	ug/m3	0.60	1.88	<1.88	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note :
- Prachum Mit Bannung Community station has moderate traffic., Normal activity, Nearby school and temple
- Map Cha Lood Community station has moderate traffic., Normal activity, Nearby school and temple
- Pa Yoon Community station has moderate traffic., Normal activity, Nearby school and temple

Sampled By : Satcha Phetsawaeng

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

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Approved by

Sarat Mongkonjirawut
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130
P/O : 4510824480
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPPO-TPO Plant

Lot ID: 2235298
Date Received : Apr 05, 2022
Date Reported : Apr 21, 2022
Report Number : 2263545-1C9

Page 2 of 3

Sample Number 2235298-2
Sampled Date Apr 04, 2022
Sample Description Air Quality
Location กรุงเทพมหานคร (GPS 47P 0730826, 1407366)
Date Analysis Commenced Apr 06, 2022
Condition of Sample Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated
Barometric Pressure 756 mmHg
Atmospheric Temperature 32.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	04/04/22 - 05/04/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	04/04/22 - 05/04/22	ug/m3	0.05	0.18	3.97	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	04/04/22 - 05/04/22	ug/m3	0.05	0.16	0.96	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	04/04/22 - 05/04/22	ug/m3	0.60	1.76	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	04/04/22 - 05/04/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	04/04/22 - 05/04/22	ug/m3	0.30	0.86	2.48	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	04/04/22 - 05/04/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	04/04/22 - 05/04/22	ug/m3	0.60	1.88	4.00	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)
PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note :
- Prachum Mit Bamrung Community station has moderate traffic., Normal activity, Nearby school and temple
- Map Cha Lood Community station has moderate traffic., Normal activity, Nearby school and temple
- Pa Yoon Community station has moderate traffic., Normal activity, Nearby school and temple

Sampled By : Satcha Phetsawaeng

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130
P/O : 4510824480
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPPO-TPO Plant

Lot ID: 2235298
Date Received : Apr 05, 2022
Date Reported : Apr 21, 2022
Report Number : 2263545-1C9

Page 3 of 3

Sample Number 2235298-3
Sampled Date Apr 04, 2022
Sample Description Air Quality
Location กรุงเทพมหานคร (GPS 47P 0724377, 1402458)
Date Analysis Commenced Apr 06, 2022
Condition of Sample Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated
Barometric Pressure 756 mmHg
Atmospheric Temperature 32.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	04/04/22 - 05/04/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	04/04/22 - 05/04/22	ug/m3	0.05	0.18	3.14	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	04/04/22 - 05/04/22	ug/m3	0.05	0.16	0.77	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	04/04/22 - 05/04/22	ug/m3	0.60	1.76	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	04/04/22 - 05/04/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	04/04/22 - 05/04/22	ug/m3	0.30	0.86	0.89	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	04/04/22 - 05/04/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	04/04/22 - 05/04/22	ug/m3	0.60	1.88	<1.88	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)
PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note :
- Prachum Mit Bamrung Community station has moderate traffic., Normal activity, Nearby school and temple
- Map Cha Lood Community station has moderate traffic., Normal activity, Nearby school and temple
- Pa Yoon Community station has moderate traffic., Normal activity, Nearby school and temple

Sampled By : Satcha Phetsawaeng

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID : 2235309

Date Received : Apr 05, 2022

Date Reported : Apr 07, 2022

Report Number : 2263550-1

Sample Number : 2235309-1

Parameter : Wind Speed / Wind Direction

Location : กรุงเทพมหานคร (GPS 47P 0730826, 1407366)

Sampling Date : Apr 04 - Apr 05, 2022

Sampling by : Satcha Phetsawaeng

Time	Apr 04 - Apr 05, 2022																	
	WS (m/s)	WD (deg)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 AM - 10:00 AM	1.0	5.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 AM - 11:00 AM	1.2	344.0	NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM - 12:00 PM	1.6	358.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM - 01:00 PM	1.4	159.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 PM - 02:00 PM	1.5	196.0	SSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 PM - 03:00 PM	1.0	150.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 PM - 04:00 PM	0.6	211.0	SSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 PM - 05:00 PM	0.7	146.0	SE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 PM - 06:00 PM	0.5	248.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 PM - 07:00 PM	1.9	248.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 PM - 08:00 PM	1.4	344.0	NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 PM - 09:00 PM	1.9	122.0	ESE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 PM - 10:00 PM	1.3	8.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 PM - 11:00 PM	0.9	4.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 PM - 12:00 AM	1.5	359.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 AM - 01:00 AM	1.6	16.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 AM - 02:00 AM	0.4	359.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 AM - 03:00 AM	1.5	359.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 AM - 04:00 AM	1.4	4.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 AM - 05:00 AM	1.0	0.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 AM - 06:00 AM	0.3	3.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 AM - 07:00 AM	1.7	359.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 AM - 08:00 AM	1.6	6.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 AM - 09:00 AM	1.0	0.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

Page 1 of 2



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

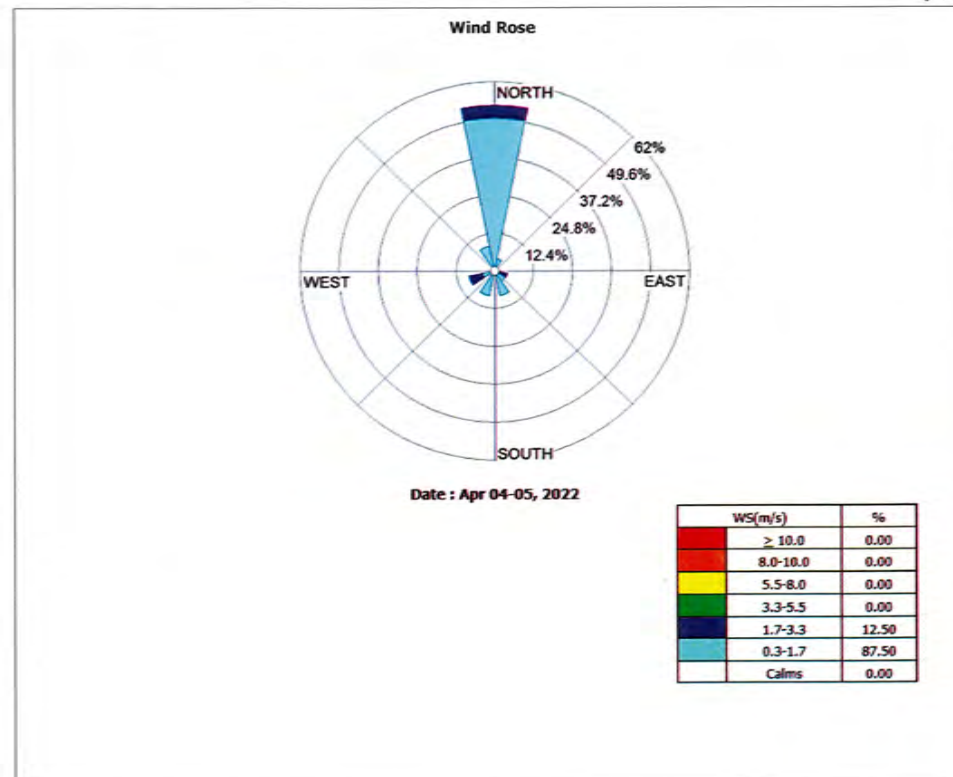
Lot ID : 2235309

Date Received : Apr 05, 2022

Date Reported : Apr 07, 2022

Report Number : 2263550-1

Page 2 of 2



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Approved by

Sarayuth Jitranont
Assistant General Manager

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Sarayuth Jitranont
Assistant General Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2240275

Date Received : May 04, 2022

Date Reported : May 12, 2022

Report Number : 2274433-1C9

Page 1 of 3

Sample Number : 2240275-1
Sampled Date : May 03, 2022
Sample Description : Air Quality
Location : กรุงเทพมหานคร (GPS 47P 0726292, 1407282)
Date Analysis Commenced : May 05, 2022
Condition of Sample : Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated
Barometric Pressure : 756 mmHg
Atmospheric Temperature : 29.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	03/05/22 - 04/05/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	03/05/22 - 04/05/22	ug/m3	0.05	0.18	1.88	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	03/05/22 - 04/05/22	ug/m3	0.05	0.16	0.89	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	03/05/22 - 04/05/22	ug/m3	0.60	1.76	<1.76	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	03/05/22 - 04/05/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	03/05/22 - 04/05/22	ug/m3	0.30	0.86	<0.86	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	03/05/22 - 04/05/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	03/05/22 - 04/05/22	ug/m3	0.60	1.88	1.38	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Prachum MR Bamrung Community station has moderate traffic, Normal activity, Light rain, Nearby school temple and Community

Sampled By : Satcha Phetsawaeng

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Supervisor

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2240275

Date Received : May 04, 2022

Date Reported : May 12, 2022

Report Number : 2274433-1C9

Page 2 of 3

Sample Number : 2240275-2
Sampled Date : May 03, 2022
Sample Description : Air Quality
Location : กรุงเทพมหานคร (GPS 47P 0730826, 1407366)
Date Analysis Commenced : May 05, 2022
Condition of Sample : Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated
Barometric Pressure : 756 mmHg
Atmospheric Temperature : 29.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	03/05/22 - 04/05/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	03/05/22 - 04/05/22	ug/m3	0.05	0.18	1.84	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	03/05/22 - 04/05/22	ug/m3	0.05	0.16	0.70	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	03/05/22 - 04/05/22	ug/m3	0.60	1.76	<1.76	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	03/05/22 - 04/05/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	03/05/22 - 04/05/22	ug/m3	0.30	0.86	<0.86	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	03/05/22 - 04/05/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	03/05/22 - 04/05/22	ug/m3	0.60	1.88	5.65	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Map Cha Lood Community station has moderate traffic, Normal activity, Light rain, Nearby school temple and Community

Sampled By : Satcha Phetsawaeng

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Supervisor

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2240275

Date Received : May 04, 2022

Date Reported : May 12, 2022

Report Number : 2274433-1C9

Sample Number 2240275-3
Sampled Date May 03, 2022
Sample Description Air Quality
Location ต.บึงนาเกลือ (GPS 47P 0724377, 1402458)
Date Analysis Commenced May 05, 2022
Condition of Sample Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated
Barometric Pressure 756 mmHg
Atmospheric Temperature 29.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	03/05/22 - 04/05/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	03/05/22 - 04/05/22	ug/m3	0.05	0.18	1.66	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	03/05/22 - 04/05/22	ug/m3	0.05	0.16	0.64	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	03/05/22 - 04/05/22	ug/m3	0.60	1.76	2.72	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	03/05/22 - 04/05/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, V16	-	Bangkok
Propene (Propylene)	03/05/22 - 04/05/22	ug/m3	0.30	0.86	<0.86	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	03/05/22 - 04/05/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	03/05/22 - 04/05/22	ug/m3	0.60	1.88	4.56	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Pa Yoon Community station has moderate traffic, Normal activity, Light rain, Nearby school temple and Community

Sampled By : Satcha Phetsawaeng

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Supervisor

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID : 2240279

Date Received : May 04, 2022

Date Reported : May 09, 2022

Report Number : 2274434-1

Sample Number 2240279-1
Parameter Wind Speed / Wind Direction
Location ต.บึงนาเกลือ (GPS 47P 0730826, 1407366)
Sampling Date May 03 - May 04, 2022
Sampling by Satcha Phetsawaeng

Time	May 03 - May 04, 2022		-		-		-		-		-		-	
	WS (m/s)	WD (deg)	-	-	-	-	-	-	-	-	-	-	-	-
09:00 AM - 10:00 AM	1.2	350.0	N	-	-	-	-	-	-	-	-	-	-	-
10:00 AM - 11:00 AM	1.4	357.0	N	-	-	-	-	-	-	-	-	-	-	-
11:00 AM - 12:00 PM	3.1	347.0	NNW	-	-	-	-	-	-	-	-	-	-	-
12:00 PM - 01:00 PM	1.1	355.0	N	-	-	-	-	-	-	-	-	-	-	-
01:00 PM - 02:00 PM	3.8	9.0	N	-	-	-	-	-	-	-	-	-	-	-
02:00 PM - 03:00 PM	0.9	347.0	NNW	-	-	-	-	-	-	-	-	-	-	-
03:00 PM - 04:00 PM	1.3	8.0	N	-	-	-	-	-	-	-	-	-	-	-
04:00 PM - 05:00 PM	1.2	334.0	NNW	-	-	-	-	-	-	-	-	-	-	-
05:00 PM - 06:00 PM	0.8	2.0	N	-	-	-	-	-	-	-	-	-	-	-
06:00 PM - 07:00 PM	1.0	359.0	N	-	-	-	-	-	-	-	-	-	-	-
07:00 PM - 08:00 PM	1.0	15.0	NNE	-	-	-	-	-	-	-	-	-	-	-
08:00 PM - 09:00 PM	1.4	356.0	N	-	-	-	-	-	-	-	-	-	-	-
09:00 PM - 10:00 PM	1.0	284.0	WNW	-	-	-	-	-	-	-	-	-	-	-
10:00 PM - 11:00 PM	0.9	359.0	N	-	-	-	-	-	-	-	-	-	-	-
11:00 PM - 12:00 AM	2.8	1.0	N	-	-	-	-	-	-	-	-	-	-	-
12:00 AM - 01:00 AM	0.9	338.0	NNW	-	-	-	-	-	-	-	-	-	-	-
01:00 AM - 02:00 AM	3.0	0.0	N	-	-	-	-	-	-	-	-	-	-	-
02:00 AM - 03:00 AM	1.3	359.0	N	-	-	-	-	-	-	-	-	-	-	-
03:00 AM - 04:00 AM	1.0	359.0	N	-	-	-	-	-	-	-	-	-	-	-
04:00 AM - 05:00 AM	0.7	1.0	N	-	-	-	-	-	-	-	-	-	-	-
05:00 AM - 06:00 AM	1.2	330.0	NNW	-	-	-	-	-	-	-	-	-	-	-
06:00 AM - 07:00 AM	1.3	359.0	N	-	-	-	-	-	-	-	-	-	-	-
07:00 AM - 08:00 AM	1.8	25.0	NNE	-	-	-	-	-	-	-	-	-	-	-
08:00 AM - 09:00 AM	1.2	26.0	NNE	-	-	-	-	-	-	-	-	-	-	-

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by

Sarayuth Jitranont
Assistant General Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130

P/O : 451288163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPPO-TPO Plant

Lot ID : 2240279

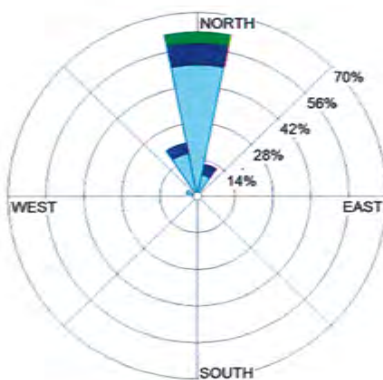
Date Received : May 04, 2022

Date Reported : May 09, 2022

Report Number : 2274434-1

Page 2 of 2

Wind Rose



Date : May 03-04, 2022

WS(m/s)	%
> 10.0	0.00
8.0-10.0	0.00
5.5-8.0	0.00
3.3-5.5	4.16
1.7-3.3	16.67
0.3-1.7	79.17
Calms	0.00

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPPO-TPO Plant

Lot ID: 2265543

Date Received : Jun 02, 2022

Date Reported : Jun 10, 2022

Report Number : 2326634-1C9

Page 1 of 3

Sample Number : 2265543-1
Sampled Date : Jun 01, 2022
Sample Description : Air Quality
Location : กรุงเทพมหานคร (GPS 47P 0726292, 1407282)
Date Analysis Commenced : Jun 03, 2022
Condition of Sample : Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated
Barometric Pressure : 754 mmHg
Atmospheric Temperature : 31.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	01/06/22 - 02/06/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	01/06/22 - 02/06/22	ug/m3	0.05	0.18	2.74	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	01/06/22 - 02/06/22	ug/m3	0.05	0.16	0.38	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	01/06/22 - 02/06/22	ug/m3	0.60	1.76	<1.76	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	01/06/22 - 02/06/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	01/06/22 - 02/06/22	ug/m3	0.30	0.86	<0.86	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	01/06/22 - 02/06/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	01/06/22 - 02/06/22	ug/m3	0.60	1.88	46.43	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Prachin Mit Bamrung Community station has moderate traffic, Normal activity, Nearby school temple and Community

Sampled By : Ronnachai Moungma

Remark :

- LOD : Limit of Detection

- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

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Sararat Mongkonjirawut
Supervisor

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2265543

Date Received : Jun 02, 2022

Date Reported : Jun 10, 2022

Report Number : 2326634-1C9

Page 2 of 3

Sample Number 2265543-2
Sampled Date Jun 01, 2022
Sample Description Air Quality
Location กรุงเทพมหานคร (GPS 47P 0730826, 1407366)
Date Analysis Commenced Jun 03, 2022
Condition of Sample Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated
Barometric Pressure 754 mmHg
Atmospheric Temperature 31.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	01/06/22 - 02/06/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	01/06/22 - 02/06/22	ug/m3	0.05	0.18	2.49	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	01/06/22 - 02/06/22	ug/m3	0.05	0.16	0.45	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	01/06/22 - 02/06/22	ug/m3	0.60	1.76	<1.76	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	01/06/22 - 02/06/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	01/06/22 - 02/06/22	ug/m3	0.30	0.86	0.93	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	01/06/22 - 02/06/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	01/06/22 - 02/06/22	ug/m3	0.60	1.88	57.06	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Map Cha Lood Community station has moderate traffic, Normal activity, Nearby school temple and Community

Sampled By : Ronnachai Moungma

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Supervisor

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2265543

Date Received : Jun 02, 2022

Date Reported : Jun 10, 2022

Report Number : 2326634-1C9

Page 3 of 3

Sample Number 2265543-3
Sampled Date Jun 01, 2022
Sample Description Air Quality
Location กรุงเทพมหานคร (GPS 47P 0724377, 1402458)
Date Analysis Commenced Jun 03, 2022
Condition of Sample Drawn into one 6-L Canister, one amber plastic bottle and two sorbent tubes, refrigerated
Barometric Pressure 754 mmHg
Atmospheric Temperature 31.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
1,4-Dichlorobenzene	01/06/22 - 02/06/22	ug/m3	0.20	0.60	Not Detected	1100	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Acetaldehyde	01/06/22 - 02/06/22	ug/m3	0.05	0.18	5.56	860	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Benzene	01/06/22 - 02/06/22	ug/m3	0.05	0.16	0.83	7.6	Based on US EPA Compendium Method, TO-15	PCD	Rayong
Hexane	01/06/22 - 02/06/22	ug/m3	0.60	1.76	Not Detected	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Hydrogen Peroxide	01/06/22 - 02/06/22	ug/m3	0.3	5.0	Not Detected	No Standard	OSHA, VI6	-	Bangkok
Propene (Propylene)	01/06/22 - 02/06/22	ug/m3	0.30	0.86	1.27	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong
Propylene Oxide	01/06/22 - 02/06/22	ug/m3	1.2	14	Not Detected	No Standard	Based on NIOSH, 1612	-	Bangkok
Toluene	01/06/22 - 02/06/22	ug/m3	0.60	1.88	69.35	No Standard	Based on US EPA Compendium Method, TO-15	-	Rayong

Guideline :

NEB : Notification of National Environment Board, B.E. 2560 (2017)

PCD : Notification of the Pollution Control Department, which was published in the Royal Government Gazette Vol. 126 Special Part 13 D dated January 27, B.E. 2552 (2009)

Note : - Pa Yoon Community station has moderate traffic, Normal activity, Nearby school temple and Community

Sampled By : Ronnachai Moungma

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Sararat Mongkonjirawut
Supervisor

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Sample Number : 2265545-1

Parameter : Wind Speed / Wind Direction

Location : กรุงเทพมหานคร (GPS 47P 0730826, 1407366)

Sampling Date : Jun 01 - Jun 02, 2022

Sampling by : Ronnachai Moungma

Lot ID : 2265545

Date Received : Jun 02, 2022

Date Reported : Jun 09, 2022

Report Number : 2326644-1

Page 1 of 2

Time	Jun 01 - Jun 02, 2022																	
	WS (m/s)	WD (deg)																
09:00 AM - 10:00 AM	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 AM - 11:00 AM	0.6	220.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM - 12:00 PM	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM - 01:00 PM	0.7	145.0	SE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 PM - 02:00 PM	1.1	224.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 PM - 03:00 PM	0.9	208.0	SSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 PM - 04:00 PM	1.1	146.0	SE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 PM - 05:00 PM	0.9	221.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 PM - 06:00 PM	0.4	260.0	W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 PM - 07:00 PM	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 PM - 08:00 PM	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 PM - 09:00 PM	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 PM - 10:00 PM	0.4	200.0	SSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 PM - 11:00 PM	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 PM - 12:00 AM	0.4	254.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 AM - 01:00 AM	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 AM - 02:00 AM	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 AM - 03:00 AM	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 AM - 04:00 AM	0.4	291.0	WWW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 AM - 05:00 AM	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 AM - 06:00 AM	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 AM - 07:00 AM	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 AM - 08:00 AM	0.6	305.0	NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 AM - 09:00 AM	1.7	241.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Sarayuth Jitranont
Assistant General Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang,
Rayong Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

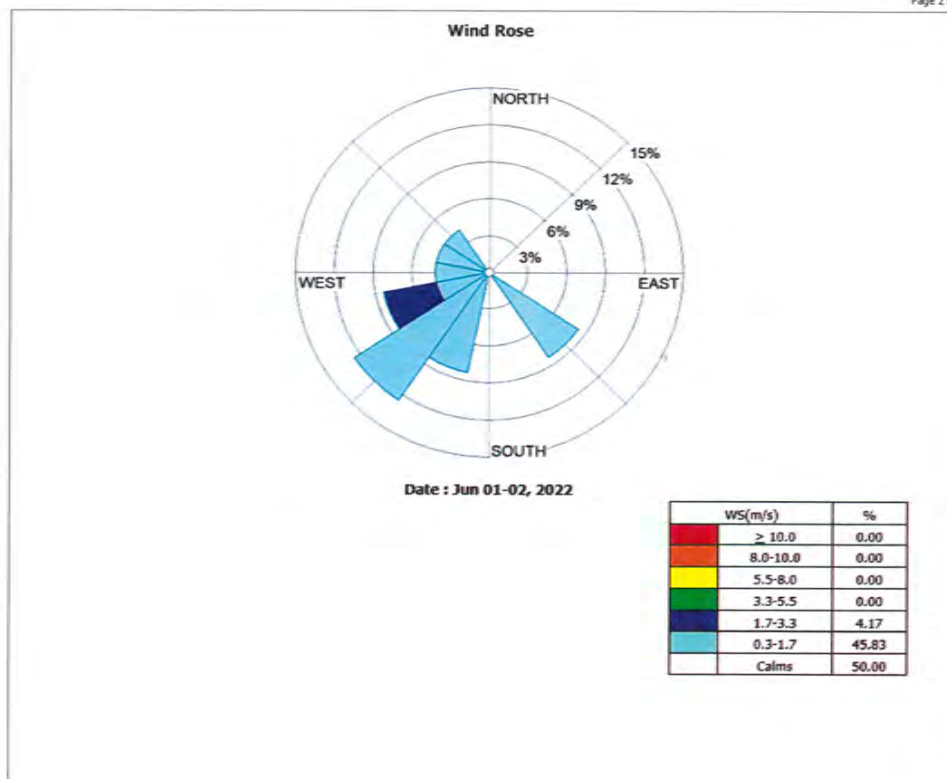
Lot ID : 2265545

Date Received : Jun 02, 2022

Date Reported : Jun 09, 2022

Report Number : 2326644-1

Page 2 of 2



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Approved by

Sarayuth Jitranont
Assistant General Manager

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2220434

Date Received : Feb 22, 2022

Date Reported : Mar 02, 2022

Report Number: 2236585-1

Sample Number 2220434-1
Sampled Date Feb 21, 2022
Sample Description Emission from Stationary Source
Location TOX1 (ERU Stack) (GPS 47P 0726915, 1405346)
Date Analysis Commenced Feb 23, 2022
Condition of Sample Extracted into two 2-L collection flasks, one filter paper placed in plastic petri dish and one plastic bottle

Stack Description									
Ambient Pressure	759	mmHg	Diameter	3.00	m	Oxygen	11.6	%	
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	5.3	%	
Type of Process	Combustion		Stack Temperature	214	°C	Gas Velocity	5.0	m/s	
Type of Fuel	Natural Gas		Moisture	22.54	%	Flow Rate (Actual O2)	60095	Nm3/hr	

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result at 7 %O ₂ at 11.6 % O ₂		Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing										
Oxides of Nitrogen *	11:39 AM - 11:49 AM	ppm	-	1.06	22.9	15.3	200	72	US EPA, Method 7	Rayong
Total Suspended Particulate	11:39 AM - 12:34 PM	mg/m3	-	0.5	<0.5	<0.5	320	35	US EPA, Method 5	Rayong

Guideline :

Guideline

- 1).Notification of the Ministry of Industry 2006 (B.E. 2549) Published in the Royal Government Gazette, Vol.123 Special Part 125 D, dated December 4, 2006 (B.E. 2549)
- 2).Emission Air Standard according to EIA study of HPPO Plant, Approval Letter No. Tor Sor 1009.8/7196 dated June 09, 2017 (B.E. 2560)

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

ทะเบียนเลขที่ ๖-323-๙-9447

Approved by

D. Chongchon

Dej Changchon
Senior Manager

ทะเบียนเลขที่ ๖-323-๙-9442

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2220434

Date Received : Feb 22, 2022

Date Reported : Mar 02, 2022

Report Number: 2236585-1

Sample Number 2220434-1
Sampled Date Feb 21, 2022
Sample Description Emission from Stationary Source
Location TOX1 (ERU Stack) (GPS 47P 0726915, 1405346)
Date Analysis Commenced Feb 23, 2022
Condition of Sample Extracted into two 2-L collection flasks, one filter paper placed in plastic petri dish and one plastic bottle

Stack Description									
Ambient Pressure	759	mmHg	Diameter	3.00	m	Oxygen	11.6	%	
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	5.3	%	
Type of Process	Combustion		Stack Temperature	214	°C	Gas Velocity	5.0	m/s	
Type of Fuel	Natural Gas		Moisture	22.54	%	Flow Rate (Actual O2)	60095	Nm3/hr	

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Oxides of Nitrogen *	11:39 AM - 11:49 AM	g/s	-	-	0.482	-	2.0	Calculated	Rayong
Total Suspended Particulate *	11:39 AM - 12:34 PM	g/s	-	-	<0.008	-	0.52	Calculated	Rayong

Guideline :

Guideline

- 1).Notification of the Ministry of Industry 2006 (B.E. 2549) Published in the Royal Government Gazette, Vol.123 Special Part 125 D, dated December 4, 2006 (B.E. 2549)
- 2).Emission Air Standard according to EIA study of HPPO Plant, Approval Letter No. Tor Sor 1009.8/7196 dated June 09, 2017 (B.E. 2560)

Sampled By : Kantaphon Maneesampan

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

ทะเบียนเลขที่ ๖-323-๙-9447

Approved by

D. Chongchon

Dej Changchon
Senior Manager

ทะเบียนเลขที่ ๖-323-๙-9442

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPO-TPO Plant

Lot ID: 2220439
Date Received : Feb 23, 2022
Date Reported : Mar 02, 2022
Report Number: 2236587-1

Page 1 of 2

Sample Number 2220439-1
Sampled Date Feb 23, 2022
Sample Description Emission from Stationary Source
Location TOX2 (ERU Stack) (GPS 47P 0726941 1405348)
Date Analysis Commenced Feb 24, 2022
Condition of Sample Extracted into two 2-L collection flasks, one filter paper placed in plastic petri dish and one plastic bottle

Stack Description

Ambient Pressure	759	mmHg	Diameter	3.00	m	Oxygen	11.0	%
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	5.7	%
Type of Process	Combustion		Stack Temperature	236	°C	Gas Velocity	5.3	m/s
Type of Fuel	Natural Gas		Moisture	21.84	%	Flow Rate (Actual O2)	61616	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result at 7 %O ₂ at 11.0 % O ₂		Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing										
Oxides of Nitrogen *	11:15 AM - 11:25 AM	ppm	-	1.06	20.3	14.5	200	72	US EPA, Method 7	Rayong
Total Suspended Particulate	11:15 AM - 12:09 PM	mg/m3	-	0.5	<0.5	<0.5	320	35	US EPA, Method 5	Rayong

Guideline :

- Guideline
1).Notification of the Ministry of Industry 2006 (B.E. 2549) Published in the Royal Government Gazette, Vol.123 Special Part 125 D, dated December 4, 2006 (B.E. 2549)
2).Emission Air Standard according to EIA study of HPPO Plant, Approval Letter No. Tor Sor 1009.8/7196 dated June 09, 2017 (B.E. 2560)

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

หมายเลขโทรศัพท์ 3-323-9-9447

Approved by

D. Changchon

Dej Changchon
Senior Manager

หมายเลขโทรศัพท์ 3-323-9-9442

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPO-TPO Plant

Lot ID: 2220439
Date Received : Feb 23, 2022
Date Reported : Mar 02, 2022
Report Number: 2236587-1

Page 2 of 2

Sample Number 2220439-1
Sampled Date Feb 23, 2022
Sample Description Emission from Stationary Source
Location TOX2 (ERU Stack) (GPS 47P 0726941 1405348)
Date Analysis Commenced Feb 24, 2022
Condition of Sample Extracted into two 2-L collection flasks, one filter paper placed in plastic petri dish and one plastic bottle

Stack Description

Ambient Pressure	759	mmHg	Diameter	3.00	m	Oxygen	11.0	%
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	5.7	%
Type of Process	Combustion		Stack Temperature	236	°C	Gas Velocity	5.3	m/s
Type of Fuel	Natural Gas		Moisture	21.84	%	Flow Rate (Actual O2)	61616	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Oxides of Nitrogen *	11:15 AM - 11:25 AM	g/s	-	-	0.465	-	2.0	Calculated	Rayong
Total Suspended Particulate *	11:15 AM - 12:09 PM	g/s	-	-	<0.009	-	0.52	Calculated	Rayong

Guideline :

- Guideline
1).Notification of the Ministry of Industry 2006 (B.E. 2549) Published in the Royal Government Gazette, Vol.123 Special Part 125 D, dated December 4, 2006 (B.E. 2549)
2).Emission Air Standard according to EIA study of HPPO Plant, Approval Letter No. Tor Sor 1009.8/7196 dated June 09, 2017 (B.E. 2560)

Sampled By : Tinnakorn Kulchart

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

หมายเลขโทรศัพท์ 3-323-9-9447

Approved by

D. Changchon

Dej Changchon
Senior Manager

หมายเลขโทรศัพท์ 3-323-9-9442

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130
P/O : 4511081429
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPO-TPO Plant

Lot ID: 21105008
Date Received : Oct 08, 2021
Date Reported : Oct 14, 2021
Report Number : 2085397-1

Page 1 of 3

Sample Number : 21105008-1
Sampled Date : Oct 07, 2021
Sample Description : Emission from Stationary Source
Location : TOX1 (ERU Stack)
Parameter : NOx

Relative Accuracy Test Audit Report

Run No.	Date	Time		Raw Data at Actual O2		Corrected Value at 7% O2		Difference
		Start	Stop	CEMs (ppm)	RM (ppm)	CEMs (ppm)	RM (ppm)	
1*	07 Oct 21	14:35	14:55	26.23	22.14	31.48	26.65	-4.83
2	07 Oct 21	14:56	15:16	25.98	22.33	31.38	27.05	-4.34
3	07 Oct 21	15:17	15:37	25.81	22.14	31.22	26.85	-4.37
4	07 Oct 21	15:38	15:58	25.77	22.06	31.09	26.69	-4.40
5	07 Oct 21	15:59	16:19	25.81	22.13	31.11	26.74	-4.37
6	07 Oct 21	16:20	16:40	26.31	22.55	30.33	26.10	-4.23
7*	07 Oct 21	16:41	17:01	24.80	20.89	29.44	24.78	-4.66
8	07 Oct 21	17:02	17:22	25.28	21.44	29.15	24.89	-4.26
9*	07 Oct 21	17:23	17:43	24.18	20.41	29.31	24.79	-4.52
10	07 Oct 21	17:44	18:04	24.61	20.77	29.53	25.01	-4.52
11	07 Oct 21	18:05	18:25	24.72	20.89	29.42	24.96	-4.47
12	07 Oct 21	18:26	18:46	24.61	20.84	29.28	24.88	-4.40
Average						30.28	25.91	-4.37
Confidence Coefficient (CC)								0.07
Relative Accuracy (Compared with Emission Standard : 72 ppm) (%)								6.17
Relative Accuracy Criteria ^{1/} (Compared with Emission Standard)								≤ 10%

Reference Method : US EPA Method 7E

Remark: * Sample with * is a rejected data

^{1/} Relative Accuracy Criteria of NOx is refer to 40 CFR Part 60 Appendix B : Performance Specification Test 2 (PS-2) compared with Emission Standard 72 ppm at 7%O₂

RA Result is within Criteria

Technical Management
Wichan Choonharat
Manager
โทร: 09-00000000 2-204-R-6113

Approved by
Sarayuth Uthairat
Assistant General Manager
โทร: 09-00000000 2-204-R-4702

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130
P/O : 4511081429
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPO-TPO Plant

Lot ID: 21105008
Date Received : Oct 08, 2021
Date Reported : Oct 14, 2021
Report Number : 2085397-1

Page 3 of 3

Sample Number : 21105008-1
Sampled Date : Oct 07, 2021
Sample Description : Emission from Stationary Source
Location : TOX1 (ERU Stack)
Parameter : O₂

Relative Accuracy Test Audit Report

Run No.	Date	Time		Raw Data at Actual		Difference
		Start	Stop	CEMs (%)	RM (%)	
1	07 Oct 21	14:35	14:55	9.32	9.35	0.03
2	07 Oct 21	14:56	15:16	9.39	9.43	0.03
3	07 Oct 21	15:17	15:37	9.41	9.44	0.03
4	07 Oct 21	15:38	15:58	9.38	9.41	0.03
5	07 Oct 21	15:59	16:19	9.37	9.40	0.03
6*	07 Oct 21	16:20	16:40	8.84	8.89	0.05
7	07 Oct 21	16:41	17:01	9.19	9.18	-0.01
8*	07 Oct 21	17:02	17:22	8.85	8.93	0.08
9	07 Oct 21	17:23	17:43	9.43	9.45	0.02
10	07 Oct 21	17:44	18:04	9.32	9.36	0.04
11*	07 Oct 21	18:05	18:25	9.22	9.27	0.05
12	07 Oct 21	18:26	18:46	9.22	9.26	0.04
Average				9.34	9.36	0.03
Confidence Coefficient (CC)						-
Relative Accuracy (Compared in Actual) (%)						0.03
Relative Accuracy Criteria (%)						≤ 1%

Reference Method : US EPA Method 3A

Remark: * Sample with * is a rejected data

^{1/} Relative Accuracy Criteria of O₂ is refer to 40 CFR Part 60 Appendix B : Performance Specification Test 3 (PS-3)

RA Result is within Criteria

Sampled By : Sakrit Phasaphut

Technical Management
Wichan Choonharat
Manager
โทร: 09-00000000 2-204-R-6113

Approved by
Sarayuth Uthairat
Assistant General Manager
โทร: 09-00000000 2-204-R-4702

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130
P/O : 4511081429
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPO-TPO Plant

Lot ID: 21105008
Date Received : Oct 08, 2021
Date Reported : Oct 14, 2021
Report Number : 2085397-1

Page 2 of 3

Sample Number : 21105008-1
Sampled Date : Oct 07, 2021
Sample Description : Emission from Stationary Source
Location : TOX1 (ERU Stack)
Parameter : CO

Relative Accuracy Test Audit Report

Run No.	Date	Time		Raw Data at Actual O2		Corrected Value at 7% O2		Difference
		Start	Stop	CEMs (ppm)	RM (ppm)	CEMs (ppm)	RM (ppm)	
1	07 Oct 21	14:35	14:55	0.00	0.50	0.00	0.60	0.60
2	07 Oct 21	14:56	15:16	0.00	0.54	0.00	0.65	0.65
3	07 Oct 21	15:17	15:37	0.00	0.55	0.00	0.67	0.67
4	07 Oct 21	15:38	15:58	0.00	0.63	0.00	0.76	0.76
5*	07 Oct 21	15:59	16:19	0.00	0.70	0.00	0.84	0.84
6*	07 Oct 21	16:20	16:40	0.00	0.75	0.00	0.86	0.86
7*	07 Oct 21	16:41	17:01	4.68	3.94	5.55	4.68	-0.87
8	07 Oct 21	17:02	17:22	0.04	0.52	0.04	0.60	0.55
9	07 Oct 21	17:23	17:43	0.69	0.86	0.84	1.04	0.21
10	07 Oct 21	17:44	18:04	0.10	0.43	0.12	0.51	0.39
11	07 Oct 21	18:05	18:25	0.01	0.63	0.01	0.75	0.74
12	07 Oct 21	18:26	18:46	0.00	0.66	0.01	0.79	0.79
Average						0.11	0.71	0.60
Confidence Coefficient (CC)								0.15
Relative Accuracy (Compared with Emission Standard : 690 ppm) (%)								0.11
Relative Accuracy Criteria ^{1/} (Compared with Emission Standard : 690 ppm)								≤ 5%

Reference Method : US EPA Method 10

Remark: * Sample with * is a rejected data

^{1/} Relative Accuracy Criteria of CO is refer to 40 CFR Part 60 Appendix B : Performance Specification Test 4 (PS-4) compared with Emission Standard 690 ppm at 7%O₂

RA Result is within Criteria

Technical Management
Wichan Choonharat
Manager
โทร: 09-00000000 2-204-R-6113

Approved by
Sarayuth Uthairat
Assistant General Manager
โทร: 09-00000000 2-204-R-4702

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130
P/O : 4511081429
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPO-TPO Plant

Lot ID: 21105027
Date Received : Oct 08, 2021
Date Reported : Oct 22, 2021
Report Number : 2085405-2

Page 1 of 1

Sample Number : 21105027-1
Sampled Date : Oct 07, 2021
Sample Description : Emission from Stationary Source
Location : TOX1 (ERU Stack)
Parameter : Flowrate

Relative Accuracy Test Audit Report

Run No.	Date	Time		Raw Data at Actual		Difference
		Start	Stop	CEMs (Nm3/Hr)	RM (Nm3/Hr)	
1	07 Oct 21	14:30	14:45	40841.8	40431.0	7589.2
2*	07 Oct 21	14:52	15:08	40910.9	49852.0	8941.1
3*	07 Oct 21	15:14	15:29	40900.6	49562.0	8661.4
4	07 Oct 21	15:36	15:51	40919.5	45369.0	4449.5
5	07 Oct 21	15:58	16:13	41184.5	45369.0	4184.5
6	07 Oct 21	16:20	16:35	40052.2	46922.0	6869.8
7	07 Oct 21	16:42	16:57	41035.3	43995.0	2959.7
8	07 Oct 21	17:14	17:29	42463.0	49421.0	6958.0
9	07 Oct 21	17:36	17:51	41047.4	49135.0	8087.6
10	07 Oct 21	17:58	18:13	41139.5	49085.0	7945.5
11*	07 Oct 21	18:20	18:35	41266.4	49952.0	8685.6
12	07 Oct 21	18:42	18:57	41224.5	49660.0	8435.5
Average				41100.8	47487.4	6386.6
Confidence Coefficient (CC)						1534.3
Relative Accuracy ^{1/} (Compared with RM) (%)						16.7
Relative Accuracy Criteria (Compared with RM)						≤ 20 %

Reference Method : US EPA Method 2

Remark: * Sample with * is a rejected data

^{1/} Relative Accuracy Criteria of Flowrate is refer to 40 CFR Part 60 Appendix B : Performance Specification Test 6 (PS-6)

RA Result is within Criteria

Sampled By : Sakrit Phasaphut

Technical Management
Wichan Choonharat
Manager
โทร: 09-00000000 2-204-R-6113

Approved by
Sarayuth Uthairat
Assistant General Manager
โทร: 09-00000000 2-204-R-4702

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130

P/O : 4511081429

Project Name : Environmental Quality Monitoring

Project Location : AIE_HHPO-TPO Plant

Lot ID: 21105023

Date Received : Oct 07, 2021

Date Reported : Oct 14, 2021

Report Number : 2085399-1

Page 1 of 3

Sample Number : 21105023-1
Sampled Date : Oct 06, 2021
Sample Description : Emission from Stationary Source
Location : TOX2 (ERU Stack)
Parameter : NOx

Relative Accuracy Test Audit Report

Run No.	Date	Time		Raw Data at Actual O2		Corrected Value at 7% O2		Difference
		Start	Stop	CEMs (ppm)	RM (ppm)	CEMs (ppm)	RM (ppm)	
1	06 Oct 21	12:50	13:10	6.17	11.13	7.27	13.26	6.00
2*	06 Oct 21	13:11	13:31	5.92	11.10	6.99	13.26	6.27
3	06 Oct 21	13:32	13:52	5.87	10.96	6.94	13.10	6.16
4*	06 Oct 21	13:53	14:13	5.77	10.93	6.82	13.07	6.25
5	06 Oct 21	14:14	14:34	5.75	10.84	6.78	12.94	6.16
6	06 Oct 21	14:35	14:55	5.88	10.95	6.91	13.03	6.12
7	06 Oct 21	14:56	15:16	5.88	10.95	6.81	12.84	6.03
8*	06 Oct 21	15:17	15:37	5.65	10.78	6.70	12.90	6.21
9	06 Oct 21	15:38	15:58	5.95	10.93	6.89	12.79	5.91
10	06 Oct 21	15:59	16:19	5.65	10.67	6.68	12.72	6.04
11	06 Oct 21	16:20	16:40	5.72	10.76	6.67	12.66	5.99
12	06 Oct 21	16:41	17:01	5.04	10.04	5.90	11.89	5.99
Average						6.76	12.80	6.04
Confidence Coefficient (CC)								0.07
Relative Accuracy (Compared with Emission Standard : 72 ppm) (%)								8.48
Relative Accuracy Criteria ^{1/} (Compared with Emission Standard)								≤ 10%

Reference Method : US EPA Method 7E

Remark: * Sample with * is a rejected data

^{1/} Relative Accuracy Criteria of NOx is refer to 40 CFR Part 60 Appendix B : Performance Specification Test 2 (PS-2) compared with Emission Standard 72 ppm at 7%O2

RA Result is within Criteria

Technical Management

Wichan Choonharat
Manager
เบอร์โทร 02-204-8113

Approved by

Sareyuth Jittrantorn
Assistant General Manager
เบอร์โทร 02-204-81702

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130

P/O : 4511081429

Project Name : Environmental Quality Monitoring

Project Location : AIE_HHPO-TPO Plant

Lot ID: 21105023

Date Received : Oct 07, 2021

Date Reported : Oct 14, 2021

Report Number : 2085399-1

Page 2 of 3

Sample Number : 21105023-1
Sampled Date : Oct 06, 2021
Sample Description : Emission from Stationary Source
Location : TOX2 (ERU Stack)
Parameter : CO

Relative Accuracy Test Audit Report

Run No.	Date	Time		Raw Data at Actual O2		Corrected Value at 7% O2		Difference
		Start	Stop	CEMs (ppm)	RM (ppm)	CEMs (ppm)	RM (ppm)	
1*	06 Oct 21	12:50	13:10	2.34	0.11	2.75	0.13	-2.63
2*	06 Oct 21	13:11	13:31	2.31	0.05	2.73	0.06	-2.67
3	06 Oct 21	13:32	13:52	2.23	0.13	2.64	0.16	-2.48
4	06 Oct 21	13:53	14:13	2.01	0.18	2.38	0.21	-2.17
5	06 Oct 21	14:14	14:34	2.16	0.19	2.55	0.23	-2.32
6	06 Oct 21	14:35	14:55	2.10	0.29	2.48	0.34	-2.13
7	06 Oct 21	14:56	15:16	2.05	0.42	2.37	0.50	-1.88
8	06 Oct 21	15:17	15:37	2.05	0.37	2.43	0.44	-1.99
9	06 Oct 21	15:38	15:58	2.01	0.54	2.33	0.63	-1.69
10	06 Oct 21	15:59	16:19	2.44	0.46	2.88	0.55	-2.33
11	06 Oct 21	16:20	16:40	2.55	0.57	2.97	0.67	-2.30
12*	06 Oct 21	16:41	17:01	9.42	5.94	11.04	7.03	-4.00
Average						2.56	0.41	-2.14
Confidence Coefficient (CC)								0.19
Relative Accuracy (Compared with Emission Standard : 690 ppm) (%)								0.34
Relative Accuracy Criteria ^{1/} (Compared with Emission Standard : 690 ppm)								≤ 5%

Reference Method : US EPA Method 10

Remark: * Sample with * is a rejected data

^{1/} Relative Accuracy Criteria of CO is refer to 40 CFR Part 60 Appendix B : Performance Specification Test 4 (PS-4) compared with Emission Standard 690 ppm at 7%O2

RA Result is within Criteria

Technical Management

Wichan Choonharat
Manager
เบอร์โทร 02-204-8113

Approved by

Sareyuth Jittrantorn
Assistant General Manager
เบอร์โทร 02-204-81702

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130

P/O : 4511081429

Project Name : Environmental Quality Monitoring

Project Location : AIE_HHPO-TPO Plant

Lot ID: 21105023

Date Received : Oct 07, 2021

Date Reported : Oct 14, 2021

Report Number : 2085399-1

Page 3 of 3

Sample Number : 21105023-1
Sampled Date : Oct 06, 2021
Sample Description : Emission from Stationary Source
Location : TOX2 (ERU Stack)
Parameter : O2

Relative Accuracy Test Audit Report

Run No.	Date	Time		Raw Data at Actual		Difference
		Start	Stop	CEMs (%)	RM (%)	
1*	06 Oct 21	12:50	13:10	9.09	9.24	0.15
2	06 Oct 21	13:11	13:31	9.14	9.26	0.13
3	06 Oct 21	13:32	13:52	9.14	9.27	0.13
4*	06 Oct 21	13:53	14:13	9.15	9.28	0.14
5	06 Oct 21	14:14	14:34	9.12	9.26	0.13
6*	06 Oct 21	14:35	14:55	9.08	9.22	0.14
7	06 Oct 21	14:56	15:16	8.91	9.04	0.13
8	06 Oct 21	15:17	15:37	9.18	9.28	0.10
9	06 Oct 21	15:38	15:58	8.90	9.03	0.13
10	06 Oct 21	15:59	16:19	9.14	9.24	0.10
11	06 Oct 21	16:20	16:40	8.97	9.08	0.11
12	06 Oct 21	16:41	17:01	9.03	9.16	0.13
Average				9.06	9.18	0.12
Confidence Coefficient (CC)						-
Relative Accuracy (Compared in Actual) (%)						0.12
Relative Accuracy Criteria (%)						≤ 1%

Reference Method : US EPA Method 3A

Remark: * Sample with * is a rejected data

^{1/} Relative Accuracy Criteria of O2 is refer to 40 CFR Part 60 Appendix B : Performance Specification Test 3 (PS-3)

RA Result is within Criteria

Sampled By : Seksit Phasansit

Technical Management

Wichan Choonharat
Manager
เบอร์โทร 02-204-8113

Approved by

Sareyuth Jittrantorn
Assistant General Manager
เบอร์โทร 02-204-81702

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130

P/O : 4511081429

Project Name : Environmental Quality Monitoring

Project Location : AIE_HHPO-TPO Plant

Lot ID: 21105032

Date Received : Oct 07, 2021

Date Reported : Oct 22, 2021

Report Number : 2085407-2

Page 1 of 1

Sample Number : 21105032-1
Sampled Date : Oct 06, 2021
Sample Description : Emission from Stationary Source
Location : TOX2 (ERU Stack)
Parameter : Flowrate

Relative Accuracy Test Audit Report

Run No.	Date	Time		Raw Data at Actual		Difference
		Start	Stop	CEMs (Nm3/Hr)	RM (Nm3/Hr)	
1	06 Oct 21	12:50	13:05	54789.2	54668.0	-121.2
2	06 Oct 21	13:12	13:27	55054.6	54944.0	-710.6
3	06 Oct 21	13:34	13:49	54956.6	55718.0	761.4
4	06 Oct 21	13:57	14:12	54970.7	50456.0	-4514.7
5*	06 Oct 21	14:20	14:35	54747.0	50147.0	-4600.0
6	06 Oct 21	14:42	14:57	54646.3	56761.0	2114.7
7	06 Oct 21	15:14	15:29	54577.0	56039.0	1462.0
8	06 Oct 21	15:36	15:51	54364.1	55698.0	1333.9
9*	06 Oct 21	15:57	16:12	55140.5	61767.0	6626.5
10	06 Oct 21	16:20	16:35	55271.7	55306.0	34.3
11	06 Oct 21	16:42	16:57	52480.8	49818.0	-2662.8
12*	06 Oct 21	17:04	17:19	49806.5	56384.0	6577.5
Average				54567.9	54312.0	-255.9
Confidence Coefficient (CC)						1639.0
Relative Accuracy ^{1/} (Compared with RM) (%)						3.5
Relative Accuracy Criteria (Compared with RM)						≤ 20 %

Reference Method : US EPA Method 2

Remark: * Sample with * is a rejected data

^{1/} Relative Accuracy Criteria of Flowrate is refer to 40 CFR Part 60 Appendix B : Performance Specification Test 6 (PS-6)

RA Result is within Criteria

Sampled By : Seksit Phasansit

Technical Management

Wichan Choonharat
Manager
เบอร์โทร 02-204-8113

Approved by

Sareyuth Jittrantorn
Assistant General Manager
เบอร์โทร 02-204-81702

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O :
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149867
Date Received : Feb 04, 2022
Date Reported : Feb 12, 2022
Report Number : 2185320-1

Page 1 of 2

Sample Number 21149867-1
Sampled Date Feb 04, 2022
Sample Description Air Quality
Location บริเวณถนนมิตรภาพ PO
Date Analysis Commenced Feb 05, 2022
Condition of Sample Drawn into one 10-L air sampling bag and one sorbent tube, refrigerated
Barometric Pressure 758 mmHg
Atmospheric Temperature 31.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Methane as Propane	09:30 AM - 11:30 AM	ppm	-	0.33	0.90	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	09:30 AM - 11:30 AM	ppm	-	0.33	0.74	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Propylene Oxide	09:30 AM - 11:30 AM	ppm	-	0.10	<0.10	100	NIOSH (1994), 1612	MOL	Bangkok
Total Hydrocarbon as Propane	09:30 AM - 11:30 AM	ppm	-	0.33	1.64	No Standard	Total Hydrocarbon Analyzer	-	Rayong

Guideline :
MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Sathapron Thakarn

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O :
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149867
Date Received : Feb 04, 2022
Date Reported : Feb 12, 2022
Report Number : 2185320-1

Page 2 of 2

Sample Number 21149867-2
Sampled Date Feb 04, 2022
Sample Description Air Quality
Location บริเวณถนนมิตรภาพ PO
Date Analysis Commenced Feb 05, 2022
Condition of Sample Drawn into one 10-L air sampling bag and one sorbent tube, refrigerated
Barometric Pressure 758 mmHg
Atmospheric Temperature 31.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Methane as Propane	09:30 AM - 11:30 AM	ppm	-	0.33	0.86	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	09:30 AM - 11:30 AM	ppm	-	0.33	<0.33	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Propylene Oxide	09:30 AM - 11:30 AM	ppm	-	0.10	<0.10	100	NIOSH (1994), 1612	MOL	Bangkok
Total Hydrocarbon as Propane	09:30 AM - 11:30 AM	ppm	-	0.33	0.86	No Standard	Total Hydrocarbon Analyzer	-	Rayong

Guideline :
MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Sathapron Thakarn

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPPO-TPO Plant

Lot ID: 2240281

Date Received : May 13, 2022

Date Reported : May 23, 2022

Report Number : 2274453-1

Sample Number 2240281-1
Sampled Date May 13, 2022
Sample Description Air Quality
Location บริเวณหน่วยผลิตสาร PO
Date Analysis Commenced May 14, 2022
Condition of Sample Drawn into one 10-L air sampling bag and one sorbent tube, refrigerated
Barometric Pressure 758 mmHg
Atmospheric Temperature 32.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Methane as Propane	09:30 AM - 09:50 AM	ppm	-	0.33	0.81	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	09:30 AM - 09:50 AM	ppm	-	0.33	0.86	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Propylene Oxide	09:30 AM - 11:30 AM	ppm	-	0.10	<0.10	100	NIOSH (1994), 1612	MOL	Bangkok
Total Hydrocarbon as Propane	09:30 AM - 09:50 AM	ppm	-	0.33	1.67	No Standard	Total Hydrocarbon Analyzer	-	Rayong

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Satcha Phetsawaeng

Remark :

- LOD : Limit of Detection
- "c" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Saranya C.

Saranya Chalerthamrong
Scientist (4)

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPPO-TPO Plant

Lot ID: 2240281

Date Received : May 13, 2022

Date Reported : May 23, 2022

Report Number : 2274453-1

Sample Number 2240281-2
Sampled Date May 13, 2022
Sample Description Air Quality
Location บริเวณห้องเก็บก๊าซสาร PO
Date Analysis Commenced May 14, 2022
Condition of Sample Drawn into one 10-L air sampling bag and one sorbent tube, refrigerated
Barometric Pressure 758 mmHg
Atmospheric Temperature 32.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Methane as Propane	09:35 AM - 09:55 AM	ppm	-	0.33	0.81	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	09:35 AM - 09:55 AM	ppm	-	0.33	1.04	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Propylene Oxide	09:35 AM - 11:35 AM	ppm	-	0.10	<0.10	100	NIOSH (1994), 1612	MOL	Bangkok
Total Hydrocarbon as Propane	09:35 AM - 09:55 AM	ppm	-	0.33	1.85	No Standard	Total Hydrocarbon Analyzer	-	Rayong

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Satcha Phetsawaeng

Remark :

- LOD : Limit of Detection
- "c" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Saranya C.

Saranya Chalerthamrong
Scientist (4)

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ระดับเสียงทั่วไป (Leq 24 hrs) บริเวณโรงงาน



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248937-1

Page 1 of 1

Sample Number	2220467-5
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณพื้นที่โรงโม่หินทางด้านทิศตะวันตกของพื้นที่ HPP0 (GPS 47P 0726777, 1405417)
Measurement Date	Feb 25 - Feb 26, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734221

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	59.4	79.0	57.5
01:00 PM - 02:00 PM	59.3	74.5	56.7
02:00 PM - 03:00 PM	58.9	73.0	56.9
03:00 PM - 04:00 PM	58.8	73.8	57.0
04:00 PM - 05:00 PM	59.9	75.7	57.5
05:00 PM - 06:00 PM	60.9	75.4	58.7
06:00 PM - 07:00 PM	62.0	83.9	59.3
07:00 PM - 08:00 PM	60.5	75.4	59.2
08:00 PM - 09:00 PM	60.6	76.6	59.3
09:00 PM - 10:00 PM	60.4	70.0	59.5
10:00 PM - 11:00 PM	60.3	67.6	59.5
11:00 PM - 12:00 AM	60.4	74.5	59.5
12:00 AM - 01:00 AM	60.4	69.0	59.4
01:00 AM - 02:00 AM	60.2	74.4	59.3
02:00 AM - 03:00 AM	59.7	66.4	58.9
03:00 AM - 04:00 AM	59.8	62.7	59.0
04:00 AM - 05:00 AM	60.4	67.7	59.4
05:00 AM - 06:00 AM	60.6	73.1	59.7
06:00 AM - 07:00 AM	61.4	70.8	59.8
07:00 AM - 08:00 AM	62.6	76.0	60.4
08:00 AM - 09:00 AM	62.3	83.2	59.7
09:00 AM - 10:00 AM	61.8	75.4	60.4
10:00 AM - 11:00 AM	63.0	85.4	60.1
11:00 AM - 12:00 PM	63.4	76.5	61.5
Leq Average 24 hrs. (dB(A))	60.9		
Lmax (dB(A))		85.4	
L90 (dB(A))			59.3
Ldn (dB(A))	66.9		
Standard (dB(A))	70	115	
Reference Method : ISO1996-1 and 1996-2			
Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยข้อกำหนดอันที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป 2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการกวน และระดับเสียงที่มาจากอุปกรณ์การกวน โดย พ.ร.บ. 2548			

Technical Management

Thanitak.
Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S
Supot Salameh
Section Head

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S:\Reports_AP Noise.rpt (10:18AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248938-1

Page 1 of 1

Sample Number	2220467-6
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณพื้นที่โรงโม่หินทางด้านทิศตะวันตกของพื้นที่ HPP0 (GPS 47P 0726777, 1405417)
Measurement Date	Feb 26 - Feb 27, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734221

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	63.9	84.3	62.0
01:00 PM - 02:00 PM	62.0	77.5	60.1
02:00 PM - 03:00 PM	61.6	79.5	60.3
03:00 PM - 04:00 PM	61.6	71.4	60.8
04:00 PM - 05:00 PM	61.6	73.2	60.8
05:00 PM - 06:00 PM	62.1	71.9	61.3
06:00 PM - 07:00 PM	62.0	74.4	61.2
07:00 PM - 08:00 PM	62.4	75.1	61.5
08:00 PM - 09:00 PM	58.9	68.6	58.0
09:00 PM - 10:00 PM	58.7	62.0	57.9
10:00 PM - 11:00 PM	56.7	63.0	58.0
11:00 PM - 12:00 AM	59.6	72.7	58.5
12:00 AM - 01:00 AM	60.5	72.5	58.9
01:00 AM - 02:00 AM	61.9	76.4	59.4
02:00 AM - 03:00 AM	61.0	81.0	58.5
03:00 AM - 04:00 AM	59.6	75.0	58.2
04:00 AM - 05:00 AM	60.3	83.1	57.8
05:00 AM - 06:00 AM	60.3	78.2	58.0
06:00 AM - 07:00 AM	58.4	77.2	56.6
07:00 AM - 08:00 AM	58.5	75.7	55.7
08:00 AM - 09:00 AM	58.8	72.5	57.2
09:00 AM - 10:00 AM	59.8	80.5	57.6
10:00 AM - 11:00 AM	62.9	86.1	58.4
11:00 AM - 12:00 PM	60.8	73.1	58.9
Leq Average 24 hrs. (dB(A))	60.9		
Lmax (dB(A))		86.1	
L90 (dB(A))			58.5
Ldn (dB(A))	66.8		
Standard (dB(A))	70	115	
Reference Method : ISO1996-1 and 1996-2			
Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยข้อกำหนดอันที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป 2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการกวน และระดับเสียงที่มาจากอุปกรณ์การกวน โดย พ.ร.บ. 2548			

Technical Management

Thanitak.
Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S
Supot Salameh
Section Head

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248939-1

Page 1 of 1

Sample Number	2220467-7
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณพื้นที่โรงโม่หินทางด้านทิศตะวันตกของพื้นที่ HPP0 (GPS 47P 0726777, 1405417)
Measurement Date	Feb 27 - Feb 28, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734221

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	61.2	84.0	59.0
01:00 PM - 02:00 PM	60.0	81.5	58.4
02:00 PM - 03:00 PM	60.0	73.2	58.9
03:00 PM - 04:00 PM	60.2	75.4	59.3
04:00 PM - 05:00 PM	59.7	67.7	58.9
05:00 PM - 06:00 PM	59.7	69.0	58.9
06:00 PM - 07:00 PM	59.6	71.8	58.6
07:00 PM - 08:00 PM	59.7	66.4	59.0
08:00 PM - 09:00 PM	59.9	64.1	59.2
09:00 PM - 10:00 PM	66.9	80.3	59.1
10:00 PM - 11:00 PM	60.1	77.7	58.0
11:00 PM - 12:00 AM	59.2	72.2	58.3
12:00 AM - 01:00 AM	60.2	74.6	58.3
01:00 AM - 02:00 AM	62.2	82.8	58.9
02:00 AM - 03:00 AM	61.1	77.7	58.6
03:00 AM - 04:00 AM	59.7	75.3	58.3
04:00 AM - 05:00 AM	59.6	76.8	58.1
05:00 AM - 06:00 AM	60.3	79.5	58.0
06:00 AM - 07:00 AM	58.5	78.1	56.6
07:00 AM - 08:00 AM	58.4	73.6	55.8
08:00 AM - 09:00 AM	58.0	72.1	56.0
09:00 AM - 10:00 AM	57.9	72.9	56.1
10:00 AM - 11:00 AM	59.0	74.8	56.6
11:00 AM - 12:00 PM	60.5	75.0	58.3
Leq Average 24 hrs. (dB(A))	60.6		
Lmax (dB(A))		84.0	
L90 (dB(A))			58.4
Ldn (dB(A))	66.7		
Standard (dB(A))	70	115	
Reference Method : ISO1996-1 and 1996-2			
Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยข้อกำหนดอันที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป 2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการกวน และระดับเสียงที่มาจากอุปกรณ์การกวน โดย พ.ร.บ. 2548			

Technical Management

Thanitak.
Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S
Supot Salameh
Section Head

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248940-1

Page 1 of 1

Sample Number	2220467-8
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณพื้นที่โรงโม่หินทางด้านทิศตะวันตกของพื้นที่ HPP0 (GPS 47P 0727136, 1405550)
Measurement Date	Feb 21 - Feb 22, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734223

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	56.2	81.9	50.7
01:00 PM - 02:00 PM	56.1	77.0	48.6
02:00 PM - 03:00 PM	55.4	79.4	48.6
03:00 PM - 04:00 PM	51.3	70.4	47.3
04:00 PM - 05:00 PM	53.3	75.0	48.1
05:00 PM - 06:00 PM	53.4	77.1	48.6
06:00 PM - 07:00 PM	53.3	74.2	49.7
07:00 PM - 08:00 PM	52.0	68.5	49.0
08:00 PM - 09:00 PM	56.7	80.7	48.5
09:00 PM - 10:00 PM	50.3	59.2	49.2
10:00 PM - 11:00 PM	50.4	60.1	49.0
11:00 PM - 12:00 AM	52.5	77.4	50.9
12:00 AM - 01:00 AM	57.6	81.7	52.0
01:00 AM - 02:00 AM	53.6	74.7	52.5
02:00 AM - 03:00 AM	53.5	60.4	52.6
03:00 AM - 04:00 AM	53.9	59.7	53.0
04:00 AM - 05:00 AM	53.9	70.2	53.0
05:00 AM - 06:00 AM	54.9	72.7	53.4
06:00 AM - 07:00 AM	58.0	75.2	54.8
07:00 AM - 08:00 AM	58.8	78.2	55.5
08:00 AM - 09:00 AM	55.9	72.1	53.6
09:00 AM - 10:00 AM	57.0	82.0	53.0
10:00 AM - 11:00 AM	54.5	78.1	51.6
11:00 AM - 12:00 PM	52.3	71.7	50.0
Leq Average 24 hrs. (dB(A))	55.0		
Lmax (dB(A))		82.0	
L90 (dB(A))			50.7
Ldn (dB(A))	61.3		
Standard (dB(A))	70	115	
Reference Method : ISO1996-1 and 1996-2			
Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยข้อกำหนดอันที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป 2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการกวน และระดับเสียงที่มาจากอุปกรณ์การกวน โดย พ.ร.บ. 2548			

Technical Management

Thanitak.
Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S
Supot Salameh
Section Head

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4512886163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467

Date Received : Mar 01, 2022

Date Reported : Mar 04, 2022

Report Number: 2248941-1

Page 1 of 1

Sample Number	2220467-9
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณชั้นโรงโม่หินทางเข้าใต้ถุนห้อง HPP0 (ช่วงบน รุน มวล 45) (GPS 47P 0727136, 1404550)
Measurement Date	Feb 22 - Feb 23, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734223

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	52.3	72.2	48.4
01:00 PM - 02:00 PM	53.0	76.3	49.2
02:00 PM - 03:00 PM	56.2	79.6	49.3
03:00 PM - 04:00 PM	52.0	73.8	48.4
04:00 PM - 05:00 PM	52.1	69.9	47.0
05:00 PM - 06:00 PM	52.6	68.4	47.8
06:00 PM - 07:00 PM	55.8	76.2	49.9
07:00 PM - 08:00 PM	52.4	67.1	50.1
08:00 PM - 09:00 PM	52.9	70.9	50.5
09:00 PM - 10:00 PM	52.4	57.9	51.3
10:00 PM - 11:00 PM	54.2	83.7	51.3
11:00 PM - 12:00 AM	53.8	70.6	51.6
12:00 AM - 01:00 AM	53.9	61.5	52.1
01:00 AM - 02:00 AM	52.5	65.4	51.3
02:00 AM - 03:00 AM	52.6	61.7	51.1
03:00 AM - 04:00 AM	53.5	62.2	51.5
04:00 AM - 05:00 AM	53.9	70.8	51.9
05:00 AM - 06:00 AM	57.5	80.3	52.8
06:00 AM - 07:00 AM	58.9	85.8	54.3
07:00 AM - 08:00 AM	58.2	78.1	54.3
08:00 AM - 09:00 AM	56.7	78.4	53.3
09:00 AM - 10:00 AM	55.3	79.4	53.1
10:00 AM - 11:00 AM	55.2	79.0	52.7
11:00 AM - 12:00 PM	53.9	78.6	50.8

Leq Average 24 hrs. (dB(A))	54.8
Lmax (dB(A))	85.8
L90 (dB(A))	51.3
Ldn (dB(A))	61.4
Standard (dB(A))	70

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงรบกวน ฉบับที่ 15 (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงรบกวน ฉบับที่ 15 (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป

Technical Management

Thanitak.
Thanita Kulsunwong
Scientist (4)

Approved by

Supt S
Supot Salameth
Section Head

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4512886163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467

Date Received : Mar 01, 2022

Date Reported : Mar 04, 2022

Report Number: 2248943-1

Page 1 of 1

Sample Number	2220467-11
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณชั้นโรงโม่หินทางเข้าใต้ถุนห้อง HPP0 (ช่วงบน รุน มวล 45) (GPS 47P 0727136, 1404550)
Measurement Date	Feb 24 - Feb 25, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734223

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	63.0	83.8	54.5
01:00 PM - 02:00 PM	59.8	77.6	52.2
02:00 PM - 03:00 PM	56.6	81.5	46.1
03:00 PM - 04:00 PM	51.4	71.8	46.0
04:00 PM - 05:00 PM	51.5	71.5	46.9
05:00 PM - 06:00 PM	51.6	72.8	47.9
06:00 PM - 07:00 PM	54.2	75.5	49.4
07:00 PM - 08:00 PM	52.4	69.4	50.8
08:00 PM - 09:00 PM	53.3	77.4	51.9
09:00 PM - 10:00 PM	54.1	80.7	51.7
10:00 PM - 11:00 PM	53.1	80.6	51.7
11:00 PM - 12:00 AM	54.2	84.8	52.3
12:00 AM - 01:00 AM	54.2	81.0	52.3
01:00 AM - 02:00 AM	54.0	80.8	52.2
02:00 AM - 03:00 AM	54.1	81.2	52.2
03:00 AM - 04:00 AM	54.5	81.3	52.5
04:00 AM - 05:00 AM	54.4	85.9	52.3
05:00 AM - 06:00 AM	57.8	86.3	53.3
06:00 AM - 07:00 AM	59.3	87.3	54.4
07:00 AM - 08:00 AM	60.3	86.7	54.4
08:00 AM - 09:00 AM	60.1	87.7	54.1
09:00 AM - 10:00 AM	59.9	88.7	53.8
10:00 AM - 11:00 AM	59.1	89.2	53.1
11:00 AM - 12:00 PM	54.6	73.4	52.3

Leq Average 24 hrs. (dB(A))	56.8
Lmax (dB(A))	89.2
L90 (dB(A))	52.2
Ldn (dB(A))	62.3
Standard (dB(A))	70

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงรบกวน ฉบับที่ 15 (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงรบกวน ฉบับที่ 15 (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป

Technical Management

Thanitak.
Thanita Kulsunwong
Scientist (4)

Approved by

Supt S
Supot Salameth
Section Head

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S:\Reports_Air Noise rpt (10-18AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4512886163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467

Date Received : Mar 01, 2022

Date Reported : Mar 04, 2022

Report Number: 2248942-1

Page 1 of 1

Sample Number	2220467-10
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณชั้นโรงโม่หินทางเข้าใต้ถุนห้อง HPP0 (ช่วงบน รุน มวล 45) (GPS 47P 0727136, 1404550)
Measurement Date	Feb 23 - Feb 24, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734223

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	52.6	77.0	50.1
01:00 PM - 02:00 PM	55.5	75.4	50.5
02:00 PM - 03:00 PM	57.0	79.0	51.4
03:00 PM - 04:00 PM	55.6	76.5	51.1
04:00 PM - 05:00 PM	53.5	74.5	48.9
05:00 PM - 06:00 PM	52.9	72.2	49.4
06:00 PM - 07:00 PM	54.7	76.9	49.7
07:00 PM - 08:00 PM	52.1	68.2	49.4
08:00 PM - 09:00 PM	51.5	70.2	49.9
09:00 PM - 10:00 PM	53.6	66.0	51.0
10:00 PM - 11:00 PM	55.9	72.2	53.4
11:00 PM - 12:00 AM	56.4	66.7	53.9
12:00 AM - 01:00 AM	56.3	68.7	54.1
01:00 AM - 02:00 AM	56.2	70.8	54.0
02:00 AM - 03:00 AM	55.9	76.2	53.9
03:00 AM - 04:00 AM	55.7	67.3	54.0
04:00 AM - 05:00 AM	55.6	76.3	54.1
05:00 AM - 06:00 AM	57.1	71.7	54.7
06:00 AM - 07:00 AM	60.6	82.8	57.3
07:00 AM - 08:00 AM	60.8	78.6	56.9
08:00 AM - 09:00 AM	59.4	91.3	55.1
09:00 AM - 10:00 AM	60.8	89.8	54.8
10:00 AM - 11:00 AM	60.7	93.4	54.9
11:00 AM - 12:00 PM	59.7	86.9	54.0

Leq Average 24 hrs. (dB(A))	57.2
Lmax (dB(A))	93.4
L90 (dB(A))	53.9
Ldn (dB(A))	63.4
Standard (dB(A))	70

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงรบกวน ฉบับที่ 15 (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงรบกวน ฉบับที่ 15 (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป

Technical Management

Thanitak.
Thanita Kulsunwong
Scientist (4)

Approved by

Supt S
Supot Salameth
Section Head

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8525-209/ EMAIL

S:\Reports_Air Noise rpt (10-18AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4512886163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467

Date Received : Mar 01, 2022

Date Reported : Mar 04, 2022

Report Number: 2248944-1

Page 1 of 1

Sample Number	2220467-12
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณชั้นโรงโม่หินทางเข้าใต้ถุนห้อง HPP0 (ช่วงบน รุน มวล 45) (GPS 47P 0727136, 1404550)
Measurement Date	Feb 25 - Feb 26, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734223

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	54.2	81.3	51.2
01:00 PM - 02:00 PM	53.1	71.3	50.6
02:00 PM - 03:00 PM	56.9	80.7	47.5
03:00 PM - 04:00 PM	52.4	66.6	47.5
04:00 PM - 05:00 PM	54.6	70.1	50.3
05:00 PM - 06:00 PM	54.3	72.3	51.9
06:00 PM - 07:00 PM	54.7	70.5	51.9
07:00 PM - 08:00 PM	53.5	67.2	52.0
08:00 PM - 09:00 PM	53.3	66.8	51.9
09:00 PM - 10:00 PM	52.5	64.4	51.4
10:00 PM - 11:00 PM	52.7	67.3	51.8
11:00 PM - 12:00 AM	53.0	65.8	52.0
12:00 AM - 01:00 AM	53.5	68.0	52.4
01:00 AM - 02:00 AM	56.3	76.9	52.6
02:00 AM - 03:00 AM	52.7	62.4	51.7
03:00 AM - 04:00 AM	53.5	61.0	52.4
04:00 AM - 05:00 AM	53.6	72.7	52.5
05:00 AM - 06:00 AM	55.0	67.8	53.6
06:00 AM - 07:00 AM	56.3	72.7	54.2
07:00 AM - 08:00 AM	57.7	86.1	54.0
08:00 AM - 09:00 AM	54.7	78.3	52.4
09:00 AM - 10:00 AM	55.6	78.6	52.9
10:00 AM - 11:00 AM	55.6	83.1	52.9
11:00 AM - 12:00 PM	52.9	68.1	50.4

Leq Average 24 hrs. (dB(A))	54.5
Lmax (dB(A))	86.1
L90 (dB(A))	52.0
Ldn (dB(A))	60.8
Standard (dB(A))	70

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงรบกวน ฉบับที่ 15 (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงรบกวน ฉบับที่ 15 (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป

Technical Management

Thanitak.
Thanita Kulsunwong
Scientist (4)

Approved by

Supt S
Supot Salameth
Section Head

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S:\Reports_Air Noise rpt (10-18AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPD-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248945-1

Page 1 of 1

Sample Number 2220467-13
Parameter Noise (Leq 24 hrs.)
Location บ้านนาข้าวหอมมะลิโครงการทางด่วนพิเศษใต้ของพื้นที่ HPPD (ช่วงถนน รพช 45) (GPS 47P 0727136, 1404550)
Measurement Date Feb 26 - Feb 27, 2022
Measurement by Anurak Tongkhajonsakda
Sound Level meter Serial No. 734223

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	52.6	66.6	50.2
01:00 PM - 02:00 PM	53.0	70.3	49.9
02:00 PM - 03:00 PM	56.0	79.9	49.9
03:00 PM - 04:00 PM	54.2	78.1	50.0
04:00 PM - 05:00 PM	52.7	80.9	48.6
05:00 PM - 06:00 PM	51.3	66.8	46.6
06:00 PM - 07:00 PM	53.7	70.4	48.5
07:00 PM - 08:00 PM	52.8	67.8	50.7
08:00 PM - 09:00 PM	53.4	69.4	51.6
09:00 PM - 10:00 PM	54.2	74.2	51.8
10:00 PM - 11:00 PM	52.5	61.4	51.6
11:00 PM - 12:00 AM	52.3	59.8	51.8
12:00 AM - 01:00 AM	52.7	64.6	51.8
01:00 AM - 02:00 AM	52.9	60.6	52.1
02:00 AM - 03:00 AM	52.8	63.7	52.0
03:00 AM - 04:00 AM	53.2	67.1	52.3
04:00 AM - 05:00 AM	53.5	66.4	52.6
05:00 AM - 06:00 AM	56.1	77.4	52.7
06:00 AM - 07:00 AM	57.4	87.3	53.9
07:00 AM - 08:00 AM	51.4	75.8	48.9
08:00 AM - 09:00 AM	54.3	74.2	49.3
09:00 AM - 10:00 AM	55.8	77.8	50.2
10:00 AM - 11:00 AM	54.4	75.3	49.9
11:00 AM - 12:00 PM	52.3	73.3	47.7
Leq Average 24 hrs. (dB(A))	53.8		
Lmax (dB(A))		87.3	
L90 (dB(A))			50.2
Ldn (dB(A))	60.4		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงจากการจราจร และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management

Thanitak.

Thanita Kulsurwong
Scientist (4)

Approved by

Supot S.

Supot Salameh
Section Head

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S:\Reports_L\Air Noise rpt (10:18AM)

8525-209/ EMAIL



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPD-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248946-1

Page 1 of 1

Sample Number 2220467-14
Parameter Noise (Leq 24 hrs.)
Location บ้านนาข้าวหอมมะลิโครงการทางด่วนพิเศษใต้ของพื้นที่ HPPD (ช่วงถนน รพช 45) (GPS 47P 0727136, 1404550)
Measurement Date Feb 27 - Feb 28, 2022
Measurement by Anurak Tongkhajonsakda
Sound Level meter Serial No. 734223

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	51.7	71.0	48.2
01:00 PM - 02:00 PM	53.5	75.7	48.5
02:00 PM - 03:00 PM	50.9	67.0	48.2
03:00 PM - 04:00 PM	52.1	70.8	50.5
04:00 PM - 05:00 PM	54.2	66.6	51.6
05:00 PM - 06:00 PM	56.5	72.8	54.0
06:00 PM - 07:00 PM	57.0	67.3	54.5
07:00 PM - 08:00 PM	56.9	69.3	54.7
08:00 PM - 09:00 PM	56.8	71.4	54.6
09:00 PM - 10:00 PM	56.5	76.8	54.5
10:00 PM - 11:00 PM	56.3	67.9	54.6
11:00 PM - 12:00 AM	54.8	75.5	53.3
12:00 AM - 01:00 AM	56.3	70.9	53.9
01:00 AM - 02:00 AM	59.8	82.0	56.5
02:00 AM - 03:00 AM	60.0	77.8	56.1
03:00 AM - 04:00 AM	58.6	90.5	54.3
04:00 AM - 05:00 AM	60.0	89.0	54.0
05:00 AM - 06:00 AM	59.9	92.6	54.1
06:00 AM - 07:00 AM	58.9	86.1	53.2
07:00 AM - 08:00 AM	60.2	83.0	53.7
08:00 AM - 09:00 AM	59.0	76.8	51.4
09:00 AM - 10:00 AM	54.3	79.2	43.8
10:00 AM - 11:00 AM	49.1	69.5	43.7
11:00 AM - 12:00 PM	49.2	69.2	44.6
Leq Average 24 hrs. (dB(A))	57.0		
Lmax (dB(A))		92.6	
L90 (dB(A))			53.7
Ldn (dB(A))	64.7		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงจากการจราจร และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management

Thanitak.

Thanita Kulsurwong
Scientist (4)

Approved by

Supot S.

Supot Salameh
Section Head

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S:\Reports_L\Air Noise rpt (11:53AM)

ระดับเสียงทั่วไป (Leq 24 hrs) บริเวณชุมชน



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512886163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPO-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248947-1

Page 1 of 1

Sample Number : 2220467-15
Parameter : Noise (Leq 24 hrs.)
Location : กลุ่มบ้านในเขตชุมชนบ้านนา (บ้านนาหลวง) (GPS 47P 0726292, 1407282)
Measurement Date : Feb 21 - Feb 22, 2022
Measurement by : Anurak Tongkhajonsakda
Sound Level meter : Serial No. 472126

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	52.9	82.1	40.9
01:00 PM - 02:00 PM	56.6	85.5	39.4
02:00 PM - 03:00 PM	50.3	80.5	38.5
03:00 PM - 04:00 PM	46.7	70.6	37.3
04:00 PM - 05:00 PM	48.3	77.5	37.9
05:00 PM - 06:00 PM	51.5	78.7	40.7
06:00 PM - 07:00 PM	49.4	69.1	39.3
07:00 PM - 08:00 PM	50.0	77.2	43.1
08:00 PM - 09:00 PM	49.1	77.6	42.4
09:00 PM - 10:00 PM	48.3	68.4	43.8
10:00 PM - 11:00 PM	46.1	68.3	42.9
11:00 PM - 12:00 AM	46.1	66.4	44.2
12:00 AM - 01:00 AM	44.6	53.6	43.4
01:00 AM - 02:00 AM	45.1	63.3	43.2
02:00 AM - 03:00 AM	45.0	71.9	43.3
03:00 AM - 04:00 AM	45.6	65.7	43.9
04:00 AM - 05:00 AM	47.4	67.7	44.5
05:00 AM - 06:00 AM	50.8	73.0	44.9
06:00 AM - 07:00 AM	52.0	75.2	46.8
07:00 AM - 08:00 AM	56.4	78.4	50.2
08:00 AM - 09:00 AM	59.2	77.4	51.6
09:00 AM - 10:00 AM	54.8	72.3	50.3
10:00 AM - 11:00 AM	55.5	72.8	50.3
11:00 AM - 12:00 PM	54.5	75.9	50.4

Leq Average 24 hrs. (dB(A)) : 52.3
Lmax (dB(A)) : 85.5
L90 (dB(A)) : 43.3
Ldn (dB(A)) : 55.7
Standard (dB(A)) : 70
Reference Method : ISO1996-1 and 1996-2
Standard : 1. ปรากฏผลการตรวจวัดค่าเฉลี่ยของระดับเสียง 15 (น.ม. 2540) ที่รายงานค่ามาตรฐานระดับเสียงโดยทั่วไป
2. ปรากฏผลการตรวจวัดค่ามาตรฐาน ที่รายงานค่ามาตรฐานระดับเสียงการก่อกวน และระดับเสียงที่ปรากฏการรบกวนการ
โรงงาน น.ม. 2548

Technical Management

Thanitak.

Thanita Kulsuriwong
Scientist (4)

Approved by

Suppt S.

Supot Salameth
Section Head

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S\Report\Air Noise rpt (11 54AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512886163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPO-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248949-1

Page 1 of 1

Sample Number : 2220467-17
Parameter : Noise (Leq 24 hrs.)
Location : กลุ่มบ้านในเขตชุมชนบ้านนา (บ้านนาหลวง) (GPS 47P 0726292, 1407282)
Measurement Date : Feb 23 - Feb 24, 2022
Measurement by : Anurak Tongkhajonsakda
Sound Level meter : Serial No. 472126

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	57.4	88.3	43.3
01:00 PM - 02:00 PM	51.9	75.4	42.3
02:00 PM - 03:00 PM	52.3	83.0	43.5
03:00 PM - 04:00 PM	53.1	82.8	44.2
04:00 PM - 05:00 PM	53.3	79.7	45.5
05:00 PM - 06:00 PM	52.8	72.1	46.7
06:00 PM - 07:00 PM	52.7	78.9	46.7
07:00 PM - 08:00 PM	49.7	68.6	46.4
08:00 PM - 09:00 PM	48.1	66.2	45.2
09:00 PM - 10:00 PM	45.6	66.8	43.2
10:00 PM - 11:00 PM	44.0	62.1	42.7
11:00 PM - 12:00 AM	46.4	73.7	43.5
12:00 AM - 01:00 AM	47.7	79.2	43.3
01:00 AM - 02:00 AM	46.3	71.4	44.3
02:00 AM - 03:00 AM	46.1	61.2	45.1
03:00 AM - 04:00 AM	46.4	57.7	45.5
04:00 AM - 05:00 AM	48.3	66.2	45.7
05:00 AM - 06:00 AM	51.5	71.2	48.0
06:00 AM - 07:00 AM	55.7	79.2	50.1
07:00 AM - 08:00 AM	58.1	80.2	50.6
08:00 AM - 09:00 AM	53.3	82.1	48.6
09:00 AM - 10:00 AM	54.1	78.6	48.8
10:00 AM - 11:00 AM	54.8	75.9	47.6
11:00 AM - 12:00 PM	56.4	79.8	46.1

Leq Average 24 hrs. (dB(A)) : 52.8
Lmax (dB(A)) : 88.3
L90 (dB(A)) : 45.5
Ldn (dB(A)) : 57.0
Standard (dB(A)) : 70
Reference Method : Based on ISO1996-1 and 1996-2
Standard : 1. ปรากฏผลการตรวจวัดค่าเฉลี่ยของระดับเสียง 15 (น.ม. 2540) ที่รายงานค่ามาตรฐานระดับเสียงโดยทั่วไป
2. ปรากฏผลการตรวจวัดค่ามาตรฐาน ที่รายงานค่ามาตรฐานระดับเสียงการก่อกวน และระดับเสียงที่ปรากฏการรบกวนการ
โรงงาน น.ม. 2548

Technical Management

Thanitak.

Thanita Kulsuriwong
Scientist (4)

Approved by

Suppt S.

Supot Salameth
Section Head

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S\Report\Air Noise rpt (11 54AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512886163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPO-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248948-1

Page 1 of 1

Sample Number : 2220467-16
Parameter : Noise (Leq 24 hrs.)
Location : กลุ่มบ้านในเขตชุมชนบ้านนา (บ้านนาหลวง) (GPS 47P 0726292, 1407282)
Measurement Date : Feb 22 - Feb 23, 2022
Measurement by : Anurak Tongkhajonsakda
Sound Level meter : Serial No. 472126

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	62.6	90.2	48.8
01:00 PM - 02:00 PM	51.7	81.9	39.9
02:00 PM - 03:00 PM	48.1	72.0	38.7
03:00 PM - 04:00 PM	49.7	78.9	39.3
04:00 PM - 05:00 PM	52.9	80.1	42.1
05:00 PM - 06:00 PM	50.8	70.5	40.7
06:00 PM - 07:00 PM	51.4	78.6	44.5
07:00 PM - 08:00 PM	50.5	79.0	43.8
08:00 PM - 09:00 PM	46.2	66.3	41.7
09:00 PM - 10:00 PM	44.3	66.2	40.8
10:00 PM - 11:00 PM	44.0	64.3	42.1
11:00 PM - 12:00 AM	42.5	51.5	41.3
12:00 AM - 01:00 AM	43.0	61.2	41.1
01:00 AM - 02:00 AM	42.9	69.8	41.2
02:00 AM - 03:00 AM	43.5	63.6	41.8
03:00 AM - 04:00 AM	43.5	63.8	40.6
04:00 AM - 05:00 AM	46.9	69.1	41.0
05:00 AM - 06:00 AM	48.1	71.3	42.9
06:00 AM - 07:00 AM	52.5	74.5	46.3
07:00 AM - 08:00 AM	55.3	73.5	47.7
08:00 AM - 09:00 AM	50.9	68.4	46.4
09:00 AM - 10:00 AM	51.6	68.9	46.4
10:00 AM - 11:00 AM	50.6	72.0	46.5
11:00 AM - 12:00 PM	58.7	86.3	44.9

Leq Average 24 hrs. (dB(A)) : 52.9
Lmax (dB(A)) : 90.2
L90 (dB(A)) : 41.8
Ldn (dB(A)) : 55.4
Standard (dB(A)) : 70
Reference Method : ISO1996-1 and 1996-2
Standard : 1. ปรากฏผลการตรวจวัดค่าเฉลี่ยของระดับเสียง 15 (น.ม. 2540) ที่รายงานค่ามาตรฐานระดับเสียงโดยทั่วไป
2. ปรากฏผลการตรวจวัดค่ามาตรฐาน ที่รายงานค่ามาตรฐานระดับเสียงการก่อกวน และระดับเสียงที่ปรากฏการรบกวนการ
โรงงาน น.ม. 2548

Technical Management

Thanitak.

Thanita Kulsuriwong
Scientist (4)

Approved by

Suppt S.

Supot Salameth
Section Head

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RIGHT SOLUTIONS RIGHT PARTNER

8525-209/ EMAIL

S\Report\Air Noise rpt (11 54AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512886163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPO-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248950-1

Page 1 of 1

Sample Number : 2220467-18
Parameter : Noise (Leq 24 hrs.)
Location : กลุ่มบ้านในเขตชุมชนบ้านนา (บ้านนาหลวง) (GPS 47P 0726292, 1407282)
Measurement Date : Feb 24 - Feb 25, 2022
Measurement by : Anurak Tongkhajonsakda
Sound Level meter : Serial No. 472126

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	55.3	77.1	44.4
01:00 PM - 02:00 PM	51.0	75.2	43.3
02:00 PM - 03:00 PM	56.2	73.4	45.3
03:00 PM - 04:00 PM	50.9	69.1	44.7
04:00 PM - 05:00 PM	54.2	76.8	46.2
05:00 PM - 06:00 PM	55.2	82.4	45.6
06:00 PM - 07:00 PM	54.0	78.2	45.2
07:00 PM - 08:00 PM	48.1	71.8	43.7
08:00 PM - 09:00 PM	50.5	82.7	43.5
09:00 PM - 10:00 PM	47.1	67.3	43.7
10:00 PM - 11:00 PM	44.3	65.7	42.4
11:00 PM - 12:00 AM	45.6	71.0	44.0
12:00 AM - 01:00 AM	45.7	60.9	44.4
01:00 AM - 02:00 AM	45.5	56.3	44.5
02:00 AM - 03:00 AM	46.2	64.8	44.8
03:00 AM - 04:00 AM	46.8	67.0	45.3
04:00 AM - 05:00 AM	48.9	68.4	45.9
05:00 AM - 06:00 AM	52.0	70.3	48.2
06:00 AM - 07:00 AM	57.1	85.7	49.7
07:00 AM - 08:00 AM	59.1	89.9	50.4
08:00 AM - 09:00 AM	54.8	84.0	49.2
09:00 AM - 10:00 AM	56.1	87.4	49.0
10:00 AM - 11:00 AM	56.2	73.3	47.6
11:00 AM - 12:00 PM	55.3	83.7	46.3

Leq Average 24 hrs. (dB(A)) : 53.5
Lmax (dB(A)) : 89.9
L90 (dB(A)) : 45.2
Ldn (dB(A)) : 57.7
Standard (dB(A)) : 70
Reference Method : ISO1996-1 and 1996-2
Standard : 1. ปรากฏผลการตรวจวัดค่าเฉลี่ยของระดับเสียง 15 (น.ม. 2540) ที่รายงานค่ามาตรฐานระดับเสียงโดยทั่วไป
2. ปรากฏผลการตรวจวัดค่ามาตรฐาน ที่รายงานค่ามาตรฐานระดับเสียงการก่อกวน และระดับเสียงที่ปรากฏการรบกวนการ
โรงงาน น.ม. 2548

Technical Management

Thanitak.

Thanita Kulsuriwong
Scientist (4)

Approved by

Suppt S.

Supot Salameth
Section Head

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RIGHT SOLUTIONS RIGHT PARTNER

8525-209/ EMAIL

S\Report\Air Noise rpt (11 54AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HFPO-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248951-1

Page 1 of 1

Sample Number	2220467-19
Parameter	Noise (Leq 24 hrs.)
Location	ถนนสายเอเชียบริเวณซอยอุตสาหกรรม (บ้านคลองขุด) (GPS 47P 0726292, 1407282)
Measurement Date	Feb 25 - Feb 26, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 472126

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	53.7	74.7	44.4
01:00 PM - 02:00 PM	50.9	74.4	43.0
02:00 PM - 03:00 PM	52.4	78.3	44.0
03:00 PM - 04:00 PM	50.3	79.5	41.9
04:00 PM - 05:00 PM	56.1	84.0	45.6
05:00 PM - 06:00 PM	57.9	85.0	46.8
06:00 PM - 07:00 PM	55.1	74.2	47.3
07:00 PM - 08:00 PM	52.8	79.8	46.5
08:00 PM - 09:00 PM	52.4	74.1	46.4
09:00 PM - 10:00 PM	54.4	78.7	46.4
10:00 PM - 11:00 PM	47.8	71.6	46.0
11:00 PM - 12:00 AM	48.6	73.7	46.2
12:00 AM - 01:00 AM	47.2	71.6	44.6
01:00 AM - 02:00 AM	46.5	69.2	45.2
02:00 AM - 03:00 AM	46.8	67.0	44.6
03:00 AM - 04:00 AM	46.8	67.1	45.0
04:00 AM - 05:00 AM	50.8	71.7	46.4
05:00 AM - 06:00 AM	52.2	73.4	47.4
06:00 AM - 07:00 AM	55.6	78.7	49.1
07:00 AM - 08:00 AM	58.3	82.4	49.5
08:00 AM - 09:00 AM	56.8	84.3	47.8
09:00 AM - 10:00 AM	58.0	83.6	47.5
10:00 AM - 11:00 AM	59.5	86.6	48.1
11:00 AM - 12:00 PM	54.6	78.3	45.4
Leq Average 24 hrs. (dB(A))	54.4		
Lmax (dB(A))		86.6	
L90 (dB(A))			46.2
Ldn (dB(A))	58.1		
Standard (dB(A))	70	115	
Reference Method : ISO1996-1 and 1996-2			
Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียง (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป 2. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงสำหรับโรงงานอุตสาหกรรม และระดับเสียงที่มาจากทางรถยนต์/อากาศยาน พ.ศ. 2548			

Technical Management

Thanitak.
Thanita Kulsurwong
Scientist (4)

Approved by

Supot S.
Supot Salameh
Section Head

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RIGHT SOLUTIONS RIGHT PARTNER

S\Reports_Air Noise rpt (11.54AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HFPO-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248953-1

Page 1 of 1

Sample Number	2220467-21
Parameter	Noise (Leq 24 hrs.)
Location	ถนนสายเอเชียบริเวณซอยอุตสาหกรรม (บ้านคลองขุด) (GPS 47P 0726292, 1407282)
Measurement Date	Feb 27 - Feb 28, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 472126

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	55.1	81.2	46.0
01:00 PM - 02:00 PM	51.3	80.9	47.4
02:00 PM - 03:00 PM	51.6	74.5	46.8
03:00 PM - 04:00 PM	52.5	74.4	45.8
04:00 PM - 05:00 PM	58.9	89.6	44.4
05:00 PM - 06:00 PM	55.7	80.4	41.4
06:00 PM - 07:00 PM	54.8	79.4	41.6
07:00 PM - 08:00 PM	47.9	76.6	40.9
08:00 PM - 09:00 PM	49.0	82.7	40.8
09:00 PM - 10:00 PM	44.0	64.9	41.0
10:00 PM - 11:00 PM	47.8	74.0	41.5
11:00 PM - 12:00 AM	41.5	59.2	38.9
12:00 AM - 01:00 AM	40.7	67.0	37.8
01:00 AM - 02:00 AM	44.0	68.2	36.9
02:00 AM - 03:00 AM	42.3	64.3	39.6
03:00 AM - 04:00 AM	44.0	65.4	40.8
04:00 AM - 05:00 AM	47.6	68.3	39.5
05:00 AM - 06:00 AM	51.4	70.7	41.8
06:00 AM - 07:00 AM	58.6	82.0	44.6
07:00 AM - 08:00 AM	55.7	83.9	42.0
08:00 AM - 09:00 AM	53.2	74.7	38.1
09:00 AM - 10:00 AM	54.5	78.5	43.7
10:00 AM - 11:00 AM	54.4	75.9	39.3
11:00 AM - 12:00 PM	55.7	79.7	44.9
Leq Average 24 hrs. (dB(A))	53.2		
Lmax (dB(A))		89.6	
L90 (dB(A))			41.4
Ldn (dB(A))	57.9		
Standard (dB(A))	70	115	
Reference Method : ISO1996-1 and 1996-2			
Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียง (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป 2. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงสำหรับโรงงานอุตสาหกรรม และระดับเสียงที่มาจากทางรถยนต์/อากาศยาน พ.ศ. 2548			

Technical Management

Thanitak.
Thanita Kulsurwong
Scientist (4)

Approved by

Supot S.
Supot Salameh
Section Head

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S\Reports_Air Noise rpt (11.55AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HFPO-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248952-1

Page 1 of 1

Sample Number	2220467-20
Parameter	Noise (Leq 24 hrs.)
Location	ถนนสายเอเชียบริเวณซอยอุตสาหกรรม (บ้านคลองขุด) (GPS 47P 0726292, 1407282)
Measurement Date	Feb 26 - Feb 27, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 472126

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	54.5	77.9	44.0
01:00 PM - 02:00 PM	52.2	77.9	41.6
02:00 PM - 03:00 PM	55.1	80.0	44.5
03:00 PM - 04:00 PM	56.1	81.7	45.8
04:00 PM - 05:00 PM	56.3	83.7	44.9
05:00 PM - 06:00 PM	54.1	81.3	44.7
06:00 PM - 07:00 PM	54.2	88.0	46.4
07:00 PM - 08:00 PM	50.6	83.3	43.3
08:00 PM - 09:00 PM	51.1	82.9	43.2
09:00 PM - 10:00 PM	46.4	65.9	43.0
10:00 PM - 11:00 PM	45.6	60.1	44.4
11:00 PM - 12:00 AM	48.1	73.6	43.6
12:00 AM - 01:00 AM	45.8	78.9	43.3
01:00 AM - 02:00 AM	44.2	57.2	43.2
02:00 AM - 03:00 AM	43.6	62.0	42.0
03:00 AM - 04:00 AM	44.5	64.5	41.4
04:00 AM - 05:00 AM	47.5	72.2	42.2
05:00 AM - 06:00 AM	50.3	72.4	43.5
06:00 AM - 07:00 AM	52.9	77.0	46.2
07:00 AM - 08:00 AM	55.2	77.2	46.7
08:00 AM - 09:00 AM	52.2	72.0	46.8
09:00 AM - 10:00 AM	51.0	73.6	46.5
10:00 AM - 11:00 AM	49.5	72.3	44.1
11:00 AM - 12:00 PM	54.0	79.9	46.0
Leq Average 24 hrs. (dB(A))	52.2		
Lmax (dB(A))		88.0	
L90 (dB(A))			44.0
Ldn (dB(A))	55.8		
Standard (dB(A))	70	115	
Reference Method : ISO1996-1 and 1996-2			
Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียง (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป 2. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงสำหรับโรงงานอุตสาหกรรม และระดับเสียงที่มาจากทางรถยนต์/อากาศยาน พ.ศ. 2548			

Technical Management

Thanitak.
Thanita Kulsurwong
Scientist (4)

Approved by

Supot S.
Supot Salameh
Section Head

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S\Reports_Air Noise rpt (11.54AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512888163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HFPO-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248954-1

Page 1 of 1

Sample Number	2220467-22
Parameter	Noise (Leq 24 hrs.)
Location	ถนนสายเอเชียบริเวณซอยอุตสาหกรรม (บ้านคลองขุด) (GPS 47P 0724337, 1402458)
Measurement Date	Feb 21 - Feb 22, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	50.0	70.1	44.6
01:00 PM - 02:00 PM	52.0	79.0	45.3
02:00 PM - 03:00 PM	62.0	95.4	49.2
03:00 PM - 04:00 PM	53.3	74.1	46.6
04:00 PM - 05:00 PM	52.0	76.4	45.7
05:00 PM - 06:00 PM	51.7	81.6	47.1
06:00 PM - 07:00 PM	49.6	72.1	43.8
07:00 PM - 08:00 PM	50.3	76.2	44.0
08:00 PM - 09:00 PM	48.1	70.4	43.9
09:00 PM - 10:00 PM	53.8	79.5	43.8
10:00 PM - 11:00 PM	45.9	61.1	46.2
11:00 PM - 12:00 AM	47.9	67.3	44.6
12:00 AM - 01:00 AM	51.9	79.2	47.1
01:00 AM - 02:00 AM	48.7	71.5	46.5
02:00 AM - 03:00 AM	49.9	72.7	44.5
03:00 AM - 04:00 AM	48.5	70.4	41.2
04:00 AM - 05:00 AM	53.3	77.4	41.3
05:00 AM - 06:00 AM	59.5	82.3	41.8
06:00 AM - 07:00 AM	54.6	83.0	42.9
07:00 AM - 08:00 AM	61.5	93.1	46.3
08:00 AM - 09:00 AM	52.0	74.1	43.2
09:00 AM - 10:00 AM	54.3	77.3	45.9
10:00 AM - 11:00 AM	52.5	67.7	48.1
11:00 AM - 12:00 PM	55.6	98.1	44.2
Leq Average 24 hrs. (dB(A))	54.7		
Lmax (dB(A))		95.4	
L90 (dB(A))			44.3
Ldn (dB(A))	60.0		
Standard (dB(A))	70	115	
Reference Method : ISO1996-1 and 1996-2			
Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียง (พ.ศ. 2540) ที่กำหนดมาตรฐานระดับเสียงโดยทั่วไป 2. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงสำหรับโรงงานอุตสาหกรรม และระดับเสียงที่มาจากทางรถยนต์/อากาศยาน พ.ศ. 2548			

Technical Management

Thanitak.
Thanita Kulsurwong
Scientist (4)

Approved by

Supot S.
Supot Salameh
Section Head

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S\Reports_Air Noise rpt (11.55AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 451288163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2246955-1

Page 1 of 1

Sample Number	2220467-23
Parameter	Noise (Leq 24 hrs.)
Location	ใกล้บ้านชุมชน (บ้านชุมชน) (GPS 47P 0724337, 1402458)
Measurement Date	Feb 22 - Feb 23, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	50.7	68.7	45.7
01:00 PM - 02:00 PM	50.5	73.2	45.7
02:00 PM - 03:00 PM	49.6	71.9	45.1
03:00 PM - 04:00 PM	51.1	75.0	44.8
04:00 PM - 05:00 PM	50.4	71.3	46.3
05:00 PM - 06:00 PM	51.0	70.0	46.8
06:00 PM - 07:00 PM	50.6	74.3	46.3
07:00 PM - 08:00 PM	49.6	75.9	45.2
08:00 PM - 09:00 PM	50.9	78.6	44.7
09:00 PM - 10:00 PM	51.5	75.0	44.2
10:00 PM - 11:00 PM	50.3	73.6	43.9
11:00 PM - 12:00 AM	49.2	72.6	44.3
12:00 AM - 01:00 AM	50.4	78.4	40.1
01:00 AM - 02:00 AM	49.6	76.6	38.6
02:00 AM - 03:00 AM	48.1	69.7	39.1
03:00 AM - 04:00 AM	48.2	72.3	39.7
04:00 AM - 05:00 AM	54.0	75.5	41.7
05:00 AM - 06:00 AM	58.8	87.2	42.3
06:00 AM - 07:00 AM	59.8	89.3	45.7
07:00 AM - 08:00 AM	59.4	85.5	42.0
08:00 AM - 09:00 AM	58.9	92.7	43.7
09:00 AM - 10:00 AM	58.1	86.7	43.9
10:00 AM - 11:00 AM	53.1	73.0	50.1
11:00 AM - 12:00 PM	52.4	79.6	48.5

Leq Average 24 hrs. (dB(A))	54.2
Lmax (dB(A))	92.7
L90 (dB(A))	44.3
Ldn (dB(A))	60.8
Standard (dB(A))	70
Reference Method : ISO1996-1 and 1996-2	
Standard : 1. ประกาศกระทรวงมหาดไทย เรื่องเสียงสิ่งแวดล้อม พ.ศ. 2540 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงไว้ 2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการก่อกวน และระดับเสียงที่อาจก่อให้เกิดการก่อกวน จาก พ.ศ. 2546	

Technical Management

Thanitak.

Approved by

Supot Salameth

Section Head

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8525-209/ EMAIL

S:\Reports_Air Noise rpt (11.56AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 451288163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2246957-1

Page 1 of 1

Sample Number	2220467-25
Parameter	Noise (Leq 24 hrs.)
Location	ใกล้บ้านชุมชน (บ้านชุมชน) (GPS 47P 0724337, 1402458)
Measurement Date	Feb 24 - Feb 25, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	52.0	61.3	49.1
01:00 PM - 02:00 PM	50.4	68.5	45.4
02:00 PM - 03:00 PM	57.5	85.4	44.0
03:00 PM - 04:00 PM	48.9	65.8	44.6
04:00 PM - 05:00 PM	50.6	71.6	44.8
05:00 PM - 06:00 PM	51.2	70.6	46.1
06:00 PM - 07:00 PM	49.6	65.3	47.4
07:00 PM - 08:00 PM	50.5	61.4	49.3
08:00 PM - 09:00 PM	51.3	55.9	50.5
09:00 PM - 10:00 PM	53.6	74.1	50.5
10:00 PM - 11:00 PM	51.0	60.9	50.2
11:00 PM - 12:00 AM	51.5	56.4	50.7
12:00 AM - 01:00 AM	51.3	56.0	50.6
01:00 AM - 02:00 AM	51.3	57.1	50.6
02:00 AM - 03:00 AM	51.2	59.7	50.5
03:00 AM - 04:00 AM	51.6	60.1	50.8
04:00 AM - 05:00 AM	52.1	59.7	51.1
05:00 AM - 06:00 AM	59.6	83.8	52.2
06:00 AM - 07:00 AM	57.9	76.0	53.2
07:00 AM - 08:00 AM	54.7	69.0	52.6
08:00 AM - 09:00 AM	56.2	73.3	52.2
09:00 AM - 10:00 AM	54.5	78.4	52.0
10:00 AM - 11:00 AM	53.9	68.7	50.6
11:00 AM - 12:00 PM	52.1	71.7	50.1

Leq Average 24 hrs. (dB(A))	53.7
Lmax (dB(A))	85.4
L90 (dB(A))	50.5
Ldn (dB(A))	60.7
Standard (dB(A))	70
Reference Method : ISO1996-1 and 1996-2	
Standard : 1. ประกาศกระทรวงมหาดไทย เรื่องเสียงสิ่งแวดล้อม พ.ศ. 2540 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงไว้ 2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการก่อกวน และระดับเสียงที่อาจก่อให้เกิดการก่อกวน จาก พ.ศ. 2546	

Technical Management

Thanitak.

Approved by

Supot Salameth

Section Head

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S:\Reports_Air Noise rpt (11.56AM)



Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 451288163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2246956-1

Page 1 of 1

Sample Number	2220467-24
Parameter	Noise (Leq 24 hrs.)
Location	ใกล้บ้านชุมชน (บ้านชุมชน) (GPS 47P 0724337, 1402458)
Measurement Date	Feb 23 - Feb 24, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	50.5	68.3	47.5
01:00 PM - 02:00 PM	50.2	68.6	47.3
02:00 PM - 03:00 PM	57.4	82.6	49.0
03:00 PM - 04:00 PM	53.4	72.4	49.0
04:00 PM - 05:00 PM	52.7	71.5	46.1
05:00 PM - 06:00 PM	51.7	70.5	46.2
06:00 PM - 07:00 PM	49.2	70.6	46.1
07:00 PM - 08:00 PM	49.0	70.1	47.5
08:00 PM - 09:00 PM	49.4	54.0	48.2
09:00 PM - 10:00 PM	51.7	57.8	50.6
10:00 PM - 11:00 PM	52.0	59.9	51.0
11:00 PM - 12:00 AM	52.8	60.5	51.7
12:00 AM - 01:00 AM	52.6	57.9	51.6
01:00 AM - 02:00 AM	53.1	59.7	52.1
02:00 AM - 03:00 AM	52.8	60.7	51.8
03:00 AM - 04:00 AM	53.2	61.4	52.0
04:00 AM - 05:00 AM	53.3	63.3	52.0
05:00 AM - 06:00 AM	57.7	74.2	53.4
06:00 AM - 07:00 AM	59.8	79.7	55.1
07:00 AM - 08:00 AM	57.0	81.5	53.9
08:00 AM - 09:00 AM	55.0	64.9	52.9
09:00 AM - 10:00 AM	54.3	77.4	51.9
10:00 AM - 11:00 AM	53.7	69.3	51.3
11:00 AM - 12:00 PM	53.2	69.3	50.2

Leq Average 24 hrs. (dB(A))	54.1
Lmax (dB(A))	82.6
L90 (dB(A))	51.0
Ldn (dB(A))	61.3
Standard (dB(A))	70
Reference Method : ISO1996-1 and 1996-2	
Standard : 1. ประกาศกระทรวงมหาดไทย เรื่องเสียงสิ่งแวดล้อม พ.ศ. 2540 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงไว้ 2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการก่อกวน และระดับเสียงที่อาจก่อให้เกิดการก่อกวน จาก พ.ศ. 2546	

Technical Management

Thanitak.

Approved by

Supot Salameth

Section Head

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 451288163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPP0-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2246958-1

Page 1 of 1

Sample Number	2220467-26
Parameter	Noise (Leq 24 hrs.)
Location	ใกล้บ้านชุมชน (บ้านชุมชน) (GPS 47P 0724337, 1402458)
Measurement Date	Feb 25 - Feb 26, 2022
Measurement by	Anurak Tongkhajonsakda
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	50.6	67.5	48.6
01:00 PM - 02:00 PM	52.6	75.3	48.7
02:00 PM - 03:00 PM	56.3	83.5	44.7
03:00 PM - 04:00 PM	52.7	67.9	44.2
04:00 PM - 05:00 PM	54.6	73.6	47.3
05:00 PM - 06:00 PM	52.4	68.7	50.0
06:00 PM - 07:00 PM	50.7	63.6	49.8
07:00 PM - 08:00 PM	51.0	56.1	50.0
08:00 PM - 09:00 PM	52.1	64.8	50.6
09:00 PM - 10:00 PM	51.4	59.0	50.5
10:00 PM - 11:00 PM	51.7	56.3	50.9
11:00 PM - 12:00 AM	51.5	57.2	50.8
12:00 AM - 01:00 AM	52.2	72.3	50.8
01:00 AM - 02:00 AM	59.1	83.0	50.8
02:00 AM - 03:00 AM	50.8	55.9	50.0
03:00 AM - 04:00 AM	51.6	60.4	50.7
04:00 AM - 05:00 AM	52.7	63.3	51.3
05:00 AM - 06:00 AM	56.7	77.5	52.3
06:00 AM - 07:00 AM	58.6	80.8	53.2
07:00 AM - 08:00 AM	57.0	75.2	52.0
08:00 AM - 09:00 AM	53.7	73.1	50.8
09:00 AM - 10:00 AM	51.8	62.1	50.9
10:00 AM - 11:00 AM	53.0	71.8	49.9
11:00 AM - 12:00 PM	53.3	70.0	48.2

Leq Average 24 hrs. (dB(A))	54.1
Lmax (dB(A))	83.5
L90 (dB(A))	50.0
Ldn (dB(A))	61.3
Standard (dB(A))	70
Reference Method : ISO1996-1 and 1996-2	
Standard : 1. ประกาศกระทรวงมหาดไทย เรื่องเสียงสิ่งแวดล้อม พ.ศ. 2540 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงไว้ 2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการก่อกวน และระดับเสียงที่อาจก่อให้เกิดการก่อกวน จาก พ.ศ. 2546	

Technical Management

Thanitak.

Approved by

Supot Salameth

Section Head

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 451288163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPO-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248959-1

Page 1 of 1

Sample Number : 2220467-27
Parameter : Noise (Leq 24 hrs.)
Location : ถนนพหลโยธิน (สายพหลโยธิน) (GPS 47P 0724337, 1402458)
Measurement Date : Feb 26 - Feb 27, 2022
Measurement by : Anurak Tongkhajonsakda
Sound Level meter : Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	49.7	61.2	47.5
01:00 PM - 02:00 PM	52.7	69.3	47.9
02:00 PM - 03:00 PM	59.4	87.8	47.7
03:00 PM - 04:00 PM	53.0	72.1	48.5
04:00 PM - 05:00 PM	51.6	76.6	45.8
05:00 PM - 06:00 PM	52.2	75.1	45.4
06:00 PM - 07:00 PM	50.4	71.3	45.9
07:00 PM - 08:00 PM	49.8	57.1	47.8
08:00 PM - 09:00 PM	53.4	75.6	50.4
09:00 PM - 10:00 PM	56.1	80.3	50.7
10:00 PM - 11:00 PM	51.2	58.5	50.5
11:00 PM - 12:00 AM	51.1	54.5	50.5
12:00 AM - 01:00 AM	51.3	54.2	50.5
01:00 AM - 02:00 AM	51.2	57.4	50.5
02:00 AM - 03:00 AM	51.2	54.7	50.5
03:00 AM - 04:00 AM	51.7	57.9	50.8
04:00 AM - 05:00 AM	52.2	59.5	51.1
05:00 AM - 06:00 AM	59.8	84.1	51.8
06:00 AM - 07:00 AM	57.7	78.6	52.6
07:00 AM - 08:00 AM	56.3	75.5	51.5
08:00 AM - 09:00 AM	54.4	74.8	50.4
09:00 AM - 10:00 AM	51.6	64.4	49.2
10:00 AM - 11:00 AM	48.5	64.0	44.2
11:00 AM - 12:00 PM	47.1	63.4	44.1

Leq Average 24 hrs. (dB(A)) : 54.0
Lmax (dB(A)) : 87.8
L90 (dB(A)) : 50.4
Ldn (dB(A)) : 60.8
Standard (dB(A)) : 70 115

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงรบกวนในชุมชน พ.ศ. 2540
2. ประกาศกระทรวงอุตสาหกรรมว่าด้วยมาตรฐานเสียงรบกวนในโรงงาน พ.ศ. 2548

Technical Management

Thanitak.
Thanita Kulsurwong
Scientist (4)

Approved by

Supot Salameh
Section Head

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 451288163
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPO-TPO Plant

Lot ID: 2220467
Date Received : Mar 01, 2022
Date Reported : Mar 04, 2022
Report Number: 2248950-1

Page 1 of 1

Sample Number : 2220467-28
Parameter : Noise (Leq 24 hrs.)
Location : ถนนพหลโยธิน (สายพหลโยธิน) (GPS 47P 0724337, 1402458)
Measurement Date : Feb 27 - Feb 28, 2022
Measurement by : Anurak Tongkhajonsakda
Sound Level meter : Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	49.6	64.0	45.4
01:00 PM - 02:00 PM	58.0	86.0	45.7
02:00 PM - 03:00 PM	51.1	64.4	45.7
03:00 PM - 04:00 PM	50.9	68.3	44.6
04:00 PM - 05:00 PM	67.1	87.1	45.8
05:00 PM - 06:00 PM	53.2	85.7	45.3
06:00 PM - 07:00 PM	48.3	67.8	45.9
07:00 PM - 08:00 PM	46.4	54.3	45.5
08:00 PM - 09:00 PM	47.9	64.5	45.8
09:00 PM - 10:00 PM	47.1	58.6	46.5
10:00 PM - 11:00 PM	46.4	59.2	45.4
11:00 PM - 12:00 AM	47.7	50.5	47.1
12:00 AM - 01:00 AM	47.8	58.2	47.1
01:00 AM - 02:00 AM	49.0	51.7	48.4
02:00 AM - 03:00 AM	50.1	58.7	48.8
03:00 AM - 04:00 AM	49.5	59.2	48.6
04:00 AM - 05:00 AM	50.6	60.9	49.0
05:00 AM - 06:00 AM	58.5	84.6	49.8
06:00 AM - 07:00 AM	63.8	89.8	51.7
07:00 AM - 08:00 AM	54.4	73.8	47.7
08:00 AM - 09:00 AM	57.0	77.1	44.9
09:00 AM - 10:00 AM	55.0	77.6	44.0
10:00 AM - 11:00 AM	52.5	79.2	40.4
11:00 AM - 12:00 PM	41.1	68.8	38.1

Leq Average 24 hrs. (dB(A)) : 56.8
Lmax (dB(A)) : 89.8
L90 (dB(A)) : 45.8
Ldn (dB(A)) : 62.7
Standard (dB(A)) : 70 115

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศกระทรวงมหาดไทยว่าด้วยมาตรฐานเสียงรบกวนในชุมชน พ.ศ. 2540
2. ประกาศกระทรวงอุตสาหกรรมว่าด้วยมาตรฐานเสียงรบกวนในโรงงาน พ.ศ. 2548

Technical Management

Thanitak.
Thanita Kulsurwong
Scientist (4)

Approved by

Supot Salameh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 21146510
Date Received : Jan 20, 2022
Date Reported : Jan 28, 2022
Report Number : 2177311-1

Page 1 of 1

Sample Number	21146510-1
Sampled Date	Jan 20, 2022 11:00 AM
Sample Description	Wastewater
Location	PUI_EQ Tank
Date Analysis Commenced	Jan 20, 2022
Condition of Sample	Contained in three amber glass bottles, three plastic bottles and two glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Water Testing						
BOD (5 days at 20 Degree C)	mg/L	-	2	1185	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	2991	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	30	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	27	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	7	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	7.5	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	34.2	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	404	APHA (2017), 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	57	APHA (2017), 2540 D	Rayong

Sampled By : Jaradrawee Srinuksa, Thanasoun Namakunna

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Narumon Banchongkit
Supervisor
โทรศัพท์มือถือ ๐-323-๙-9445

Approved by

Dj Changchon
Senior Manager
โทรศัพท์มือถือ ๐-323-๙-9442

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Analysis / Test Report

TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 21146457
Date Received : Jan 20, 2022
Date Reported : Jan 28, 2022
Report Number : 2177303-1

Page 1 of 2

Sample Number	21146457-1
Sampled Date	Jan 20, 2022 12:20 PM
Sample Description	Wastewater
Location	Inspection Manhole
Date Analysis Commenced	Jan 20, 2022
Condition of Sample	Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	<2	≤20	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	40	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	13	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	11	≤300	APHA (2017), 2120 F	Rayong
Cyanide as CN	mg/L	0.001	0.005	Not Detected	≤0.2	Based on APHA (2017), 4500-CN(C), (F)	Rayong
Formaldehyde	mg/L	0.03	0.1	<0.1	≤1.0	Wastewater Analysis	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	8.3	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Phenol	mg/L	0.005	0.01	Not Detected	≤1.0	APHA (2017), 5530 D	Rayong
Residual Free Chlorine *	mg/L	-	0.1	<0.1	≤1.0	Based on APHA (2017), 4500-Cl(F)	Rayong
Sulfide *	mg/L	-	0.5	<0.5	≤1.0	Based on APHA (2017), 4500-S2(C), (F)	Rayong
Temperature *	Degree C	-	-	34.7	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	880	≤3000	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	<1.0	≤100	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	<5	≤50	APHA (2017), 2540 D	Rayong

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 31.3 degree Celsius.

Sampled By : Jaradrawee Srinuksa, Thanasoun Namakunna

Remark :
- LOD : Limit of Detection

Technical Management

Narumon Banchongkit
Supervisor
โทรศัพท์มือถือ ๐-323-๙-9445

Approved by

Dj Changchon
Senior Manager
โทรศัพท์มือถือ ๐-323-๙-9442

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Analysis / Test Report

TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 21146510
Date Received : Jan 20, 2022
Date Reported : Jan 28, 2022
Report Number : 2177311-2

Page 1 of 1

Sample Number	21146510-1
Sampled Date	Jan 20, 2022 11:00 AM
Sample Description	Wastewater
Location	PUI_EQ Tank
Date Analysis Commenced	Jan 22, 2022
Condition of Sample	Contained in three amber glass bottles, three plastic bottles and two glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Organic Compounds						
Propylene oxide	mg/L	-	10	<10	Based on US EPA, Method 8015B	Bangkok
Water Testing						
Methanol	mg/L	0.05	2.0	66.1	Based on APHA (2017), 6200B	Bangkok

Sampled By : Jaradrawee Srinuksa, Thanasoun Namakunna

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Nanthawadee Somborn
Specialist 1

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Analysis / Test Report

TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 21146457
Date Received : Jan 20, 2022
Date Reported : Jan 28, 2022
Report Number : 2177303-1

Page 2 of 2

- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Narumon Banchongkit
Supervisor
โทรศัพท์มือถือ ๐-323-๙-9445

Approved by

Dj Changchon
Senior Manager
โทรศัพท์มือถือ ๐-323-๙-9442

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Analysis / Test Report



TESTING

No.0009

Lot ID: 21146457
Date Received : Jan 20, 2022
Date Reported : Jan 28, 2022
Report Number : 2177303-2

Client : Dow Chemical Thailand Ltd.,
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512/23208
Project Name : Water Testing
Project Location : AIE_HFPO-TPO Plant

Page 1 of 2

Sample Number 21146457-1
Sampled Date Jan 20, 2022 12:20 PM
Sample Description Wastewater
Location Inspection Manhole
Date Analysis Commenced Jan 22, 2022
Condition of Sample Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
2,4-DDD	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
2,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
2,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDD	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Aldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
alpha-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Atrazine *	ug/L	0.15	0.5	Not Detected	No Standard	Based on APHA (2017), 6630 B	Bangkok
beta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Chlordane	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
delta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Dieldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Endosulfan I	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Endosulfan II	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Erdrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Heptachlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Heptachlor-Epoxyde	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Lindane (gamma-BHC)	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Methoxychlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok

Technical Management

Nant Somb
Nanthawadee Sombboon
Specialist 1
เบอร์โทรแจ้งเหตุ 204-4716

Approved by

Kanokorn Anek
Senior Manager
เบอร์โทรแจ้งเหตุ 204-4511

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Analysis / Test Report



TESTING

No.0009

Client : Dow Chemical Thailand Ltd.,
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512/23208
Project Name : Water Testing
Project Location : AIE_HFPO-TPO Plant

Page 2 of 2

Sample Number 21146457-1
Sampled Date Jan 20, 2022 12:20 PM
Sample Description Wastewater
Location Inspection Manhole
Date Analysis Commenced Jan 22, 2022
Condition of Sample Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
Toxaphene *	ug/L	0.001	0.1	Not Detected	No Standard	Based on APHA (2017), 6630 C	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 31.3 degree Celsius.
Sampled By : Jaradrawee Siruksa, Thanassou Namakunna
Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Nant Somb
Nanthawadee Sombboon
Specialist 1
เบอร์โทรแจ้งเหตุ 204-4716

Approved by

Kanokorn Anek
Senior Manager
เบอร์โทรแจ้งเหตุ 204-4511

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Analysis / Test Report



TESTING

No.0042

Lot ID: 21146457
Date Received : Jan 20, 2022
Date Reported : Jan 28, 2022
Report Number : 2177303-3

Client : Dow Chemical Thailand Ltd.,
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512/23208
Project Name : Water Testing
Project Location : AIE_HFPO-TPO Plant

Page 1 of 1

Sample Number 21146457-1
Sampled Date Jan 20, 2022 12:20 PM
Sample Description Wastewater
Location Inspection Manhole
Date Analysis Commenced Jan 21, 2022
Condition of Sample Contained in two plastic bottles and two glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
Hexachlorobenzene	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Water Testing							
Chlorine *	mg/L	-	-	0.19	No Standard	Based on APHA (2017), 4500-Cl(G)	Rayong

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 31.3 degree Celsius.
Sampled By : Jaradrawee Siruksa, Thanassou Namakunna
Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Approved by

Nant Somb
Nanthawadee Sombboon
Specialist 1

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Analysis / Test Report



TESTING

No.0009

Client : Dow Chemical Thailand Ltd.,
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512/23208
Project Name : Water Testing
Project Location : AIE_HFPO-TPO Plant

Page 1 of 1

Sample Number 21146504-1
Sampled Date Jan 20, 2022 12:20 PM
Sample Description Wastewater
Location Inspection Manhole
Date Analysis Commenced Jan 21, 2022
Condition of Sample Contained in two plastic bottles and two glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Arsenic	mg/L	0.0003	0.0005	0.002	No Standard	Based on APHA (2017), 3125	Bangkok
Barium	mg/L	0.0003	0.0005	0.12	No Standard	Based on APHA (2017), 3125	Bangkok
Cadmium	mg/L	0.0003	0.0005	Not Detected	No Standard	Based on APHA (2017), 3125	Bangkok
Chromium	mg/L	0.0003	0.0005	0.004	No Standard	Based on APHA (2017), 3125	Bangkok
Copper	mg/L	0.0003	0.0005	0.0009	No Standard	Based on APHA (2017), 3125	Bangkok
Hexavalent Chromium	mg/L	0.003	0.01	Not Detected	No Standard	Based on APHA (2017), 3500-Cr (B)	Bangkok
Iron	mg/L	0.003	0.005	0.18	No Standard	Based on APHA (2017), 3125	Bangkok
Lead	mg/L	0.0003	0.0005	Not Detected	No Standard	Based on APHA (2017), 3125	Bangkok
Manganese	mg/L	0.0003	0.0005	0.01	No Standard	Based on APHA (2017), 3125	Bangkok
Mercury *	mg/L	0.0001	0.0005	Not Detected	No Standard	Based on APHA (2017), 3112	Bangkok
Nickel	mg/L	0.0003	0.0005	0.003	No Standard	Based on APHA (2017), 3125	Bangkok
Selenium	mg/L	0.0003	0.0005	Not Detected	No Standard	Based on APHA (2017), 3125	Bangkok
Silver	mg/L	0.0003	0.0005	<0.0005	No Standard	Based on APHA (2017), 3125	Bangkok
Trivalent Chromium *	mg/L	-	0.01	<0.01	No Standard	Based on APHA (2017), Calculated	Bangkok
Zinc	mg/L	0.003	0.005	0.31	No Standard	Based on APHA (2017), 3125	Bangkok

Guideline :
Sampled By : Thanassou Namakunna

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Sawitree N.
Sawitree Nongniam
Assistant Manager
เบอร์โทรแจ้งเหตุ 204-4709

Approved by

Kanokorn Anek
Senior Manager
เบอร์โทรแจ้งเหตุ 204-4511

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Analysis / Test Report



TESTING
No.0009

Lot ID: 21146504
Date Received : Jan 20, 2022
Date Reported : Jan 25, 2022
Report Number : 2177307-2

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Page 1 of 1

Sample Number	21146504-1						
Sampled Date	Jan 20, 2022 12:20 PM						
Sample Description	Wastewater						
Location	Inspection Manhole						
Date Analysis Commenced	Jan 21, 2022						
Condition of Sample	Contained in two plastic bottles and two glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Arsenic	mg/L	0.0003	0.0005	0.002	≤0.25	Based on APHA (2017), 3125	Bangkok
Iron	mg/L	0.003	0.005	0.18	No Standard	Based on APHA (2017), 3125	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).
Sampled By : Thanassou Namakunna

Remark :
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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Approved by

Savitree N.
Savitree Naisangam
Assistant Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 221679
Date Received : Feb 03, 2022
Date Reported : Feb 11, 2022
Report Number : 2195365-2

Page 1 of 1

Sample Number	221679-1					
Sampled Date	Feb 03, 2022 10:20 AM					
Sample Description	Wastewater					
Location	PUI_EQ Tank					
Date Analysis Commenced	Feb 04, 2022					
Condition of Sample	Contained in three amber glass bottles, three plastic bottles and two glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)					
Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Organic Compounds						
Propylene oxide	mg/L	-	10	<10	Based on US EPA, Method 8015B	Bangkok
Water Testing						
Methanol	mg/L	0.05	2.0	14.5	Based on US EPA, Method 8260 B	Bangkok

Sampled By : Chainusorn Lerbanthakunchai, Thanassou Namakunna

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

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Approved by

Siriluk P.
Siriluk Puengparng
Supervisor

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 221679
Date Received : Feb 03, 2022
Date Reported : Feb 11, 2022
Report Number : 2195365-1

Page 1 of 1

Sample Number	221679-1					
Sampled Date	Feb 03, 2022 10:20 AM					
Sample Description	Wastewater					
Location	PUI_EQ Tank					
Date Analysis Commenced	Feb 03, 2022					
Condition of Sample	Contained in three amber glass bottles, three plastic bottles and two glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)					
Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Water Testing						
BOD (5 days at 20 Degree C)	mg/L	-	2	1005	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	2861	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	20	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	18	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	7	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	7.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	34.5	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1750	APHA (2017), 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	52	APHA (2017), 2540 D	Rayong

Sampled By : Chainusorn Lerbanthakunchai, Thanassou Namakunna

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

N. Banongkit
Nanumon Banchongkit
Supervisor
โทรศัพท์ 0-323-8-9445

Approved by

D. Chanchong
Dej Chanchong
Manager
โทรศัพท์ 0-323-8-5283

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 221675
Date Received : Feb 03, 2022
Date Reported : Feb 11, 2022
Report Number : 2195360-1

Page 1 of 2

Page 1 of 1

Sample Number	221675-1						
Sampled Date	Feb 03, 2022 1:40 PM						
Sample Description	Wastewater						
Location	Inspection Manhole						
Date Analysis Commenced	Feb 03, 2022						
Condition of Sample	Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	<2	≤20	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	43	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	13	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	11	≤300	APHA (2017), 2120 F	Rayong
Cyanide as CN	mg/L	0.001	0.005	0.006	≤0.2	Based on APHA (2017), 4500-CN(C), (F)	Rayong
Formaldehyde	mg/L	0.03	0.1	Not Detected	≤1.0	Wastewater Analysis	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	8.3	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Phenol	mg/L	0.005	0.01	Not Detected	≤1.0	APHA (2017), 5530 D	Rayong
Residual Free Chlorine *	mg/L	-	0.1	<0.1	≤1.0	Based on APHA (2017), 4500-Cl(F)	Rayong
Sulfide *	mg/L	-	0.5	<0.5	≤1.0	Based on APHA (2017), 4500-S2(C), (F)	Rayong
Temperature *	Degree C	-	-	35.1	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1012	≤3000	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	<1.0	≤100	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	<5	≤50	APHA (2017), 2540 D	Rayong

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).
Note : Ambient Temperature is 30.2 degree celsius.

Sampled By : Chainusorn Lerbanthakunchai, Thanassou Namakunna

Remark :
- LOD : Limit of Detection

Technical Management

N. Banongkit
Nanumon Banchongkit
Supervisor
โทรศัพท์ 0-323-8-9445

Approved by

D. Chanchong
Dej Chanchong
Senior Manager
โทรศัพท์ 0-323-8-9442

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Analysis / Test Report



TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location: AIE_HPPO-TPO Plant

Lot ID: 221675
Date Received : Feb 03, 2022
Date Reported : Feb 11, 2022
Report Number : 2195360-1

Page 2 of 2

- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.



Analysis / Test Report



TESTING
No.0009

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location: AIE_HPPO-TPO Plant

Lot ID: 221675
Date Received : Feb 03, 2022
Date Reported : Feb 11, 2022
Report Number : 2195360-2

Page 1 of 2

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
2,4-DDD	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
2,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
2,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDD	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Aldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
alpha-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Atrazine *	ug/L	0.15	0.5	Not Detected	Not Detected	Based on APHA (2017), 6630 B	Bangkok
beta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Chlordane	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
delta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Dieldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Endosulfan I	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Endosulfan II	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Endrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Heptachlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Heptachlor-Epoxide	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Lindane (gamma-BHC)	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Methoxychlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok

Technical Management

N. Banchongkit

Nanamon Banchongkit
Supervisor
โทรศัพท์ 0-323-9-9445

Approved by

D. Changchon

Dej Changchon
Senior Manager
โทรศัพท์ 0-323-9-9442

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Technical Management

Siriluk P.

Siriluk Puangpang
Supervisor
โทรศัพท์ 0-204-9-4720

Approved by

Kanokkom Anek

Kanokkom Anek
Senior Manager
โทรศัพท์ 0-204-9-6111

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Analysis / Test Report



TESTING
No.0009

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location: AIE_HPPO-TPO Plant

Lot ID: 221675
Date Received : Feb 03, 2022
Date Reported : Feb 11, 2022
Report Number : 2195360-2

Page 2 of 2

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 30.2 degree celsius.

Sampled By : Chainusorn Lertnathakunchai, Thanassou Namakunna

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Analysis / Test Report



Lot ID: 221675

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location: AIE_HPPO-TPO Plant

Date Received : Feb 03, 2022
Date Reported : Feb 11, 2022
Report Number : 2195360-3

Page 1 of 1

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
Hexachlorobenzene	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Toxaphene	ug/L	0.001	0.1	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Water Testing							
Chlorine	mg/L	-	-	0.42	No Standard	Based on APHA (2017), 4500-ClO	Rayong

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 30.2 degree celsius.

Sampled By : Chainusorn Lertnathakunchai, Thanassou Namakunna

Remark :
- LOD : Limit of Detection
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Technical Management

Siriluk P.

Siriluk Puangpang
Supervisor
โทรศัพท์ 0-204-9-4720

Approved by

Kanokkom Anek

Kanokkom Anek
Senior Manager
โทรศัพท์ 0-204-9-6111

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ADDRESS 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand / PHONE +66 0 2760 3000 / FAX +66 0 2760 3197
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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

TESTING
No.0009
Lot ID: 221676
Date Received : Feb 03, 2022
Date Reported : Feb 08, 2022
Report Number : 2195363-1

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Arsenic	mg/L	0.0003	0.0005	0.005	≤0.25	Based on APHA (2017), 3125	Bangkok
Barium	mg/L	0.0003	0.0005	0.19	≤1.0	Based on APHA (2017), 3125	Bangkok
Cadmium	mg/L	0.0003	0.0005	Not Detected	≤0.03	Based on APHA (2017), 3125	Bangkok
Chromium	mg/L	0.0003	0.0005	0.003		Based on APHA (2017), 3125	Bangkok
Copper	mg/L	0.0003	0.0005	0.003	≤2.0	Based on APHA (2017), 3125	Bangkok
Hexavalent Chromium	mg/L	0.003	0.01	Not Detected	≤0.25	Based on APHA (2017), 3500-Cr (6)	Bangkok
Lead	mg/L	0.0003	0.0005	Not Detected	≤0.2	Based on APHA (2017), 3125	Bangkok
Manganese	mg/L	0.0003	0.0005	0.02	≤5.0	Based on APHA (2017), 3125	Bangkok
Mercury *	mg/L	0.0001	0.0005	Not Detected	≤0.005	Based on APHA (2017), 3112	Bangkok
Nickel	mg/L	0.0003	0.0005	0.005	≤1.0	Based on APHA (2017), 3125	Bangkok
Selenium	mg/L	0.0003	0.0005	<0.0005	≤0.02	Based on APHA (2017), 3125	Bangkok
Trivalent Chromium *	mg/L	-	0.01	<0.01	≤0.75	Based on APHA (2017), Calculated	Bangkok
Zinc	mg/L	0.003	0.005	0.55	≤5.0	Based on APHA (2017), 3125	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).
Sampled By : Chaisasom Lertnanthakunchai

Remark :
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Technical Management

Sawitree N.
Sawitree Noisangiam
Assistant Manager
โทรศัพท์มือถือ : 09-44-4709

Approved by

Kanokorn Anek
Kanokorn Anek
Senior Manager
โทรศัพท์มือถือ : 09-44-6111

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

TESTING
No.0042
Lot ID: 2219222
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2230510-1

Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Water Testing						
BOD (5 days at 20 Degree C)	mg/L	-	2	792	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	2360	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	12	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	11	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	19	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	6.1	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	33.7	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1650	APHA (2017), 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	10	APHA (2017), 2540 D	Rayong

Sampled By : Wanlop Hunchinaow, Thanassou Namakuma

Remark :
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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Technical Management

N. Banphit
Narumen Banchongkit
Supervisor
โทรศัพท์มือถือ : 09-323-9445

Approved by

D. Chanchon
Dg Chanchon
Manager
โทรศัพท์มือถือ : 09-323-9-5283

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

TESTING
No.0009
Lot ID: 221676
Date Received : Feb 03, 2022
Date Reported : Feb 08, 2022
Report Number : 2195363-2

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Iron	mg/L	0.003	0.005	0.14	No Standard	Based on APHA (2017), 3125	Bangkok
Silver	mg/L	0.0003	0.0005	Not Detected	No Standard	Based on APHA (2017), 3125	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).
Sampled By : Chaisasom Lertnanthakunchai

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Approved by

Sawitree N.
Sawitree Noisangiam
Assistant Manager

ADDRESS 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand PHONE +66 0 2760 3000 FAX +66 0 2760 3197
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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 2219222
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2230510-2

Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Organic Compounds						
Propylene oxide	mg/L	-	10	<10	Based on US EPA, Method 8015B	Bangkok
Water Testing						
Methanol	mg/L	0.05	2.0	12.2	Based on APHA (2017), 6200B	Bangkok

Sampled By : Wanlop Hunchinaow, Thanassou Namakuma

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Narin Saiseng
Narin Saiseng
Supervisor

ADDRESS 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand PHONE +66 0 2760 3000 FAX +66 0 2760 3197
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Analysis / Test Report

TESTING
No.0042Lot ID: 2219218
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2230493-1Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPP0-TPO Plant

Page 1 of 2

Sample Number	2219218-1						
Sampled Date	Mar 09, 2022 11:45 AM						
Sample Description	Wastewater						
Location	Inspection Manhole						
Date Analysis Commenced	Mar 09, 2022						
Condition of Sample	Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	<2	≤20	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	33	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMT	-	5	11	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMT	-	5	12	≤300	APHA (2017), 2120 F	Rayong
Cyanide as CN	mg/L	0.001	0.005	Not Detected	≤0.2	Based on APHA (2017), 4500-CN(C), (E)	Rayong
Formaldehyde	mg/L	0.03	0.1	Not Detected	≤1.0	Wastewater Analysis	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	8.0	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Phenol	mg/L	0.005	0.01	Not Detected	≤1.0	APHA (2017), 5530 D	Rayong
Residual Free Chlorine *	mg/L	-	0.1	<0.1	≤1.0	Based on APHA (2017), 4500-Cl(F)	Rayong
Sulfide *	mg/L	-	0.5	<0.5	≤1.0	Based on APHA (2017), 4500-Sz(C), (F)	Rayong
Temperature *	Degree C	-	-	33.5	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	940	≤3000	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	2.6	≤100	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	<5	≤50	APHA (2017), 2540 D	Rayong

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 32.0 degree celsius.

Sampled By : Wanlop Hunchaisaw, Thanassou Namakunna

Remark :
- LOD : Limit of Detection

Technical Management

N. Banchongkit

Nanumon Banchongkit
Supervisor
โทร: 09-323-9-9445

Approved by

D. Changchon

Dej Changchon
Senior Manager
โทร: 09-323-9-9442The above results are valid only for the analyzed (tested sample(s)) as indicated in this report. No part of this report or certificate may be reproduced in any form without written consent from the Laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.
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Analysis / Test Report

TESTING
No.0042Lot ID: 2219218
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2230493-1Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPP0-TPO Plant

Page 2 of 2

- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

N. Banchongkit

Nanumon Banchongkit
Supervisor
โทร: 09-323-9-9445

Approved by

D. Changchon

Dej Changchon
Senior Manager
โทร: 09-323-9-9442The above results are valid only for the analyzed (tested sample(s)) as indicated in this report. No part of this report or certificate may be reproduced in any form without written consent from the Laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.
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Analysis / Test Report

TESTING
No.0009Lot ID: 2219218
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2230493-2Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPP0-TPO Plant

Page 1 of 2

Sample Number	2219218-1						
Sampled Date	Mar 09, 2022 11:45 AM						
Sample Description	Wastewater						
Location	Inspection Manhole						
Date Analysis Commenced	Mar 12, 2022						
Condition of Sample	Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
2,4-DDD	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
2,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
2,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Aldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
alpha-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
beta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Chlordane	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
delta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Dieldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Endosulfan I	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Endosulfan II	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Endrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Heptachlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Heptachlor-Epoxyde	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Lindane (gamma-BHC)	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Methoxychlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Technical Management

Siriluk P.

Siriluk Puengpang
Supervisor
โทร: 09-204-4-4720

Approved by

K. Anek

Kanokkorn Anek
Senior Manager
โทร: 09-204-4-6111The above results are valid only for the analyzed (tested sample(s)) as indicated in this report. No part of this report or certificate may be reproduced in any form without written consent from the Laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.
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Analysis / Test Report

TESTING
No.0009Lot ID: 2219218
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2230493-2Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPP0-TPO Plant

Page 2 of 2

Note : Ambient Temperature is 32.0 degree celsius.
Sampled By : Wanlop Hunchaisaw, Thanassou Namakunna
Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Siriluk P.

Siriluk Puengpang
Supervisor
โทร: 09-204-4-4720

Approved by

K. Anek

Kanokkorn Anek
Senior Manager
โทร: 09-204-4-6111The above results are valid only for the analyzed (tested sample(s)) as indicated in this report. No part of this report or certificate may be reproduced in any form without written consent from the Laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.
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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HHPO-TPO Plant

TESTING
No.0009

Lot ID: 2219218
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2230493-3

Page 1 of 1

Sample Number	2219218-1
Sampled Date	Mar 09, 2022 11:45 AM
Sample Description	Wastewater
Location	Inspection Manhole
Date Analysis Commenced	Mar 09, 2022
Condition of Sample	Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
Atrazine *	ug/L	0.15	0.5	Not Detected	Not Detected	Based on APHA (2017), 6630 B	Bangkok
Hexachlorobenzene	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Toxaphene *	ug/L	0.001	0.1	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Water Testing							
Chlorine *	mg/L	-	-	0.51	No Standard	Based on APHA (2017), 4500-C(F) Rayong	

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).
Note : Ambient Temperature is 32.0 degree Celsius.

Sampled By : Wanlop Hunchanaow , Thanasoun Namakunna

Remark :

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Approved by

Siriluk P.
Siriluk Puengpaeng
Supervisor

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HHPO-TPO Plant

TESTING
No.0042

Lot ID: 2225759
Date Received : Apr 05, 2022
Date Reported : Apr 12, 2022
Report Number : 2243360-1

Page 1 of 1

Sample Number	2225759-1
Sampled Date	Apr 05, 2022 10:35 AM
Sample Description	Wastewater
Location	PUL_EQ Tank
Date Analysis Commenced	Apr 05, 2022
Condition of Sample	Contained in two glass vials, two amber glass bottles and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Water Testing						
BOD (5 days at 20 Degree C)	mg/L	-	2	1044	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	2737	APHA (2017), 5220 D	Rayong
Color (at original pH)	ADMI	-	5	9	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	8	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	8	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	7.1	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	33.2	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1540	APHA (2017), 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	34	APHA (2017), 2540 D	Rayong

Sampled By : Chainorn Lertranthakunhai , Thanasoun Namakunna

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

N. Banthit
Narumon Banchongkit
Supervisor

Approved by

D. Changchon
Dej Changchon
Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HHPO-TPO Plant

TESTING
No.0009

Lot ID: 2219220
Date Received : Mar 09, 2022
Date Reported : Mar 14, 2022
Report Number : 2230503-1

Page 1 of 1

Sample Number	2219220-1
Sampled Date	Mar 09, 2022
Sample Description	Wastewater
Location	Inspection Manhole
Date Analysis Commenced	Mar 10, 2022
Condition of Sample	Contained in two plastic bottles and two glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Arsenic	mg/L	0.0003	0.0005	0.007	≤0.25	Based on APHA (2017), 3125	Bangkok
Barium	mg/L	0.0003	0.0005	0.17	≤1.0	Based on APHA (2017), 3125	Bangkok
Cadmium	mg/L	0.0003	0.0005	Not Detected	≤0.03	Based on APHA (2017), 3125	Bangkok
Chromium	mg/L	0.0003	0.0005	0.002	No Standard	Based on APHA (2017), 3125	Bangkok
Copper	mg/L	0.0003	0.0005	0.001	≤2.0	Based on APHA (2017), 3125	Bangkok
Hexavalent Chromium	mg/L	0.003	0.01	Not Detected	≤0.25	Based on APHA (2017), 3500-Cr (B)	Bangkok
Iron	mg/L	0.003	0.005	0.07	No Standard	Based on APHA (2017), 3125	Bangkok
Lead	mg/L	0.0003	0.0005	<0.0005	≤0.2	Based on APHA (2017), 3125	Bangkok
Manganese	mg/L	0.0003	0.0005	0.03	≤5.0	Based on APHA (2017), 3125	Bangkok
Mercury *	mg/L	0.0001	0.0005	Not Detected	≤0.005	Based on APHA (2017), 3112	Bangkok
Nickel	mg/L	0.0003	0.0005	0.004	≤1.0	Based on APHA (2017), 3125	Bangkok
Selenium	mg/L	0.0003	0.0005	<0.0005	≤0.02	Based on APHA (2017), 3125	Bangkok
Silver	mg/L	0.0003	0.0005	Not Detected	No Standard	Based on APHA (2017), 3125	Bangkok
Trivalent Chromium *	mg/L	-	0.01	<0.01	≤0.75	Based on APHA (2017), Calculated	Bangkok
Zinc	mg/L	0.003	0.005	0.57	≤5.0	Based on APHA (2017), 3125	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Thanasoun Namakunna

Remark :

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Approved by

Sawitree N.
Sawitree Naisangam
Assistant Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HHPO-TPO Plant

Lot ID: 2225759
Date Received : Apr 05, 2022
Date Reported : Apr 12, 2022
Report Number : 2243360-2

Page 1 of 1

Sample Number	2225759-1
Sampled Date	Apr 05, 2022 10:35 AM
Sample Description	Wastewater
Location	PUL_EQ Tank
Date Analysis Commenced	Apr 06, 2022
Condition of Sample	Contained in two glass vials, two amber glass bottles and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Organic Compounds						
Propylene oxide	mg/L	-	10	<10	Based on US EPA, Method 8015B	Bangkok
Water Testing						
Methanol	mg/L	0.05	2.0	14.8	Based on APHA (2017), 6200B	Bangkok

Sampled By : Chainorn Lertranthakunhai , Thanasoun Namakunna

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Nant Somb
Nanthawadee Sombsoon
Specialist 1

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Analysis / Test Report



TESTING

No.0042

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand

21130

P/O : 4512723208

Project Name : Water Testing

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2225756

Date Received : Apr 05, 2022

Date Reported : Apr 12, 2022

Report Number : 2243344-1

Page 1 of 2

Sample Number	2225756-1						
Sampled Date	Apr 05, 2022 2:00 PM						
Sample Description	Wastewater						
Location	Inspection Manhole						
Date Analysis Commenced	Apr 05, 2022						
Condition of Sample	Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	<2	≤20	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	40	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	9	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	8	≤300	APHA (2017), 2120 F	Rayong
Cyanide as CN	mg/L	0.001	0.005	<0.005	≤0.2	Based on APHA (2017), 4500-CN(C), (E)	Rayong
Formaldehyde	mg/L	0.03	0.1	Not Detected	≤1.0	Wastewater Analysis	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	8.2	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Phenol	mg/L	0.005	0.01	Not Detected	≤1.0	APHA (2017), 5530 D	Rayong
Residual Free Chlorine *	mg/L	-	0.1	<0.1	≤1.0	Based on APHA (2017), 4500-Cl(F)	Rayong
Sulfide *	mg/L	-	0.5	<0.5	≤1.0	Based on APHA (2017), 4500-S2(C), (F)	Rayong
Temperature *	Degree C	-	-	33.4	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	924	≤3000	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	<1.0	≤100	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	<5	≤50	APHA (2017), 2540 D	Rayong

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 32.8 degree Celsius.

Sampled By : Chainosom Lertnathakunchai, Thanasoun Namakunna

Remark :
- LOD : Limit of Detection

Technical Management

N. Bangmit

Nanumon Banchongkit
Supervisor
โทรศัพท์ 0-323-9445

Approved by

D. Changchon

Dej Changchon
Senior Manager
โทรศัพท์ 0-323-9442

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Analysis / Test Report



TESTING

No.0042

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand

21130

P/O : 4512723208

Project Name : Water Testing

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2225756

Date Received : Apr 05, 2022

Date Reported : Apr 12, 2022

Report Number : 2243344-1

Page 2 of 2

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Technical Management

N. Bangmit

Nanumon Banchongkit
Supervisor
โทรศัพท์ 0-323-9445

Approved by

D. Changchon

Dej Changchon
Senior Manager
โทรศัพท์ 0-323-9442

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Analysis / Test Report



TESTING

No.0009

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand

21130

P/O : 4512723208

Project Name : Water Testing

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2225756

Date Received : Apr 05, 2022

Date Reported : Apr 12, 2022

Report Number : 2243344-2

Page 1 of 2

Sample Number	2225756-1							Page 1 of 4
Sampled Date	Apr 05, 2022 2:00 PM							
Sample Description	Wastewater							
Location	Inspection Manhole							
Date Analysis Commenced	Apr 06, 2022							
Condition of Sample	Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)							
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location	
Pesticides - Organochlorine Group								
2,4-DDD	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
2,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
2,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
4,4-DDD	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
4,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
4,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
Aldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
alpha-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
Atrazine *	ug/L	0.15	0.5	Not Detected	Not Detected	Based on APHA (2017), 6630 B	Bangkok	
beta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
Chlordane	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
delta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
Dieldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
Endosulfan I	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
Endosulfan II	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
Endrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
Heptachlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
Heptachlor-Epoxide	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
Lindane (gamma-BHC)	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	
Methoxychlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok	

Technical Management

Nant Somb

Nanthawadee Sombphon
Specialist 1
โทรศัพท์ 0-204-4716

Approved by

Kankorn Anek

Kankorn Anek
Senior Manager
โทรศัพท์ 0-204-6111

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Analysis / Test Report



TESTING

No.0009

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand

21130

P/O : 4512723208

Project Name : Water Testing

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2225756

Date Received : Apr 05, 2022

Date Reported : Apr 12, 2022

Report Number : 2243344-2

Page 2 of 2

Sample Number	2225756-1						
Sampled Date	Apr 05, 2022 2:00 PM						
Sample Description	Wastewater						
Location	Inspection Manhole						
Date Analysis Commenced	Apr 06, 2022						
Condition of Sample	Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
Toxaphene *	ug/L	0.001	0.1	Not Detected	No Standard	Based on APHA (2017), 6630 C	Bangkok
Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).							
Note : Ambient Temperature is 32.8 degree Celsius.							
Sampled By : Chainosom Lertnathakunchai, Thanasoun Namakunna							
Remark :							
- LOD : Limit of Detection							
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)							
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.							

Technical Management

Nant Somb

Nanthawadee Sombphon
Specialist 1
โทรศัพท์ 0-204-4716

Approved by

Kankorn Anek

Kankorn Anek
Senior Manager
โทรศัพท์ 0-204-6111

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Analysis / Test Report



TESTING
No.0009

Lot ID: 2225756
Date Received : Apr 05, 2022
Date Reported : Apr 12, 2022
Report Number : 2243344-3

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Sample Number 2225756-1
Sampled Date Apr 05, 2022 2:00 PM
Sample Description Wastewater
Location Inspection Manhole
Date Analysis Commenced Apr 05, 2022
Condition of Sample Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
Hexachlorobenzene	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6430 C	Bangkok
Water Testing							
Chlorine *	mg/L	-	-	0.57	No Standard	Based on APHA (2017), 4500-Cl(G)	Rayong

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 32.8 degree Celsius.

Sampled By : Chainusorn Lertnathakunchai, Thanassun Namakunna

Remark :

- LOD : Limit of Detection
- "C" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Page 1 of 1



Analysis / Test Report



TESTING
No.0009

Lot ID: 2225758
Date Received : Apr 05, 2022
Date Reported : Apr 09, 2022
Report Number : 2243352-1

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Sample Number 2225758-1
Sampled Date Apr 05, 2022 2:00 PM
Sample Description Wastewater
Location Inspection Manhole
Date Analysis Commenced Apr 06, 2022
Condition of Sample Contained in two glass vials and two plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Arsenic	mg/L	0.0003	0.0005	0.006	≤0.25	Based on APHA (2017), 3125	Bangkok
Barium	mg/L	0.0003	0.0005	0.16	≤1.0	Based on APHA (2017), 3125	Bangkok
Cadmium	mg/L	0.0003	0.0005	Not Detected	≤0.03	Based on APHA (2017), 3125	Bangkok
Chromium	mg/L	0.0003	0.0005	Not Detected	No Standard	Based on APHA (2017), 3125	Bangkok
Copper	mg/L	0.0003	0.0005	0.0008	≤2.0	Based on APHA (2017), 3125	Bangkok
Hexavalent Chromium	mg/L	0.003	0.01	Not Detected	≤0.25	Based on APHA (2017), 3500-Cr (B)	Bangkok
Lead	mg/L	0.0003	0.0005	Not Detected	≤0.2	Based on APHA (2017), 3125	Bangkok
Manganese	mg/L	0.0003	0.0005	0.03	≤5.0	Based on APHA (2017), 3125	Bangkok
Mercury *	mg/L	0.0001	0.0005	Not Detected	≤0.005	Based on APHA (2017), 3112	Bangkok
Nickel	mg/L	0.0003	0.0005	0.005	≤1.0	Based on APHA (2017), 3125	Bangkok
Selenium	mg/L	0.0003	0.0005	Not Detected	≤0.02	Based on APHA (2017), 3125	Bangkok
Trivalent Chromium *	mg/L	-	0.01	<0.01	≤0.75	Based on APHA (2017), Calculated	Bangkok
Zinc	mg/L	0.003	0.005	0.72	≤5.0	Based on APHA (2017), 3125	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Thanassun Namakunna

Remark :

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Approved by

Nant Somb
Nanthawadee Somborn
Specialist 1

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Technical Management

Chanatt L.
Chanattagarn Imchom
Supervisor
โทรศัพท์มือถือ +204-9-4710

Approved by

Kanokorn Anok
Senior Manager
โทรศัพท์มือถือ +204-9-5111

ADDRESS 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand PHONE +66 0 2760 3000 FAX +66 0 2760 3197
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Analysis / Test Report



TESTING
No.0009

Lot ID: 2225758
Date Received : Apr 05, 2022
Date Reported : Apr 09, 2022
Report Number : 2243352-2

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Sample Number 2225758-1
Sampled Date Apr 05, 2022 2:00 PM
Sample Description Wastewater
Location Inspection Manhole
Date Analysis Commenced Apr 06, 2022
Condition of Sample Contained in two glass vials and two plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Iron	mg/L	0.003	0.005	0.05	No Standard	Based on APHA (2017), 3125	Bangkok
Silver	mg/L	0.0003	0.0005	Not Detected	No Standard	Based on APHA (2017), 3125	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Thanassun Namakunna

Remark :

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Analysis / Test Report



TESTING
No.0042

Lot ID: 2238595
Date Received : May 06, 2022
Date Reported : May 13, 2022
Report Number : 2271196-1

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Sample Number 2238595-1
Sampled Date May 06, 2022 9:55 AM
Sample Description Wastewater
Location PUL EQ Tank
Date Analysis Commenced May 06, 2022
Condition of Sample Contained in three amber glass bottles, three plastic bottles and two glass vials. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Water Testing						
BOD (5 days at 20 Degree C)	mg/L	-	2	1053	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	3539	APHA (2017), 5220 D	Rayong
Color (at original pH)	ADMI	-	5	34	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	34	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	15	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	7.7	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	33.5	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1770	APHA (2017), 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	59	APHA (2017), 2540 D	Rayong

Sampled By : Pathompong Kornasawit, Thanassun Namakunna

Remark :

- LOD : Limit of Detection
- "C" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Approved by

Chanatt L.
Chanattagarn Imchom
Supervisor

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6225-2081 EMAIL

Technical Management

N. Ban-Phit
Nannorn Banchongkitt
Supervisor
โทรศัพท์มือถือ +323-9-9445

Approved by

Dej Changchorn
Senior Manager
โทรศัพท์มือถือ +323-9-9442

ADDRESS 61/10 Moo 5 T. Meenam Khui A. Phukdang Rayong 21140 Thailand PHONE +66 0 3304 8555 FAX +66 0 3304 8556
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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 2238595
Date Received : May 06, 2022
Date Reported : May 14, 2022
Report Number : 2271196-2

Page 1 of 1

Sample Number	2238595-1					
Sampled Date	May 06, 2022 9:55 AM					
Sample Description	Wastewater					
Location	PUL_EQ Tank					
Date Analysis Commenced	May 09, 2022					
Condition of Sample	Contained in three amber glass bottles, three plastic bottles and two glass vials. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)					
Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Organic Compounds						
Propylene oxide	mg/L	-	10	<10	Based on US EPA, Method 8015B	Bangkok
Water Testing						
Methanol	mg/L	0.05	2.0	61.5	Based on APHA (2017), 6200B	Bangkok

Sampled By : Pathompong Kornasawat, Thanassou Namakunna

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

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Approved by

Nant Somb
Nanthawadee Somboon
Specialist I

ADDRESS 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand / PHONE +66 0 2760 3000 / FAX +66 0 2760 3197
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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

TESTING
No.0042
Lot ID: 2238599
Date Received : May 06, 2022
Date Reported : May 13, 2022
Report Number : 2271185-1

Page 2 of 2

- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
* Analyte(s) marked * below are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

N. Bangnit

Narumon Banchongkit
Supervisor
โทรศัพท์ ๖-323-๙-๙๙๔๕

Approved by

D. Changchon

Dej Changchon
Senior Manager
โทรศัพท์ ๖-323-๙-๙๙๔๕

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

TESTING
No.0042
Lot ID: 2238599
Date Received : May 06, 2022
Date Reported : May 13, 2022
Report Number : 2271185-1

Page 1 of 2

Sample Number	2238599-1					
Sampled Date	May 06, 2022 11:40 AM					
Sample Description	Wastewater					
Location	Inspection Manhole					
Date Analysis Commenced	May 06, 2022					
Condition of Sample	Contained in four amber glass bottle and six plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)					
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method
Water Testing						
BOD (5 days at 20 Degree C)	mg/L	-	2	<2	≤20	APHA (2017), 5210 B
COD	mg/L	1.5	5	58	≤120	APHA (2017), 5220 D
Color (at Original pH)	ADMI	-	5	31	≤300	APHA (2017), 2120 F
Color (at pH 7.0)	ADMI	-	5	29	≤300	APHA (2017), 2120 F
Cyanide as CN	mg/L	0.001	0.005	0.006	≤0.2	Based on APHA (2017), 4500-CN(C), (E)
Formaldehyde	mg/L	0.03	0.1	<0.1	≤1.0	Wastewater Analysis
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B
pH at 25 degree C	-	-	-	8.5	5.5-9.0	Based on APHA (2017), 4500-H (B)
Phenol	mg/L	0.005	0.01	0.01	≤1.0	APHA (2017), 5530 D
Residual Free Chlorine *	mg/L	-	0.1	0.2	≤1.0	Based on APHA (2017), 4500-Cl(F)
Sulfide *	mg/L	-	0.5	<0.5	≤1.0	Based on APHA (2017), 4500-S2(C), (F)
Temperature *	Degree C	-	-	34.7	≤40	Based on APHA (2017), 2550 B
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	936	≤3000	APHA (2017), 2540 C
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	2.3	≤100	APHA (2017), 4500-Norg (C), N#3 (D)
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	<5	≤50	APHA (2017), 2540 D

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 37.6 degree Celsius.

Sampled By : Pathompong Kornasawat, Thanassou Namakunna

Remark :
- LOD : Limit of Detection

Technical Management

N. Bangnit

Narumon Banchongkit
Supervisor
โทรศัพท์ ๖-323-๙-๙๙๔๕

Approved by

D. Changchon

Dej Changchon
Senior Manager
โทรศัพท์ ๖-323-๙-๙๙๔๕

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

TESTING
No.0009
Lot ID: 2238599
Date Received : May 06, 2022
Date Reported : May 13, 2022
Report Number : 2271185-2

Page 1 of 2

Sample Number	2238599-1					
Sampled Date	May 06, 2022 11:40 AM					
Sample Description	Wastewater					
Location	Inspection Manhole					
Date Analysis Commenced	May 09, 2022					
Condition of Sample	Contained in four amber glass bottle and six plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)					
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method
Pesticides - Organochlorine Group						
2,4-DDD	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
2,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
2,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
4,4-DDD	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
4,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
4,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
Aldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
alpha-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
beta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
Chlordane	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
delta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
Dieldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
Endosulfan I	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
Endosulfan II	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
Endrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
Heptachlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
Heptachlor-Epoxyde	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
Lindane (gamma-BHC)	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C
Methoxychlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Technical Management

Siriluk P.

Siriluk Puengpang
Supervisor
โทรศัพท์ ๖-204-๙-๔๕๕๕

Approved by

Kanokorn Anek

Kanokorn Anek
Senior Manager
โทรศัพท์ ๖-204-๙-6111

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8525-208/ EMAIL

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

TESTING
No.0009
Lot ID: 2238589
Date Received : May 06, 2022
Date Reported : May 13, 2022
Report Number : 2271185-2

Sampled By : Pathompong Komsawat, Thanassou Namakunna

Page 2 of 2

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

TESTING
No.0009
Lot ID: 2238589
Date Received : May 06, 2022
Date Reported : May 13, 2022
Report Number : 2271185-3

Sample Number : 2238589-1
Sampled Date : May 06, 2022 11:40 AM
Sample Description : Wastewater
Location : Inspection Manhole
Date Analysis Commenced : May 06, 2022
Condition of Sample : Contained in four amber glass bottle and six plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)

Page 1 of 1

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
Atrazine *	ug/L	0.15	0.5	Not Detected	Not Detected	Based on APHA (2017), 6630 B	Bangkok
Hexachlorobenzene	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Toxaphene *	ug/L	0.001	0.1	Not Detected	No Standard	Based on APHA (2017), 6630 C	Bangkok
Water Testing							
Chlorine *	mg/L	-	-	0.69	No Standard	Based on APHA (2017), 4500-C(F)	Rayong

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 37.6 degree Celsius.

Sampled By : Pathompong Komsawat, Thanassou Namakunna

Remark :
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Technical Management

Siriluk P.
Siriluk Puenggang
Supervisor
โทรศัพท์ : 09-204-4720

Approved by

Kanokhom Anek
Senior Manager
โทรศัพท์ : 09-204-6111

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Approved by

N. Bangmit
Narumon Bandhongkit
Supervisor

ADDRESS 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand PHONE +66 0 2760 3000 FAX +66 0 2760 3197
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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O :
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

TESTING
No.0009
Lot ID: 2238591
Date Received : May 06, 2022
Date Reported : May 12, 2022
Report Number : 2271191-1

Page 1 of 1

Sample Number : 2238591-1
Sampled Date : May 06, 2022 11:40 AM
Sample Description : Wastewater
Location : Inspection Manhole
Date Analysis Commenced : May 09, 2022
Condition of Sample : Contained in two glass vials and two plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Arsenic	mg/L	0.0003	0.0005	0.006	≤0.25	Based on APHA (2017), 3125	Bangkok
Barium	mg/L	0.0003	0.0005	0.14	≤1.0	Based on APHA (2017), 3125	Bangkok
Cadmium	mg/L	0.0003	0.0005	Not Detected	≤0.03	Based on APHA (2017), 3125	Bangkok
Chromium	mg/L	0.0003	0.0005	0.003	No Standard	Based on APHA (2017), 3125	Bangkok
Copper	mg/L	0.0003	0.0005	0.001	≤2.0	Based on APHA (2017), 3125	Bangkok
Hexavalent Chromium	mg/L	0.003	0.01	Not Detected	≤0.25	Based on APHA (2017), 3500-Cr (6)	Bangkok
Lead	mg/L	0.0003	0.0005	<0.0005	≤0.2	Based on APHA (2017), 3125	Bangkok
Manganese	mg/L	0.0003	0.0005	0.20	≤5.0	Based on APHA (2017), 3125	Bangkok
Mercury *	mg/L	0.0001	0.0005	Not Detected	≤0.005	Based on APHA (2017), 3112	Bangkok
Nickel	mg/L	0.0003	0.0005	0.004	≤1.0	Based on APHA (2017), 3125	Bangkok
Selenium	mg/L	0.0003	0.0005	Not Detected	≤0.02	Based on APHA (2017), 3125	Bangkok
Trivalent Chromium *	mg/L	-	0.01	<0.01	≤0.75	Based on APHA (2017), Calculated	Bangkok
Zinc	mg/L	0.003	0.005	0.58	≤5.0	Based on APHA (2017), 3125	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Thanassou Namakunna

Remark :
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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Technical Management

Savitree N.
Savitree Noisangiam
Manager
โทรศัพท์ : 09-204-4709

Approved by

Kanokhom Anek
Senior Manager
โทรศัพท์ : 09-204-6111

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O :
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

TESTING
No.0009
Lot ID: 2238591
Date Received : May 06, 2022
Date Reported : May 12, 2022
Report Number : 2271191-2

Page 1 of 1

Sample Number : 2238591-1
Sampled Date : May 06, 2022 11:40 AM
Sample Description : Wastewater
Location : Inspection Manhole
Date Analysis Commenced : May 09, 2022
Condition of Sample : Contained in two glass vials and two plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Iron	mg/L	0.003	0.005	0.19	No Standard	Based on APHA (2017), 3125	Bangkok
Silver	mg/L	0.0003	0.0005	Not Detected	No Standard	Based on APHA (2017), 3125	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Thanassou Namakunna

Remark :
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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Approved by

Savitree N.
Savitree Noisangiam
Manager

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Analysis / Test Report

TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 2266301
Date Received :Jun 08, 2022
Date Reported :Jun 16, 2022
Report Number :2328342-1

Page 1 of 1

Sample Number	2266301-1					
Sampled Date	Jun 08, 2022 10:00 AM					
Sample Description	Wastewater					
Location	PUL_EQ Tank					
Date Analysis Commenced	Jun 08, 2022					
Condition of Sample	Contained in two glass vials, three amber glass bottles and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)					
Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Water Testing						
BOD (5 days at 20 Degree C)	mg/L	-	2	1102	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	2990	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	15	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	13	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	10	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	7.2	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	36.0	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1290	APHA (2017), 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	32	APHA (2017), 2540 D	Rayong

Sampled By : Wanlop Hunchanaow, Thanassou Namakunna

Remark :
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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

N. Bangpit

Narumon Banchongkit
Supervisor
โทรศัพท์ 323-9-9445

Approved by

D. Chongchon

Dej Chongchon
Senior Manager
โทรศัพท์ 323-9-9442

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Analysis / Test Report

TESTING
No.0042

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 2263677
Date Received :Jun 08, 2022
Date Reported :Jun 16, 2022
Report Number : 2328339-1

Page 1 of 2

Sample Number	2263677-1						
Sampled Date	Jun 08, 2022 9:10 AM						
Sample Description	Wastewater						
Location	Inspection Manhole						
Date Analysis Commenced	Jun 08, 2022						
Condition of Sample	Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	<2	≤20	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	31	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	9	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	8	≤300	APHA (2017), 2120 F	Rayong
Cyanide as CN	mg/L	0.001	0.005	<0.005	≤0.2	Based on APHA (2017), 4500-CN(C), (E)	Rayong
Formaldehyde	mg/L	0.03	0.1	<0.1	≤1.0	Wastewater Analysis	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	7.8	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Phenol	mg/L	0.005	0.01	Not Detected	≤1.0	APHA (2017), 5530 D	Rayong
Residual Free Chlorine *	mg/L	-	0.1	<0.1	≤1.0	Based on APHA (2017), 4500-Cl(F)	Rayong
Sulfide *	mg/L	-	0.5	<0.5	≤1.0	Based on APHA (2017), 4500-S2(C), (F)	Rayong
Temperature *	Degree C	-	-	35.9	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1190	≤3000	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	1.4	≤100	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	<5	≤50	APHA (2017), 2540 D	Rayong

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 30.4 degree Celsius.

Sampled By : Wanlop Hunchanaow, Thanassou Namakunna

Remark :
- LOD : Limit of Detection

Technical Management

N. Bangpit

Narumon Banchongkit
Supervisor
โทรศัพท์ 323-9-9445

Approved by

D. Chongchon

Dej Chongchon
Senior Manager
โทรศัพท์ 323-9-9442

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 2266301
Date Received :Jun 08, 2022
Date Reported :Jun 16, 2022
Report Number :2328342-2

Page 1 of 1

Sample Number	2266301-1					
Sampled Date	Jun 08, 2022 10:00 AM					
Sample Description	Wastewater					
Location	PUL_EQ Tank					
Date Analysis Commenced	Jun 10, 2022					
Condition of Sample	Contained in two glass vials, three amber glass bottles and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)					
Analyte	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Organic Compounds						
Propylene oxide	mg/L	-	10	<10	Based on US EPA, Method 8015B	Bangkok
Water Testing						
Methanol	mg/L	0.05	2.0	43.6	Based on APHA (2017), 6200B	Bangkok

Sampled By : Wanlop Hunchanaow, Thanassou Namakunna

Remark :
- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

N. Saiseng

Narin Saiseng
Supervisor

ADDRESS 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand PHONE +66 0 2760 3000 FAX +66 0 2760 3197
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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Lot ID: 2263677
Date Received :Jun 08, 2022
Date Reported :Jun 16, 2022
Report Number : 2328339-1

Page 2 of 2

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- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

N. Bangpit

Narumon Banchongkit
Supervisor
โทรศัพท์ 323-9-9445

Approved by

D. Chongchon

Dej Chongchon
Senior Manager
โทรศัพท์ 323-9-9442

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Sample Number 2263677-1
Sampled Date Jun 08, 2022 9:10 AM
Sample Description Wastewater
Location Inspection Manhole
Date Analysis Commenced Jun 09, 2022
Condition of Sample Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
2,4-DDD	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
2,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
2,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDD	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDE	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
4,4-DDT	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Aldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
alpha-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
beta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Chlordane	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
delta-BHC	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Dieldrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Endosulfan I	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Endosulfan II	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Endrin	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Heptachlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Heptachlor-Epoxyde	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Lindane (gamma-BHC)	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Methoxychlor	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Technical Management

Siriluk P.
Siriluk Puenggang
Supervisor
โทรศัพท์ 204-4720

Approved by

Kanokorn Anek
Kanokorn Anek
Senior Manager
โทรศัพท์ 204-46111

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Sample Number 2263677-1
Sampled Date Jun 08, 2022 9:10 AM
Sample Description Wastewater
Location Inspection Manhole
Date Analysis Commenced Jun 08, 2022
Condition of Sample Contained in four amber glass bottles and six plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Pesticides - Organochlorine Group							
Atrazine *	ug/L	0.15	0.5	Not Detected	Not Detected	Based on APHA (2017), 6630 B	Bangkok
Hexachlorobenzene	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Toxaphene *	ug/L	0.001	0.1	Not Detected	No Standard	Based on APHA (2017), 6630 C	Bangkok
Water Testing							
Chlorine *	mg/L	-	-	0.32	No Standard	Based on APHA (2017), 4500-Cl(F) Rayong	

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Note : Ambient Temperature is 30.4 degree Celsius.

Sampled By : Wanlop Hunchainaw, Thanassou Namakunna

Remark :

- LOD : Limit of Detection
- "C" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Approved by

Siriluk P.
Siriluk Puenggang
Supervisor

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TESTING
No.0009

Lot ID: 2263677
Date Received : Jun 08, 2022
Date Reported : Jun 16, 2022
Report Number : 2328339-2

Page 1 of 2



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Note : Ambient Temperature is 30.4 degree Celsius.
Sampled By : Wanlop Hunchainaw, Thanassou Namakunna

Remark :

- LOD : Limit of Detection
- "C" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.
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Page 2 of 2

TESTING
No.0009

Lot ID: 2263677
Date Received : Jun 08, 2022
Date Reported : Jun 16, 2022
Report Number : 2328339-2

Technical Management

Siriluk P.
Siriluk Puenggang
Supervisor
โทรศัพท์ 204-4720

Approved by

Kanokorn Anek
Kanokorn Anek
Senior Manager
โทรศัพท์ 204-46111

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPPO-TPO Plant

Sample Number 2266300-1
Sampled Date Jun 08, 2022 9:10 AM
Sample Description Wastewater
Location Inspection Manhole
Date Analysis Commenced Jun 09, 2022
Condition of Sample Contained in two glass vials and two plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Arsenic	mg/L	0.0003	0.0005	0.003	≤0.25	Based on APHA (2017), 3125	Bangkok
Barium	mg/L	0.0003	0.0005	0.09	≤1.0	Based on APHA (2017), 3125	Bangkok
Cadmium	mg/L	0.0003	0.0005	Not Detected	≤0.03	Based on APHA (2017), 3125	Bangkok
Chromium	mg/L	0.0003	0.0005	0.006	No Standard	Based on APHA (2017), 3125	Bangkok
Copper	mg/L	0.0003	0.0005	Not Detected	≤2.0	Based on APHA (2017), 3125	Bangkok
Hexavalent Chromium	mg/L	0.003	0.01	<0.01	≤0.25	Based on APHA (2017), 3500-Cr (B)	Bangkok
Lead	mg/L	0.0003	0.0005	Not Detected	≤0.2	Based on APHA (2017), 3125	Bangkok
Manganese	mg/L	0.0003	0.0005	0.02	≤5.0	Based on APHA (2017), 3125	Bangkok
Mercury *	mg/L	0.0001	0.0005	Not Detected	≤0.005	Based on APHA (2017), 3125	Bangkok
Nickel	mg/L	0.0003	0.0005	0.003	≤1.0	Based on APHA (2017), 3125	Bangkok
Selenium	mg/L	0.0003	0.0005	Not Detected	≤0.02	Based on APHA (2017), 3125	Bangkok
Trivalent Chromium *	mg/L	-	0.01	<0.01	≤0.75	Based on APHA (2017), Calculated	Bangkok
Zinc	mg/L	0.003	0.005	0.34	≤5.0	Based on APHA (2017), 3125	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Thanassou Namakunna

Remark :

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Technical Management

Sawitree N.
Sawitree Nonsangiam
Manager
โทรศัพท์ 204-4709

Approved by

Kanokorn Anek
Kanokorn Anek
Senior Manager
โทรศัพท์ 204-46111

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Analysis / Test Report

TESTING
No.0009

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130
P/O : 4512723208
Project Name : Water Testing
Project Location : AIE_HPP0-TPO Plant

Lot ID: 2266300
Date Received : Jun 08, 2022
Date Reported : Jun 13, 2022
Report Number : 2328341-2

Page 1 of 1

Sample Number : 2266300-1
Sampled Date : Jun 08, 2022 9:10 AM
Sample Description : Wastewater
Location : Inspection Manhole
Date Analysis Commenced : Jun 09, 2022
Condition of Sample : Contained in two glass vials and two plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Iron	mg/L	0.003	0.005	0.37	No Standard	Based on APHA (2017), 3125	Bangkok
Silver	mg/L	0.0003	0.0005	Not Detected	No Standard	Based on APHA (2017), 3125	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).
Sampled By : Thanasoun Namakunna

Remark :
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Approved by

Savitree N.
Savitree Notsangiam
Manager

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8525-2367 (ENGL)

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ระดับความร้อน



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.
10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130
P/O :
Project Name : Environmental Quality Monitoring
Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149871
Date Received : Feb 04, 2022
Date Reported : Feb 08, 2022
Report Number: 2185322-1

Page 1 of 1

Sample Number 21149871-1
Parameter Heat Stress (Sampling Time : 09.30 AM - 11.30 AM)
Measurement Date Feb 04, 2022
Measurement by Norranon Tathongkham
Location ปฏิบัติงาน - พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
บริเวณหน่วย TOX (ERU)	120	29.1	27.8	32.6	31.5
Average (WBGT)		29.1			
Guideline WBGT (°C)		32.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong
Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2240297

Date Received : May 13, 2022

Date Reported : May 18, 2022

Report Number: 2274464-1

Page 1 of 1

Sample Number 2240297-1
Parameter Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date May 13, 2022
Measurement by Satcha Phetsawaeng
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
บริเวณหน่วย TOX (ERU)	120	31.0	28.1	38.4	36.4
Average (WBGT)		31.0			
Guideline WBGT (°C)		32.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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ระดับเสียงในสถานประกอบการ (Leq 8 hrs)



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130

P/O :

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149873

Date Received : Feb 04, 2022

Date Reported : Feb 09, 2022

Report Number: 2228978-1

Page 1 of 1

Sample Number 21149873-1
Parameter Noise (Leq 8 hrs.)
Location Compressor Area
Measurement Date Feb 04, 2022
Measurement by Norranon Tathongkham

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:26 AM - 10:26 AM	78.9	84.0	78.5
10:26 AM - 11:26 AM	78.6	79.7	78.3
11:26 AM - 12:26 PM	78.3	82.0	78.1
12:26 PM - 01:26 PM	78.2	83.3	77.8
01:26 PM - 02:26 PM	78.8	85.8	78.2
02:26 PM - 03:26 PM	78.8	84.1	78.4
03:26 PM - 04:26 PM	78.9	91.5	78.4
04:26 PM - 05:26 PM	78.6	80.4	78.5

Leq Average 8 hrs. (dB(A))

78.6

Lmax (dB(A))

91.5

Standard (dB(A))

90

140

Reference Method : Based on ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรฐานการคุ้มครองความปลอดภัยในการประกอบกิจการโรงงานเกี่ยวกับสภาวะแวดล้อมในการทำงาน พ.ศ.๒๕๕๖



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130

P/O :

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 21149873

Date Received : Feb 04, 2022

Date Reported : Feb 09, 2022

Report Number: 2228979-1

Page 1 of 1

Sample Number 21149873-2
Parameter Noise (Leq 8 hrs.)
Location Cooling Tower
Measurement Date Feb 04, 2022
Measurement by Norranon Tathongkham

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:17 AM - 10:17 AM	78.0	79.7	77.8
10:17 AM - 11:17 AM	77.9	80.3	77.8
11:17 AM - 12:17 PM	78.0	78.7	77.8
12:17 PM - 01:17 PM	78.0	78.6	77.9
01:17 PM - 02:17 PM	78.2	80.0	78.1
02:17 PM - 03:17 PM	78.6	79.8	78.2
03:17 PM - 04:17 PM	78.9	83.0	78.7
04:17 PM - 05:17 PM	78.6	79.2	78.5

Leq Average 8 hrs. (dB(A))

78.3

Lmax (dB(A))

83.0

Standard (dB(A))

90

140

Reference Method : Based on ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรฐานการคุ้มครองความปลอดภัยในการประกอบกิจการโรงงานเกี่ยวกับสภาวะแวดล้อมในการทำงาน พ.ศ.๒๕๕๖

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salameh
Section Head

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Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salameh
Section Head

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O :

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPPO-TPO Plant

Lot ID: 21149873

Date Received : Feb 04, 2022

Date Reported : Feb 09, 2022

Report Number: 2228980-1

Page 1 of 1

Sample Number : 21149873-3
Parameter : Noise (Leq 8 hrs.)
Location : TOX Area (ERU)
Measurement Date : Feb 04, 2022
Measurement by : Norranon Tathongkham

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:33 AM - 10:33 AM	83.8	93.2	82.7
10:33 AM - 11:33 AM	83.8	85.8	82.8
11:33 AM - 12:33 PM	83.9	85.7	83.1
12:33 PM - 01:33 PM	83.8	85.6	83.0
01:33 PM - 02:33 PM	83.4	88.1	82.6
02:33 PM - 03:33 PM	83.1	86.5	82.5
03:33 PM - 04:33 PM	83.4	85.0	82.2
04:33 PM - 05:33 PM	83.3	88.0	82.5

Leq Average 8 hrs. (dB(A))

83.6

Lmax (dB(A))

93.2

Standard (dB(A))

90

140

Reference Method : Based on ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย

ในการประกอบกิจการโรงงานเกี่ยวกับสภาวะแวดล้อมในการทำงาน พ.ศ.๒๕๔๖



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPPO-TPO Plant

Lot ID: 2240300

Date Received : May 13, 2022

Date Reported : May 20, 2022

Report Number: 2318656-1

Page 1 of 1

Sample Number : 2240300-1
Parameter : Noise (Leq 8 hrs.)
Location : Compressor Area
Measurement Date : May 13, 2022
Measurement by : Satcha Phetsawaeng

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:28 AM - 10:28 AM	78.7	85.5	78.0
10:28 AM - 11:28 AM	78.3	79.8	77.9
11:28 AM - 12:28 PM	78.1	79.5	77.8
12:28 PM - 01:28 PM	77.8	80.3	77.4
01:28 PM - 02:28 PM	77.7	83.2	77.4
02:28 PM - 03:28 PM	77.9	82.4	77.5
03:28 PM - 04:28 PM	77.7	79.4	77.5
04:28 PM - 05:28 PM	77.9	80.4	77.5

Leq Average 8 hrs. (dB(A))

78.0

Lmax (dB(A))

85.5

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย

ในการประกอบกิจการโรงงานเกี่ยวกับสภาวะแวดล้อมในการทำงาน พ.ศ.๒๕๔๖

Technical Management

Thanitak.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Technical Management

Thanitak.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2240300

Date Received : May 13, 2022

Date Reported : May 20, 2022

Report Number: 2318657-1

Page 1 of 1

Sample Number 2240300-2
Parameter Noise (Leq 8 hrs.)
Location Cooling Tower
Measurement Date May 13, 2022
Measurement by Satcha Phetsawaeng

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:01 AM - 10:01 AM	79.6	87.9	79.3
10:01 AM - 11:01 AM	79.6	80.5	79.4
11:01 AM - 12:01 PM	79.6	80.6	79.4
12:01 PM - 01:01 PM	79.6	80.5	79.4
01:01 PM - 02:01 PM	79.6	80.4	79.4
02:01 PM - 03:01 PM	79.6	81.5	79.4
03:01 PM - 04:01 PM	79.6	80.5	79.4
04:01 PM - 05:01 PM	79.8	85.1	79.6

Leq Average 8 hrs. (dB(A))

79.6

Lmax (dB(A))

87.9

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรฐานการคุ้มครองความปลอดภัยในการประกอบกิจการโรงงานเกี่ยวกับสถานะแวดล้อมในการทำงาน พ.ศ.๒๕๔๖

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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S:\Reports_Air Noise.rpt (10:06AM)



Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand 21130

P/O : 4512888163

Project Name : Environmental Quality Monitoring

Project Location : AIE_HPPO-TPO Plant

Lot ID: 2240300

Date Received : May 13, 2022

Date Reported : May 20, 2022

Report Number: 2318658-1

Page 1 of 1

Sample Number 2240300-3
Parameter Noise (Leq 8 hrs.)
Location TOX Area (ERU)
Measurement Date May 13, 2022
Measurement by Satcha Phetsawaeng

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:28 AM - 10:28 AM	75.8	77.4	75.6
10:28 AM - 11:28 AM	75.8	79.5	75.6
11:28 AM - 12:28 PM	75.8	87.7	75.6
12:28 PM - 01:28 PM	75.8	79.5	75.6
01:28 PM - 02:28 PM	76.1	85.8	75.5
02:28 PM - 03:28 PM	75.6	76.9	75.4
03:28 PM - 04:28 PM	75.8	76.9	75.6
04:28 PM - 05:28 PM	75.7	79.4	75.5

Leq Average 8 hrs. (dB(A))

75.8

Lmax (dB(A))

87.7

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรฐานการคุ้มครองความปลอดภัยในการประกอบกิจการโรงงานเกี่ยวกับสถานะแวดล้อมในการทำงาน พ.ศ.๒๕๔๖

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report



TESTING
No.0009

Lot ID: 213067

Date Received : Jul 13, 2021

Date Reported : Jul 23, 2021

Report Number : 2051182-1 C9

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand

21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location: AIE_HPPO-TPO Plant

Page 1 of 1

Sample Number	213067-1					
Sampling Date	Jul 13, 2021 10:34 AM					
Sample Description	Groundwater					
Location	MW-1 (GW1)					
Date Analysis Commenced	Jul 14, 2021					
Condition of Sample	Contained in two amber glass bottles, two plastic bottles and four glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)					

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Zinc	mg/L	0.0001	0.005	<0.005	10	Based on APHA (2017), 3125	Bangkok

Guideline: Notification of the Ministry of Industry B.E. 2559 (2016) on Soil and Groundwater Contamination Criteria, Monitoring of Soil and Groundwater Quality, Report Submission and Report Preparation of Soil and Groundwater Quality, and Proposal Report of Soil and Groundwater Controlling and Reduction Measures

Sampling By : Pathompong Kornasawat, Thanasoun Namakunna

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Siriluk P.

Siriluk Puengpang
Supervisor

ทะเบียนเลขที่ ๖-204-๖-4720

Approved by

Kanokorn Anek

Kanokorn Anek
Senior Manager

ทะเบียนเลขที่ ๖-204-๖-6111

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C:\Users\sawitree.noisangiam\Desktop\AIL_GL_Agr_8525-209.rpt (1:48PM)



Analysis / Test Report



TESTING
No.0009

Lot ID: 213067

Date Received : Jul 13, 2021

Date Reported : Jul 23, 2021

Report Number : 2051182-3 C9

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand

21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location: AIE_HPPO-TPO Plant

Page 1 of 1

Sample Number	213067-1					
Sampling Date	Jul 13, 2021 10:34 AM					
Sample Description	Groundwater					
Location	MW-1 (GW1)					
Date Analysis Commenced	Jul 14, 2021					
Condition of Sample	Contained in two amber glass bottles, two plastic bottles and four glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)					

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Copper	mg/L	0.00005	0.0001	Not Detected	No Standard	Based on APHA (2017), 3125	Bangkok
Organic Compounds							
Propylene oxide *	mg/L	-	10	<10	No Standard	Based on US EPA, 8015	Bangkok

Guideline: Notification of the Ministry of Industry B.E. 2559 (2016) on Soil and Groundwater Contamination Criteria, Monitoring of Soil and Groundwater Quality, Report Submission and Report Preparation of Soil and Groundwater Quality, and Proposal Report of Soil and Groundwater Controlling and Reduction Measures

Sampling By : Pathompong Kornasawat, Thanasoun Namakunna

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Approved by

Sawitree N.

Sawitree Noisangiam
Assistant Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location: AIE_HPPO-TPO Plant

Lot ID: 213067

Date Received : Jul 13, 2021

Date Reported : Jul 23, 2021

Report Number : 2051184-1 C9

TESTING
No.0009

Page 1 of 1

Sample Number	213067-3
Sampling Date	Jul 13, 2021 11:25 AM
Sample Description	Groundwater
Location	MW-6 (GW2)
Date Analysis Commenced	Jul 14, 2021
Condition of Sample	Contained in two amber glass bottles, two plastic bottles and four glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Zinc	mg/L	0.0001	0.005	<0.005	10	Based on APHA (2017), 3125	Bangkok

Guideline: Notification of the Ministry of Industry B.E. 2559 (2016) on Soil and Groundwater Contamination Criteria, Monitoring of Soil and Groundwater Quality, Report Submission and Report Preparation of Soil and Groundwater Quality, and Proposal Report of Soil and Groundwater Controlling and Reduction Measures

Sampling By : Pathompong Kornasawat, Thanasoun Namakunna

Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Siriluk P.

Siriluk Puengpang
Supervisor

หมายเลขโทรศัพท์ 204-44720

Approved by

Kanokkorn Anek

Kanokkorn Anek
Senior Manager

หมายเลขโทรศัพท์ 204-6111

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location: AIE_HPPO-TPO Plant

Lot ID: 213067

Date Received : Jul 13, 2021

Date Reported : Jul 23, 2021

Report Number : 2051184-3 C9

TESTING
No.0009

Page 1 of 1

Sample Number	213067-3
Sampling Date	Jul 13, 2021 11:25 AM
Sample Description	Groundwater
Location	MW-6 (GW2)
Date Analysis Commenced	Jul 14, 2021
Condition of Sample	Contained in two amber glass bottles, two plastic bottles and four glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Copper	mg/L	0.00005	0.0001	Not Detected	No Standard	Based on APHA (2017), 3125	Bangkok
Organic Compounds							
Propylene oxide *	mg/L	-	10	<10	No Standard	Based on US EPA, 8015	Bangkok

Guideline: Notification of the Ministry of Industry B.E. 2559 (2016) on Soil and Groundwater Contamination Criteria, Monitoring of Soil and Groundwater Quality, Report Submission and Report Preparation of Soil and Groundwater Quality, and Proposal Report of Soil and Groundwater Controlling and Reduction Measures

Sampling By : Pathompong Kornasawat, Thanasoun Namakunna

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Approved by

Savitree N.

Savitree Noisangiam
Assistant Manager

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location: AIE_HPPO-TPO Plant

Lot ID: 213070

Date Received : Jul 12, 2021

Date Reported : Jul 23, 2021

Report Number : 2053743-1 C9

Sample Number 213070-1
Sampling Date Jul 12, 2021 11:46 AM
Sample Description Soil
Location MW-1 (GW1)
Date Analysis Commenced Jul 13, 2021
Condition of Sample Packed in two glass bottles and one plastic bag, refrigerated

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Zinc	mg/kg	-	1.00	18.4	1000	Based on US EPA, Method 3050B and 6010D	Bangkok

Guideline: Notification of the Ministry of Industry B.E. 2559 (2016) on Soil and Groundwater Contamination Criteria, Monitoring of Soil and Groundwater Quality, Report Submission and Report Preparation of Soil and Groundwater Quality, and Proposal Report of Soil and Groundwater Controlling and Reduction Measures

Sampling By : Pathompong Kornasawat , Thanasoun Namakunna

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Siriluk P.

Siriluk Puenggang
Supervisor

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location: AIE_HPPO-TPO Plant

Lot ID: 213070

Date Received : Jul 12, 2021

Date Reported : Jul 23, 2021

Report Number : 2053743-3 C9

Sample Number 213070-1
Sampling Date Jul 12, 2021 11:46 AM
Sample Description Soil
Location MW-1 (GW1)
Date Analysis Commenced Jul 13, 2021
Condition of Sample Packed in two glass bottles and one plastic bag, refrigerated

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Copper	mg/kg	-	1.00	2.21	No Standard	Based on US EPA, Method 3050B and 6010D	Bangkok
Organic Compounds							
Propylene Oxide	mg/kg	-	20	<20	No Standard	Based on US EPA, Method 5035 and GC/FID	Bangkok

Guideline: Notification of the Ministry of Industry B.E. 2559 (2016) on Soil and Groundwater Contamination Criteria, Monitoring of Soil and Groundwater Quality, Report Submission and Report Preparation of Soil and Groundwater Quality, and Proposal Report of Soil and Groundwater Controlling and Reduction Measures

Sampling By : Pathompong Kornasawat , Thanasoun Namakunna

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Siriluk P.

Siriluk Puenggang
Supervisor

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location: AIE_HPPO-TPO Plant

Lot ID: 213070

Date Received : Jul 12, 2021

Date Reported : Jul 23, 2021

Report Number : 2053744-1 C9

Page 1 of 1

Sample Number 213070-3
Sampling Date Jul 12, 2021 3:25 PM
Sample Description Soil
Location MW-6 (GW2)
Date Analysis Commenced Jul 13, 2021
Condition of Sample Packed in two glass bottles and one plastic bag, refrigerated

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Zinc	mg/kg	-	1.00	4.28	1000	Based on US EPA, Method 3050B and 6010D	Bangkok

Guideline: Notification of the Ministry of Industry B.E. 2559 (2016) on Soil and Groundwater Contamination Criteria, Monitoring of Soil and Groundwater Quality, Report Submission and Report Preparation of Soil and Groundwater Quality, and Proposal Report of Soil and Groundwater Controlling and Reduction Measures

Sampling By : Pathompong Kornasawat , Thanasoun Namakunna

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Siriluk P.
Siriluk Puengpang
Supervisor

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Analysis / Test Report

Client : Dow Chemical Thailand Ltd.

10 Moo 2, Asia Industrial Estate, Tambol Banchang, Amphur Banchang, Rayong Thailand
21130

P/O : 4510824480

Project Name : Environmental Quality Monitoring

Project Location: AIE_HPPO-TPO Plant

Lot ID: 213070

Date Received : Jul 12, 2021

Date Reported : Jul 23, 2021

Report Number : 2053744-3 C9

Page 1 of 1

Sample Number 213070-3
Sampling Date Jul 12, 2021 3:25 PM
Sample Description Soil
Location MW-6 (GW2)
Date Analysis Commenced Jul 13, 2021
Condition of Sample Packed in two glass bottles and one plastic bag, refrigerated

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Copper	mg/kg	-	1.00	3.06	No Standard	Based on US EPA, Method 3050B and 6010D	Bangkok
Organic Compounds							
Propylene Oxide	mg/kg	-	20	<20	No Standard	Based on US EPA, Method 5035 and GC/FID	Bangkok

Guideline: Notification of the Ministry of Industry B.E. 2559 (2016) on Soil and Groundwater Contamination Criteria, Monitoring of Soil and Groundwater Quality, Report Submission and Report Preparation of Soil and Groundwater Quality, and Proposal Report of Soil and Groundwater Controlling and Reduction Measures

Sampling By : Pathompong Kornasawat , Thanasoun Namakunna

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Siriluk P.
Siriluk Puengpang
Supervisor

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ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Total Suspended Particulate	High Volume	RYG_FS0176	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0178	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0181	-	-	On site Calibration
Ambient	Total Suspended Particulate	Analytical Balance 5 D.	RYG_EN0001	6-May-21	6-May-22	12
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0264	4-Jan-22	4-Jul-22	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0261	4-Jan-22	4-Jul-22	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0272	4-Jan-22	4-Jul-22	6
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0545	14-Sep-21	15-Mar-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0544	15-Sep-21	15-Mar-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0531	14-Jul-21	12-Jan-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0087	13-Jul-21	11-Jan-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0411	29-Jul-21	27-Jan-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0414	29-Jul-21	27-Jan-23	18
Ambient	1,4-dichlorobenzene	GC-MSD	RYG_EN0136	2-Feb-21	2-Aug-22	18
Ambient	Acetaldehyde	GC-MSD	RYG_EN0136	2-Feb-21	2-Aug-22	18
Ambient	Benzene	GC-MSD	RYG_EN0136	2-Feb-21	2-Aug-22	18
Ambient	n-Hexane	GC-MSD	RYG_EN0136	2-Feb-21	2-Aug-22	18
Ambient	Propylene	GC-MSD	RYG_EN0136	2-Feb-21	2-Aug-22	18
Ambient	Toluene	GC-MSD	RYG_EN0136	2-Feb-21	2-Aug-22	18



รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ (ต่อ)

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Propylene Oxide	Field Rotameter	BKK_FS1006	4-Jan-22	4-Apr-22	3
Ambient	Propylene Oxide	Field Rotameter	RYG_FS0199	4-Jan-22	4-Apr-22	3
Ambient	Propylene Oxide	Field Rotameter	RYG_FS0199	1-Apr-22	1-Jul-22	3
Ambient	Propylene Oxide	Field Rotameter	BKK_FS1044	1-Apr-22	1-Jul-22	3
Ambient	Propylene Oxide	GC-FID	BKK_EN0126	21-Oct-21	21-Apr-23	18
Ambient	Hydrogen Peroxide	Field Rotameter	BKK_FS1040	4-Jan-22	4-Apr-22	3
Ambient	Hydrogen Peroxide	Field Rotameter	RYG_FS0197	4-Jan-22	4-Apr-22	3
Ambient	Hydrogen Peroxide	Field Rotameter	RYG_FS0197	1-Apr-22	1-Jul-22	3
Ambient	Hydrogen Peroxide	Field Rotameter	RYG_FS0198	1-Apr-22	1-Jul-22	3
Ambient	Hydrogen Peroxide	Field Rotameter	RYG_FS0199	1-Apr-22	1-Jul-22	3
Ambient	Hydrogen Peroxide	Spectrophotometer	BKK_EN0018	15-Oct-21	15-Oct-22	12
Stack	Oxides of Nitrogen	Console Control Unit	BKK_FS0468	12-Jan-22	12-Jul-22	6
Stack	Oxides of Nitrogen	Vacuum Gauge	BKK_FS0435	9-Apr-21	8-Oct-22	18
Stack	Oxides of Nitrogen	SPECTROPHOTOMETER	RYG_EN0179	2-Nov-21	2-Nov-22	12
Stack	Total Suspended Particulate	Console Control Unit	BKK_FS0468	12-Jan-22	12-Jul-22	6
Stack	Total Suspended Particulate	Analytical Balance 4 D.	RYG_EN0003	31-Mar-21	31-Mar-22	12
Stack	Oxygen	Console Control Unit	BKK_FS0468	12-Jan-22	12-Jul-22	6
Stack (CEMs)	Oxides of Nitrogen	Analyzer , System calibration, Standard gas	-	-	-	-
Stack (CEMs)	Oxygen	Analyzer , System calibration, Standard gas	-	-	-	-



รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ (ต่อ)

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Stack	Flow rate	Console Control Unit	BKK_FS0556	18-Jul-21	18-Jan-22	6
Workplace	Propylene Oxide	Field Rotameter	BKK_FS1006	4-Jan-22	4-Apr-22	3
Workplace	Propylene Oxide	Field Rotameter	RYG_FS0199	1-Apr-22	1-Jul-22	3
Workplace	Propylene Oxide	GC-FID	BKK_EN0126	21-Oct-21	21-Apr-23	18
Workplace	Non-Methane Hydrocarbon	Field Rotameter	BKK_FS1006	4-Jan-22	4-Apr-22	3
Workplace	Non-Methane Hydrocarbon	Total Hydrocarbon Analyzer	RYG_EN0038	8-Jul-21	8-Jul-22	12
Workplace	Total Hydrocarbon	Field Rotameter	BKK_FS1006	4-Jan-22	4-Apr-22	3
Workplace	Total Hydrocarbon	Total Hydrocarbon Analyzer	RYG_EN0038	8-Jul-21	8-Jul-22	12
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0213	24-Mar-21	24-Mar-22	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0027	10-Jan-22	10-Jan-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0029	21-Apr-21	21-Apr-22	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0301	13-Sep-21	13-Sep-22	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0026	21-Jan-22	21-Jan-23	12
Noise	Leq 8 hrs	Sound Calibrator	RYG_FS0496	10-Jan-22	10-Jan-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0389	13-Sep-21	13-Sep-22	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0390	13-Sep-21	13-Sep-22	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0388	13-Sep-21	13-Sep-22	12
Noise	Leq 8 hrs	Sound Calibrator	RYG_FS0215	9-Aug-21	9-Aug-22	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0030	21-Jan-22	21-Jan-23	12



รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ (ต่อ)

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0022	21-Jan-22	21-Jan-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0023	10-Jan-22	10-Jan-23	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0228	9-Jul-21	9-Jul-22	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0523	7-Mar-22	7-Mar-23	12
Rayong Lab	pH at 25 °C	pH meter	RYG_EN0183	17-Mar-22	17-Mar-23	12
Rayong Lab	BOD (5 days at 20°C)	DO meter with Sensor	RYG_EN0140	2-Feb-21	3-Aug-22	18
Rayong Lab	BOD (5 days at 20°C)	Incubator	RYG_EN0154	22-Apr-22	21-Oct-23	18
Rayong Lab	COD	Spectrophotometer	RYG_EN0037	1-Apr-21	1-Oct-22	18
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Suspended Solids	Chamber Oven	RYG_EN0010	5-May-21	3-Nov-22	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Dissolved Solids 180°C	Chamber Oven	RYG_EN0010	5-May-21	3-Nov-22	18
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Oil & Grease	Hot Air Oven	RYG_EN0006	5-May-21	3-Nov-22	18
Rayong Lab	Oil & Grease	Water Bath	RYG_EN0061	5-May-21	3-Nov-22	18
Rayong Lab	Temperature	Digital Thermometer	RYG_FS0467	7-Jul-21	7-Jul-22	18
Rayong Lab	Color (at Original pH)	Spectrophotometer	RYG_EN0037	1-Apr-21	1-Oct-22	18
Rayong Lab	Color (at pH 7.0)	Spectrophotometer	RYG_EN0037	1-Apr-21	1-Oct-22	18
Water Lab	Methanol	Gas Chromatography	BKK_EN0041	25-Nov-21	25-May-23	18



ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng
Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand
T +66 2 760 3000 E +66 2 760 3197

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ (ต่อ)

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Silver	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Silver	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Silver	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Barium	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Barium	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Barium	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Lead	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Lead	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Lead	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Chromium	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Chromium	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Chromium	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Manganese	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Manganese	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Manganese	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Copper	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Copper	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Copper	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18



ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng
Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand
T +66 2 760 3000 E +66 2 760 3197

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ (ต่อ)

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Nickel	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Nickel	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Nickel	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Arsenic	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Arsenic	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Arsenic	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Selenium	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Selenium	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Selenium	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Cadmium	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Cadmium	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Cadmium	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Zinc	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Zinc	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Zinc	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Mercury	DUO-CVAFS / CVAAS	BKK_EL0023	6-Jun-22	5-Jun-23	12
Water Lab	Propylene Oxide	Gas Chromatography (FID)	BKK_EN0126	29-Apr-20	28-Oct-21	18



รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ (ต่อ)

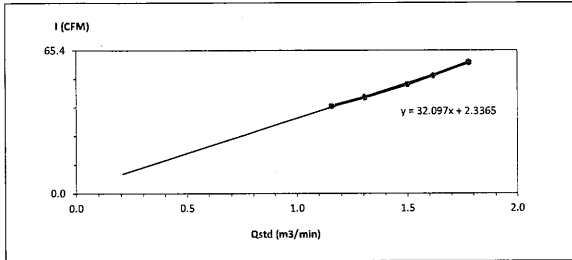
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Copper	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Copper	Hot Block	BKK_EL0054	12-Nov-20	18-May-22	18
Water Lab	Copper	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Zinc	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Zinc	Hot Block	BKK_EL0054	12-Nov-20	18-May-22	18
Water Lab	Zinc	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Soil	Propylene Oxide	Gas Chromatography (FID)	BKK_EN0126	29-Apr-20	28-Oct-21	18
Soil	Copper	ICP-OES	BKK_EL0037	2-Mar-21	2-Mar-22	12
Soil	Copper	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Soil	Copper	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Soil	Zinc	ICP-OES	BKK_EL0037	2-Mar-21	2-Mar-22	12
Soil	Zinc	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Soil	Zinc	omp	BKK_EN0167	18-May-21	16-Nov-22	18



High Volume Air Sampler Calibration Worksheet

Project Site : Dow Chemical Thailand Ltd. Barometric Pressure (mm Hg) : 758
Calibrate Location : สุพรรณภูมิ Temperature (°C) : 31
Calibrate Date : 21-Feb-22 High Volume ID : RYG_FS0176
CalibrationSheet No.: C-210222-RYG_FS0176 High Volume Model : TE-5170D
Calibrator ID : RYG_FS0206 High Volume S/N : 4802
Calibrator Model : TE-5028A Calibrator Slope : 1.4867
Calibrator S/N : 1543 Calibrator Intercept : -0.0445

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.8	1.1574	40	Slope : 32.0971 Intercept : 2.3365 Correlation Coefficient : 0.9980
2	3.6	1.3064	44	
3	4.8	1.5016	50	
4	5.6	1.6184	54	
5	6.8	1.7788	60	



Calibrated by Mr. Anurak Tongkhajonsakda
(Mr. Anurak Tongkhajonsakda)
Field Scientist(1)

Approved by Mr. Wichan Choonharat
(Mr. Wichan Choonharat)
Manager

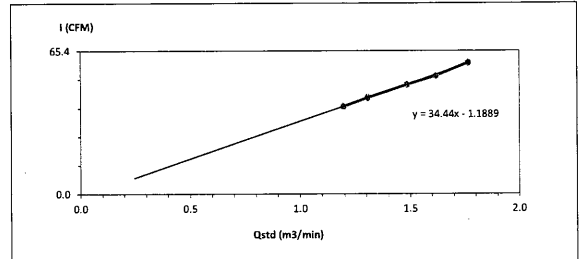
FORM NO.: F 06-073 REVISION NO.: - ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site : Dow Chemical Thailand Ltd. Barometric Pressure (mm Hg) : 758
Calibrate Location : สุพรรณภูมิ Temperature (°C) : 31
Calibrate Date : 21-Feb-22 High Volume ID : RYG_FS0178
CalibrationSheet No.: C-210222-RYG_FS0178 High Volume Model : TE-5170D
Calibrator ID : RYG_FS0206 High Volume S/N : 4804
Calibrator Model : TE-5028A Calibrator Slope : 1.4867
Calibrator S/N : 1543 Calibrator Intercept : -0.0445

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	3.0	1.1964	40	Slope : 34.4398 Intercept : -1.1889 Correlation Coefficient : 0.9991
2	3.6	1.3064	44	
3	4.7	1.4864	50	
4	5.6	1.6184	54	
5	6.7	1.7660	60	



Calibrated by Mr. Anurak Tongkhajonsakda
(Mr. Anurak Tongkhajonsakda)
Field Scientist(1)

Approved by Mr. Wichan Choonharat
(Mr. Wichan Choonharat)
Manager

FORM NO.: F 06-073 REVISION NO.: - ISSUE DATE: 14/03/16

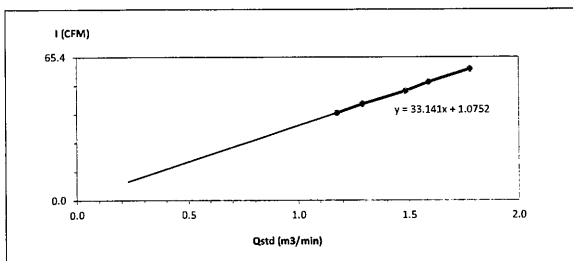
RYG_EN0001



High Volume Air Sampler Calibration Worksheet

Project Site : Dow Chemical Thailand Ltd. Barometric Pressure (mm Hg) : 758
Calibrate Location : สุพรรณภูมิ Temperature (°C) : 31
Calibrate Date : 21-Feb-22 High Volume ID : RYG_FS0181
CalibrationSheet No.: C-210222-RYG_FS0181 High Volume Model : TE-5170D
Calibrator ID : RYG_FS0206 High Volume S/N : 5334
Calibrator Model : TE-5028A Calibrator Slope : 1.4867
Calibrator S/N : 1543 Calibrator Intercept : -0.0445

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.9	1.1771	40	Slope : 33.1408 Intercept : 1.0752 Correlation Coefficient : 0.9996
2	3.5	1.2887	44	
3	4.7	1.4864	50	
4	5.4	1.5900	54	
5	6.8	1.7788	60	



Calibrated by Mr. Anurak Tongkhajonsakda
(Mr. Anurak Tongkhajonsakda)
Field Scientist(1)

Approved by Mr. Wichan Choonharat
(Mr. Wichan Choonharat)
Manager

FORM NO.: F 06-073 REVISION NO.: - ISSUE DATE: 14/03/16

Sartorius (Thailand) Co., Ltd.

129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8361-6, e-mail: service.thailand@sartorius.com



SARTORIUS

Certificate of Calibration

REVIEW BY Thamall
APPROVED BY D. J.
NEXT CAL. DATE 6/5/22

Model Number : LA130S-F
Description : Analytical Balance
Serial Number : 25409664 (RYG_EN0001)
Manufacturer : Sartorius

Certificate No. : 21BC0162
Issued Date : Monday, May 10, 2021
Reference No. : 501644
Page No. : 1 Of 2

Customer Name : ALS Laboratory Group (Thailand) Co., Ltd.(Rayong Branch)
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong,21140, Thailand.

Calibrated Place : ALS Laboratory Group (Thailand) Co., Ltd.(Balance Room)
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong,21140, Thailand.

Calibrated By : Mr.Chonchai Inthana
Calibration Date : Thursday, May 06, 2021

Calibration Procedure No. : This calibration was conducted by Using in-house calibration procedure number (WI-003) Based on UKAS LAB 14

Metrological data : Capacity : 150 g Readability : 0.0001 g
Reasons for calibration : ☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ Maintenance
Ambients Conditions : Temperature : 21.9 °C ± 5.0 °C
Humidity : 48.0 % RH ± 10.0 % RH
Pressure : ±
Equipment Condition : ☒ Good Operate ☐ Fair

Measurement Method UKAS Publication Ref :Lab 14

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 200g E2,YCS011-522-00	Sartorius	119934 D-K-19398-01-00	10-Sep-2021
MHB-382SD	Humidity/Balometer/Temp. Lutron MHB-382SD	SPC-RT	C19203076	1-Sep-2021

This certificate relate and apply this equipment only.

This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division Sartorius (Thailand) Co. Ltd.

ISO/IEC 17025:2017 IDT

Mr.Chonchai Inthana(Technical Manager)

S
T
A
M
P



Certificate

of Calibration

Model Number: **LA130S-F**
Description: **Analytical Balance**
Serial Number: **25409664 (RYG_EN0001)**
Manufacturer: **Sartorius**

Certificate No.: **21BCI0162**
Issued Date: **Monday, May 10, 2021**
Reference No.: **501644**
Page No.: **2 of 2**

Calibration Results : Without Adjustment

Repeatability			Eccentricity (Off-center loading error)		
The repeatability is the ability of a weighing instrument to display nearly identical readings under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability quantitatively.			The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/2 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).		
Nominal Value : (Low Load)	10.0000	100.0001	Nominal value:	50	g
10 g	9.9999	100.0002	Tolerance	0.0004	g
Tolerance	9.9998	99.9999			
0.0001 g	10.0000	100.0000			
	10.0000	100.0000			
Nominal Value : (High Load)	10.0000	99.9999			
100 g	10.0001	100.0001			
Tolerance	10.0000	100.0001			
0.0001 g	9.9999	100.0000			
	9.9998	100.0001			
Standard Deviation	0.00010	0.00010			

Linearity				
The linearity, also called linearity error, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.				
Tolerance	0.0002	g		
Nominal Value	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
0.01	0.0100	0.0100	0.0000	0.00024
0.05	0.0500	0.0500	0.0000	0.00024
0.1	0.1000	0.1000	0.0000	0.00024
0.5	0.5000	0.5000	0.0000	0.00024
1	1.0000	1.0000	0.0000	0.00024
2	2.0000	2.0000	0.0000	0.00024
5	5.0000	5.0000	0.0000	0.00024
10	10.0000	10.0001	0.0001	0.00024
20	20.0000	20.0001	0.0001	0.00024
100	100.0001	100.0003	0.0002	0.00026

End of Report.

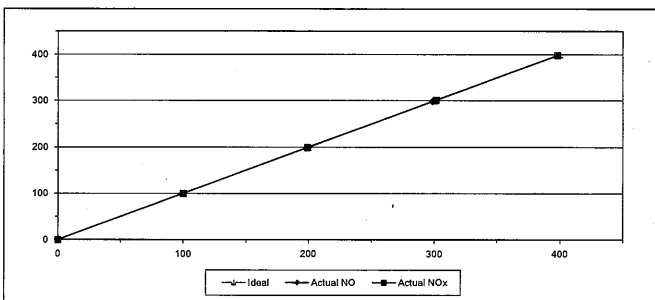
ISO/IEC 17025, 26/03/2020 R2



MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-22	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	8G314J3K	Equipment ID	RYG_FS0264
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	51.33	Cylinder No.	LL36833
Cylinder Pressure (psi)	1200	Certified By	Airgas Inc.
Certified Date	18-Mar-14	Expired Date	18-Mar-22

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.05	0.05	0.05	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80	100.10	0.10	0.10
2	200.00	198.40	-1.60	-0.80	199.10	-0.90	-0.45
3	300.00	298.60	-1.40	-0.47	301.50	1.50	0.50
4	400.00	398.10	-1.90	-0.47	398.00	-2.00	-0.50
AVERAGE (%)				-0.50			-0.05



Calibrated By

Approved By

(Mr. Jirawat Sakam)

(Mr. Sarayuth Jittrant)

Field Environmental Scientist (3)

Assistant General Manager

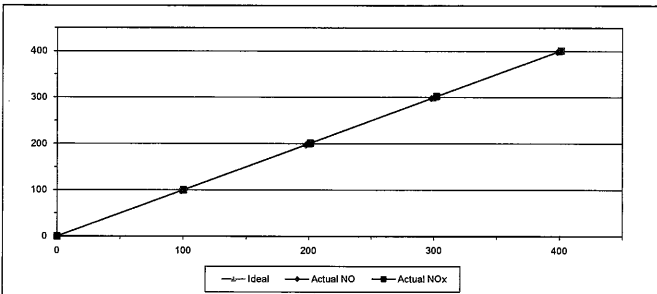
ALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-22	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	SEEAW53E	Equipment ID	RYG_FS0281
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	51.33	Cylinder No.	LL36833
Cylinder Pressure (psi)	1200	Certified By	Airgas Inc.
Certified Date	18-Mar-14	Expired Date	18-Mar-22

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.70	-1.30	-1.30	100.40	0.40	0.40
2	200.00	197.80	-2.20	-1.10	201.50	1.50	0.75
3	300.00	298.10	-1.90	-0.63	302.20	2.20	0.73
4	400.00	398.50	-1.50	-0.38	401.40	1.40	0.35
AVERAGE (%)				-0.86			0.47



Calibrated By

Approved By

(Mr. Jirawat Sakam)

(Mr. Sarayuth Jittrant)

Field Environmental Scientist (3)

Assistant General Manager

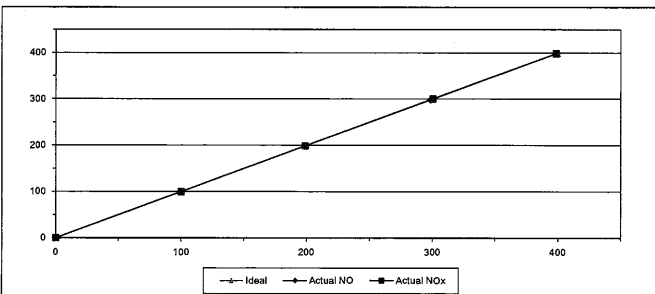
ALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-22	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	7AV89544	Equipment ID	RYG_FS0272
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	51.33	Cylinder No.	LL36833
Cylinder Pressure (psi)	1200	Certified By	Airgas Inc.
Certified Date	18-Mar-14	Expired Date	18-Mar-22

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.05	0.05	0.05	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90	100.10	0.10	0.10
2	200.00	198.60	-1.40	-0.70	199.00	-1.00	-0.50
3	300.00	298.70	-1.30	-0.43	300.50	0.50	0.17
4	400.00	398.00	-2.00	-0.50	398.70	-1.30	-0.33
AVERAGE (%)				-0.50			-0.09



Calibrated By

Approved By

(Mr. Jirawat Sakam)

(Mr. Sarayuth Jittrant)

Field Environmental Scientist (3)

Assistant General Manager

ALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12

CERTIFICATE OF CALIBRATION

Certificate No: WS-02092021
Page 1 of 2 pages

Measurement Item : Cup anemometer with data logger.
Manufacturer : Data logger: Novatynx.
: Cup anemometer: Novatynx.
Model/Type : Data logger: 11Q-WS-250L-D
: Cup anemometer: WS-02F
Serial Number : Data logger: A5816
: Cup anemometer: WSD-016
ID No : Data logger: 11Q-WS-250L-D
: Cup anemometer: WS-02F
Customer : ALS laboratory group (Thailand) Co., Ltd.
: 104 Phatthanawan 40, Phatthanawan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
Test Conditions : Wind tunnel cross test section area 900 cm²
: Anemometer frontal area 100 cm²
: Diameter of mounting pipe 76 mm
: Blockage ratio of test object 0.111 %
Test Conditions : Air temperature 23.5 ±0.6 °C
: Air pressure 1012.9 ±0.4 hPa
: Relative air humidity 57.6 ±0.5 %RH
Calibration Procedure : Calibration was carried out base on:
: ISO 91400-12-1 ED1: 2003-POWER Performance Measurements of Electricity Producing Wind Turbines.
: MEASNET Anemometer Calibration Procedure - Version 2: 2009.
Traceability : This calibration documents the traceable to national standard, which realize the unit of measurements according to the international system of units (SI) through National Institute of Metrology (NIMT).
Measurement Date : Sep 14, 2021.
Issued Date : Sep 15, 2021.

REVIEW BY *[Signature]*
APPROVED BY *[Signature]*
NEXT CAL DATE 15/12/23

Calibrated by
☒ Mr. Sorach Thachaiad
☐ Miss Chatchai Wathakanya



Approved Signatory:
Mr. Pethya Booncharoen
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No: WS-02092021
Page 2 of 2 pages

Result of calibration: ☒ Without adjustment ☐ With adjustment
Calibration in the range of 1 - 16 m/s at a calibration interval of 1 m/s.
The results of calibration and associated measurement uncertainties are reported in the table below.

V _{iso} Reading m/s	V _{unc} Reading m/s	Error (m/s)	Uncertainty (%)
2.045	2.0	0.0	2.4
4.067	4.0	-0.1	1.5
6.098	6.0	0.0	1.2
8.01	8.0	0.0	0.84
10.02	10.1	0.1	0.67
12.02	12.2	0.2	0.63
14.00	14.2	0.2	0.42
15.99	16.2	0.2	0.76
14.99	15.2	0.2	0.49
13.01	13.1	0.1	0.51
11.02	11.1	0.1	0.54
9.02	9.0	0.0	0.55
7.00	7.0	0.0	0.50
5.122	5.1	0.0	1.3
2.976	3.0	0.0	1.9
1.023	1.0	0.0	4.8

UUC* Link Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Appendix 1: Instrumentations

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Static	TCSTO-NG	05552145	Aug 07, 2021	WV-0034-21	5 - 30 m/s
2	Precision Differential Pressure Meter	Zorgas	DPM2500	Aug 07, 2021	WV-0034-21	5 - 30 m/s
3	Air velocity transducer (hot wire)	TSI INC.	8455-12	Aug 08, 2021	WV-0034-21	0 - 5 m/s
4	Temperature	Zorgas	DSR-TMP	March 30, 2021	CL-027-64	-30 - 70 °C
5	Relative humidity	Zorgas	DSR-TMP	March 30, 2021	WV-0034-21	0 - 100 %RH
6	Atmospheric pressure	Zorgas	DSR-TMP	March 30, 2021	WV-0034-21	500 - 1100 hPa
7	Wind tunnel	ESSOW	MP3500			0 - 50 m/s

End of certificate of calibration



CERTIFICATE OF CALIBRATION

Certificate No: WD-02092021
Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger.
Manufacturer : Data logger: Novatynx.
: Wind direction sensor: Novatynx.
Model/Type : Data logger: 11Q-WS-250L-D
: Wind direction sensor: WS-02F
Serial Number : Data logger: A5816
: Wind direction sensor: WSD-016
ID No : Data logger: 11Q-WS-250L-D
: Wind direction sensor: WS-02F
Customer : ALS laboratory group (Thailand) Co., Ltd.
: 104 Phatthanawan 40, Phatthanawan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
Environmental Condition : The measurement was carried out in an ambient temperature of (23±3)°C, and relative humidity of (40±10)%.
Measurement Method : The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and the laser is used for axis control. The measurement were taken at 45° intervals in clockwise and counterclockwise directions.
Note : The UUC was warned up for 1 hour prior to the calibration being performed.
Traceability : The measurement results are traceable to the international system of units (SI) through Certificate No: WD0603-07002020, Certificate No: WWS03/0044.
Measurement Date : Sep 15, 2021.
Issued Date : Sep 15, 2021.

Performed by
☒ Mr. Sorach Thachaiad
☐ Miss Chatchai Wathakanya



Approved Signatory:
Mr. Pethya Booncharoen
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No: WD-02092021
Page 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment
Calibration in the range of 0 - 360° at a calibration interval of 45°.
The results of calibration and associated measurement uncertainties are reported in table below.

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UUC* Reading (°)	Error (°)	Uncertainty ±(°)
1	Clockwise	0/360	360	359	-1	3.0
2		45	45	44	-1	3.0
3		90	90	87	-3	3.0
4		135	135	133	-2	3.0
5		180	180	180	0	3.0
6		225	225	225	0	3.0
7		270	270	273	3	3.0
8	Counter Clockwise	315	315	317	2	3.0
9		0/360	360	359	-1	3.0
10		45	45	44	-1	3.0
11		90	90	87	-3	3.0
12		135	135	133	-2	3.0
13		180	180	180	0	3.0
14		225	225	225	0	3.0
15		270	270	273	3	3.0
16		315	315	317	2	3.0

UUC* Link Under Calibration. The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No.: CL-068-64
Page 1 of 2

Equipment Name : Data Logger with Temperature
Sensor

Manufacturer : Novalyx
Model : 110-WS-25 DL-D
Serial No.: A5816
ID No.:-

Received date : 1 SEP 2021
Calibration date : 13 SEP 2021
Issue date : 15 SEP 2021

Reference Used During Calibration
1. Standard Temperature Probe Model : STS-100 A500,
Serial No.: 667882-09, Due date : 25 Mar 2022
2. Digital Temperature Indicator Model : DTI-1000 A MK
II, Serial No.: 671407-00591 Due date : 04 June 2022

Calibration Condition
Temperature : (23.13)°C
Relative Humidity : (55±15)%

Calibration Procedure
The temperature calibration was done by In-House
calibration method as WI-CL-001 according to
comparison method with standard digital temperature
indicator and standard temperature probe. The
temperature scale use was based on ITS-90.

Traceability
The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology Thailand (NIMT) Certificate
number : TT-0036-21, Certificate number : ER-0032-
21

Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Orathai Wiwatwittaya



Approved Signatory: *[Signature]*
Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

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OBTAINED IN WRITING FROM THE LABORATORY.

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20°C - 40 °C

Function:

This equipment was connected with temperature sensor Model : HMP60 S/N : T2320595

Dimension : Diameter 12mm, Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.050	19.6	-0.4	0.080
60	24.878	24.5	-0.4	0.080
60	29.857	29.4	-0.4	0.13
60	34.848	34.3	-0.5	0.080
60	39.842	39.3	-0.5	0.080

UUC* : Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of
confidence of approximately 95%

★ End of Certificate ★



CALIBRATION REPORT

Calibration No.: RH-02092021
Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger.

Manufacturer : Data logger: Novalyx
Relative humidity sensor: Novalyx.

Model/Type : Data logger: 110-WS-25 DL-D
Relative humidity sensor: HMP60.

Serial Number : Data logger: A5816
Relative humidity sensor: T2320595.

ID No : Data logger:-
Relative humidity sensor:-

Customer : ALS laboratory group (Thailand) co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250
Thailand.

Environmental Condition:
The measurement was carried out in an ambient temperature of (25±3)°C, and relative humidity of (50±15)%.

Measurement Method:
The Relative humidity with data logger, Unit Under Calibration (UUC) was calibrated by comparison method with the equilibrium of
standard salt solution: CH₃COOK: Potassium Acetate, Mg(NO₃)₂: Magnesium Nitrate, KCl: Potassium Chloride to determine the errors.

Measurement Date : Sep 13, 2021
Issued Date : Sep 15, 2021

Measurement Results:
The results of calibration are reported in table below.

Standard salt solution.	Standard (%RH)	UUC Reading	Error
CH ₃ COOK: Potassium Acetate	22.51	23.6	1.1
Mg(NO ₃) ₂ : Magnesium Nitrate	52.89	53.1	0.2
KCl: Potassium Chloride	84.34	85.4	1.0

Performed by
☐ Mr. Sorawit Thachalad
☒ Miss Orathai Wiwatwittaya



Approved Signatory: *[Signature]*
Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

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CERTIFICATE OF CALIBRATION

Certificate No.: WS-01092021
Page 1 of 2 pages

Measurement Item : Cup anemometer with data logger.

Manufacturer : Data logger: Novalyx
Cup anemometer: Novalyx.

Model/Type : Data logger: 110-WS-25 DL-D
Cup anemometer: WS-02P

Serial Number : Data logger: A5662
Cup anemometer: WSD-015

ID No : Data logger:-
Cup anemometer:-

Customer : ALS laboratory group (Thailand) co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250
Thailand.

Test Conditions : Wind tunnel cross test section area 900 cm²
Anemometer frontal area 100 cm²
Diameter of mounting pipe 1 mm
Blockage ratio of test object 0.111 [1]

Test Conditions : Air temperature 23.0 ±0.8 °C
Air pressure 1012.6 ±0.4 hPa
Relative air humidity 50.4 ±3.5 %RH

Calibration Procedure : Calibration was carried out base on:
ISO 61400-12-1 ED.1: 2005- Power Performance Measurements of Electricity Producing Wind
Turbines;
MIDASNET Anemometer Calibration Procedures - Version 2: 2009;

Traceability : This calibration documents the traceable to national standard. Which realize the unit of
measurements according to the international system of units (SI) through National Institute of
Metrology Thailand (NIMT).

Measurement Date : Sep 14, 2021
Issued Date : Sep 15, 2021

Calibrated by
☒ Mr. Sorawit Thachalad
☐ Miss Orathai Wiwatwittaya



Approved Signatory: *[Signature]*
Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No: WS-01092021
Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment

Calibration in the range of 1 - 16 m/s at a calibration interval of 1 m/s.

The results of calibration and associated measurement uncertainties are reported in the table below.

V _{air} Reading m/s	V _{UUC} Reading m/s	Error (m/s)	Uncertainty (%)
2.038	2.0	0.0	2.4
4.055	4.1	0.0	1.2
6.00	6.0	0.0	1.05
7.99	8.0	0.0	0.72
10.01	10.1	0.1	0.76
12.01	12.2	0.2	0.81
13.99	14.3	0.3	0.59
16.08	16.3	0.3	0.42
14.99	15.3	0.3	0.48
13.00	13.2	0.2	0.51
11.01	11.1	0.1	0.61
8.99	9.0	0.0	0.76
6.99	7.0	0.0	0.97
5.092	5.0	-0.1	1.1
2.992	3.0	0.0	1.7
1.008	1.0	0.0	4.8

UUC: Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

Appendix 1: Instrumentations

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Poor static	TESO INC.	60352/45	Aug 07, 2021	WV-0034-21	5 - 30 m/s
2	Precision Differential Pressure Meter	Zorgas	DMV2500	Aug 07, 2021	WV-0034-21	5 - 30 m/s
3	Air velocity transducer (hot wire)	TSI INC.	8445-12	Aug 08, 2021	WV-0035-21	0 - 5 m/s
4	Temperature	Zorgas	DMV-TMP	March 30, 2022	CL-027-24	-30 - 70°C
5	Relative humidity	Zorgas	DMV-TMP	March 30, 2022	PH-03032021	C = 100 %RH
6	Analog static pressure	Zorgas	DMV-TMP	March 30, 2021	SP-01032021	500 - 1100 mPa
7	Wind tunnel	CSBOM	MP3300			0 - 30 Hz

End of certificate of calibration



CERTIFICATE OF CALIBRATION

Certificate No: WD-01092021
Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger.

Manufacturer : Data logger: Novatymx.
Wind direction sensor: Novatymx.

Model/Type : Data logger: 110-WS-25DL-D
Wind direction sensor: WS-02P.

Serial Number : Data logger: A5662
Wind direction sensor: WSD-015.

ID No : Data logger: -
Wind direction sensor: -

Customer : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of (23±3)°C, and relative humidity of (40±10)%.

Measurement Method:

The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and the laser is used for axis control. The measurement were taken at 45° intervals in clockwise and counterclockwise directions.

Note: The UUC was warmed up for 1 hour prior to the calibration being performed

Traceability:

The measurement results are traceable to the international system of units (SI) through Certificate No: CC563-07-0046, Certificate No: KWS63/0344.

Measurement Date : Sep 15, 2021
Issued Date : Sep 15, 2021.

Performed by
☒ Mr. Suravit Thachad
☐ Miss Orathai Wivattakulaya



Approved Signatory

Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No: WD-01092021
Pages 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment.

Calibration in the range of 0 - 360 ° at a calibration interval of 45°.

The results of calibration and associated measurement uncertainties are reported in table below.

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UUC* Reading (°)	Error (°)	Uncertainty ±(°)
1	Clockwise	0/360	0	0	0	3.0
2		45	45	42	-3	3.0
3		90	90	88	-2	3.0
4		135	135	134	-1	3.0
5		180	180	181	1	3.0
6		225	225	226	1	3.0
7		270	270	273	3	3.0
8		315	315	318	3	3.0
9	Counter Clockwise	0/360	0	0	0	3.0
10		45	45	42	-3	3.0
11		90	90	88	-2	3.0
12		135	135	134	-1	3.0
13		180	180	181	1	3.0
14		225	225	226	1	3.0
15		270	270	273	3	3.0
16		315	315	318	3	3.0

UUC: Unit Under Calibration. The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No.: CL-067-64
Page 1 of 2

Equipment Name : Data Logger with Temperature Sensor

Manufacturer : Novatymx
Model : 110-WS-25 DL-D
Serial No.: A5662
ID No.: -

Customer
Name : ALS laboratory group (thailand) Co., Ltd.
Address : 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang Bangkok 10250 Thailand.

Received date : 1 SEP 2021
Calibration date : 13 SEP 2021
Issue date : 15 SEP 2021

Reference Used During Calibration

1. Standard Temperature Probe Model : STS-100 A500.
Serial No. : 667682-09, Due date : 25 Mar 2022
2. Digital Temperature Indicator Model : DTI-1000 A MK II, Serial No.: 671407-00591 Due date : 04 June 2022

Calibration Condition

Temperature : (23±3)°C
Relative Humidity : (55±15)%

Calibration Procedure

The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS 90.

Traceability

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number : TT-0036 21. Certificate number : ER-0032-21

Calibrated by
☒ Mr. Suravit Thachad
☐ Miss Orathai Wivattakulaya



Approved Signatory

Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

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Certificate No.: CL-067-64
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C - 40 °C

Function: This equipment was connected with temperature sensor Model: HMP60 S/N: T2320591

Dimension: Diameter 12mm, Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.049	19.8	-0.2	0.080
60	24.879	24.5	-0.4	0.16
60	29.864	29.4	-0.5	0.080
60	34.847	34.4	-0.5	0.13
60	39.835	39.3	-0.5	0.080

UUC*: Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

★ End of Certificate ★



CALIBRATION REPORT

Calibration No.: RH-01092021

Page 1 of 1 Pages

Measurement Item: Relative humidity with data logger.

Manufacturer: Data logger: Novosynx.
Relative humidity sensor: Novosynx.

Model/Type: Data logger: 110-WS-26 DL-D.
Relative humidity sensor: HMP60.

Serial Number: Data logger: A5662.
Relative humidity sensor: T2320591.

ID No: Data logger: -
Relative humidity sensor: -

Customer: ALS laboratory group (Thailand) co., Ltd.
104 Phathanakan 40, Phathanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of (25±3)°C and relative humidity of (60±15)%.

Measurement Method:

The Relative humidity with data logger, Unit Under Calibration (UUC) was calibrated by comparison method with the equilibrium of standard salt solution CH₃COOK: Potassium Acetate, Mg(NO₃)₂: Magnesium Nitrate, KCl: Potassium Chloride to determine the errors.

Measurement Date: Sep 13, 2021

Issued Date: Sep 15, 2021

Measurement Results:

The results of calibration are reported in table below:

Standard salt solution	Standard (WRH)	UUC(Readings)	Error
CH ₃ COOK: Potassium Acetate	22.51	23.5	1.0
Mg(NO ₃) ₂ : Magnesium Nitrate	52.89	53.1	0.2
KCl: Potassium Chloride	84.34	83.9	-0.4



Performed by
☐ Mr. Soravit Thachalad
☒ Miss Orathai Wivattavittaya

Signature: *[Signature]*
Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

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CERTIFICATE OF CALIBRATION

Certificate No.: WS-05072021

Page 1 of 2 pages

Measurement Item: Cup anemometer with data logger.

Manufacturer: Data logger: Novosynx.
Cup anemometer: Novosynx.

Model/Type: Data logger: 110-WS-26DL-D.
Cup anemometer: WS-02F.

Serial Number: Data logger: A5789
Cup anemometer: WSD-011.

ID No: Data logger: -
Cup anemometer: -

Customer: ALS laboratory group (Thailand) co., Ltd.
104 Phathanakan 40, Phathanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Test Conditions: Wind tunnel cross loss section area: 900 cm²
Anemometer frontal area: 100 cm²
Diameter of mounting pipe: mm
Backsight ratio of test object: 0.111 [-]

Test Conditions: Air temperature: 23.9 ±0.8 °C
Air pressure: 1005.8 ±0.4 hPa
Relative air humidity: 61.4 ±3.5 %RH

Calibration Procedure: Calibration was carried out base on:
ISO 61402-12-1 (D.1): 2005-POWER Performance Measurements of Electricity Producing Wind Turbines;
MCA80NT Anemometer Calibration Procedure - Version 2: 2009.

Traceability: This calibration documents the traceable to national standard, which realize the unit of measurements according to the international system of units (SI) through National Institute of Metrology Thailand (NIMT).

Measurement Date: Jul 14, 2021.

Issued Date: Jul 15, 2021.

Calibrated by
☒ Mr. Soravit Thachalad
☐ Miss Orathai Wivattavittaya



Approved Signatory: *[Signature]*
Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

Continuation of Certificate of Calibration Number

Certificate No.: WS-05072021

Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment

Calibration in the range of 1 - 16 m/s at a calibration interval of 1 m/s.

The results of calibration and associated measurement uncertainties are reported in the table below:

V _{ref} Reading m/s	V _{ref} Reading m/s	Error (m/s)	Uncertainty (%)
2.074	1.9	-0.2	2.5
4.122	4.0	-0.1	1.4
6.00	6.0	0.0	0.99
8.02	8.0	0.0	1.34
10.05	10.0	0.0	0.59
11.96	12.3	0.3	0.57
14.02	14.2	0.2	0.48
16.02	16.3	0.3	0.35
14.96	15.2	0.2	0.45
12.99	13.2	0.2	0.51
11.02	11.1	0.1	0.66
9.02	9.0	0.0	0.57
7.02	7.0	0.0	0.96
5.120	5.0	-0.1	1.0
3.004	3.0	0.0	1.5
1.024	0.9	-0.1	5.3

UUC*: Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

Appendix 1: Instrumentations

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Pitot static	TCSTC INC.	G6352145	July 16, 2020	MW-0035-20	5 - 30 m/s
2	Precision Differential Pressure Meter	Zorgas	DPM2500	July 16, 2020	MW-0035-20	5 - 30 m/s
3	Air velocity transducer (hot wire)	TS INC.	8456-12	July 20, 2020	MW-0035-20	0 - 5 m/s
4	Temperature	Zorgas	DSH-THP	March 30, 2021	CL-027-64	33 - 70 °C
5	Relative humidity	Zorgas	DSH-RHP	March 30, 2021	RH-00302021	0 - 100 %RH
6	Atmospheric pressure	Zorgas	DSH-TPP	March 30, 2021	BP-010302021	500 - 1150 hPa
7	Wind tunnel	ESSOM	MP3300			0 - 50 Hz

End of certificate of calibration



CERTIFICATE OF CALIBRATION

Certificate No: WD-05072021
Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger.

Manufacturer : Data logger: Novolynx.
Wind direction sensor: Novolynx.

Model/Type : Data logger: 110-WS-25DL-D.
Wind direction sensor: WS-02P.

Serial Number : Data logger: A5789.
Wind direction sensor: WSD-011.

ID No : Data logger: .
Wind direction sensor: .

Customer : At S laboratory group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd,Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250
Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of (23±3)°C, and relative humidity of (40±10)%.

Measurement Method:

The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and the laser is used for axis control. The measurement were taken at 45° intervals in clockwise and counterclockwise direction.

Note: The UUC was warmed up for 1 hour prior to the calibration being performed.

Traceability:

The measurement results are traceable to the International system of units (SI) through Certificate No: CD563-07-0045.
Certificate No: KWS63/0044.

Measurement Date : Jul 14, 2021.
Issued Date : Jul 15, 2021.



Approved Signatory:

[Signature]

Mr. Panuya Booncharoen.
Technical Support
and Calibration Manager

Performed by
☒ Mr. Sorawit Thechalad
☐ Miss Orathai Wiwatitaya

Continuation of Certificate of Calibration Number

Certificate No: WD-05072021
Pages 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment.
Calibration in the range of 0 - 360 ° at a calibration interval of 45°.

The results of calibration and associated measurement uncertainties are reported in table below.

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UUC* Reading (°)	Error (°)	Uncertainty ±(°)
1	Clockwise	0/360	0	0	0	3.0
2		45	45	45	0	3.0
3		90	90	90	0	3.0
4		135	135	135	1	3.0
5		180	180	183	3	3.0
6		225	225	228	3	3.0
7		270	270	272	2	3.0
8		315	315	317	2	3.0
9	Counter Clockwise	0/360	0	0	0	3.0
10		45	45	45	0	3.0
11		90	90	90	0	3.0
12		135	135	135	1	3.0
13		180	180	183	3	3.0
14		225	225	228	3	3.0
15		270	270	272	2	3.0
16		315	315	317	2	3.0

UUC*: Unit Under Calibration The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

End of Certificate of Calibration



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CERTIFICATE OF CALIBRATION

Certificate No.: CL-051-64
Page 1 of 2

Equipment Name : Data Logger with Temperature Sensor

Manufacturer : Novolynx
Model : 110-WS-25
Serial No. : A5789
ID No. : .

Customer : ALS laboratory group (thailand) Co.,Ltd.
Name : 104 Phatthanakan 40, Phatthanakan Rd,Khwaeng Suan Luang, Khet Suan Luang,Bangkok 10250 Thailand.

Reference Used During Calibration
1.Standard Temperature Probe Model : STS-100 A500.
Serial No.: 667662-09. Due date : 25 Mar 2022
2.Digital Temperature Indicator Model : DTI-1000A MK II, Serial No.: 671407-00591 Due date : 04 June 2022

Calibration Procedure

The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

Traceability

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology: Thailand (NIMT) Certificate number : TT 0036-21, Certificate number : ER-0032-21

Received date : 12 JUL 2021
Calibration date : 13 JUL 2021
Issue date : 13 JUL 2021

Calibration Condition
Temperature : (23±3)°C
Relative Humidity : (55±15)%



Certificate No.: CL-051-64
Page 2 of 2

Result of Calibration :- ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C - 40 °C

Function:

This equipment was connected with temperature sensor Model : HMP60 S/N : S4620631

Dimension : Diameter 12mm, Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.050	19.7	-0.3	0.13
60	24.877	24.5	-0.4	0.16
60	29.860	29.4	-0.5	0.060
60	34.649	34.3	-0.5	0.060
60	39.615	39.3	-0.6	0.95

UUC*: Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

★ End of Certificate ★

Calibrated by
☒ Mr. Sorawit Thechalad
☐ Miss Orathai Wiwatitaya



Approved Signatory:

[Signature]
Mr. Panuya Booncharoen
Technical Support
And Calibration Manager

CALIBRATION REPORT

Calibration No.: RH-01072021
Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger.
Manufacturer : Data logger: Novolytx.
Relative humidity sensor: Novolytx.
Model/Type : Data logger: 110-WS-250L-D.
Relative humidity sensor: HMP60.
Serial Number : Data logger: A5789.
Relative humidity sensor: S4620531.
ID No : Data logger: -
Relative humidity sensor: -
Customer : ALS laboratory group (Thailand) co., ltd.
104 Phathanakan 40, Phathanakan Rd. Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of (25±3)°C, and relative humidity of (50±15)%.

Measurement Method:

The Relative humidity with data logger, Unit Under Calibration (UUC) was calibrated by comparison method with the equilibrium of standard salt solution CH₃COOK, Potassium Acetate, Mg(NO₃)₂ Magnesium Nitrate, KCl: Potassium Chloride to determine the errors.

Measurement Date : Jul. 14, 2021
Issued Date : Jul. 14, 2021

Measurement Results:

The results of calibration are reported in table below.

Standard salt solution.	Standard (%RH)	UUC Reading	Error
CH ₃ COOK: Potassium Acetate	22.51	22.8	0.3
Mg(NO ₃) ₂ : Magnesium Nitrate	52.89	53.2	0.3
KCl: Potassium Chloride	84.34	84.9	0.6

Performed by

☒ Mr. Soravit Thacholad
☐ Miss Orathai Wwawitaya



Approved Signatory: Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

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CERTIFICATE OF CALIBRATION

Certificate No: WS-03072021
Page 1 of 2 pages

Measurement Item : Cup anemometer with data logger.
Manufacturer : Data logger: Novolytx.
Cup anemometer: Novolytx.
Model/Type : Data logger: 200-WS-250L.
Cup anemometer: WS-02P.
Serial Number : Data logger: A4986.
Cup anemometer: -
ID No : Data logger: RYG-FS0087.
Cup anemometer: -
Customer : ALS laboratory group (Thailand) co., ltd.
104 Phathanakan 40, Phathanakan Rd. Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
Test Conditions : Wind tunnel cross test section area 900 cm²
Anemometer frontal area 100 cm²
Diameter of mounting pipe 1 mm
Blockage ratio of test object 0.111 [-]
Test Conditions : Air temperature 24.1 ±0.8 °C
Air pressure 1006.3 ±0.4 hPa
Relative air humidity 60.2 ±3.6 %RH
Calibration Procedure : Calibration was carried out base on:
IEC 61400-12-1:2013: 2005-Power Performance Measurements of Electrically Producing Wind Turbines.
MBASNET Anemometer Calibration Procedure - Version 2: 2009.
Traceability : This calibration documents the traceable to national standard, which realize the unit of measurements according to the international system of units (SI) through National Institute of Metrology, Thailand (NIMT).
Measurement Date : Jul. 13, 2021
Issued Date : Jul. 14, 2021

Calibrated by
☒ Mr. Soravit Thacholad
☐ Miss Orathai Wwawitaya



Approved Signatory: Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No: WS-03072021
Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment

Calibration in the range of 1 - 16 m/s at a calibration interval of 1 m/s.

The results of calibration and associated measurement uncertainties are reported in the table below.

V _{IND} Reading m/s	V _{UUC} Reading m/s	Error (m/s)	Uncertainty (%)
2.087	2.0	-0.1	2.4
4.150	4.1	-0.1	1.2
5.99	6.0	0.0	1.1
8.01	8.0	0.0	0.73
10.02	10.2	0.2	0.58
11.98	12.3	0.3	0.50
13.97	14.3	0.3	0.55
16.02	16.6	0.6	0.48
14.96	15.5	0.5	0.37
13.03	13.4	0.4	0.66
10.97	11.2	0.2	0.59
9.02	9.1	0.1	0.55
7.02	7.0	0.0	0.81
5.165	5.0	-0.2	0.88
3.016	3.0	0.0	1.5
1.037	0.9	-0.1	4.7

UUC: Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

Appendix 1: Instrumentation

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Piston static	IC80 INC.	05352145	July 16, 2020	MV-0035-20	5 - 30 m/s
2	Precision Differential Pressure Meter	Ziegler	DPM2500	July 16, 2020	MV-0035-20	5 - 30 m/s
3	Air velocity transducer (hot wire)	TSI INC.	8445-12	July 20, 2020	MV-0036A-20	0 - 5 m/s
4	Temperature	Ziegler	28A-TUP	March 30, 2021	CL-C27-64	-30 - 70 °C
5	Relative humidity	Ziegler	25A-RHP	March 30, 2021	PH-00302021	0 - 100 %RH
6	Atmospheric pressure	Ziegler	25A-RHP	March 30, 2021	BP-010302021	500 - 1100 hPa
7	Wind Turbine	CSGCM	MP33CD			0 - 50 Hz

End of certificate of calibration



CERTIFICATE OF CALIBRATION

Certificate No: WD-03072021
Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger.
Manufacturer : Data logger: Novolytx.
Wind direction sensor: Novolytx.
Model/Type : Data logger: 200-WS-250L.
Wind direction sensor: WS-02P.
Serial Number : Data logger: A4986.
Wind direction sensor: -
ID No : Data logger: RYG-FS0087.
Wind direction sensor: -
Customer : ALS laboratory group (Thailand) Co., Ltd.
104 Phathanakan 40, Phathanakan Rd. Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
Environmental Condition: The measurement was carried out in an ambient temperature of (23±3)°C, and relative humidity of (46±10)%.
Measurement Method: The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and line laser is used for axis control. The measurement were taken at 45° intervals in clockwise and counterclockwise directions.
Note: The UUC was warmed up for 1 hour prior to the calibration being performed.
Traceability: The measurement results are traceable to the international system of units (SI) through Certificate No: CG563-07-0045.
Certificate No: RWS63/0044.
Measurement Date : Jul. 14, 2021.
Issued Date : Jul. 14, 2021.

Performed by
☒ Mr. Soravit Thacholad
☐ Miss Orathai Wwawitaya



Approved Signatory: Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No: WD-03072021
Pages 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment.

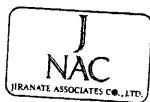
Calibration in the range of 0 – 360 ° at a calibration interval of 45°.

The results of calibration and associated measurement uncertainties are reported in table below.

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UUC* Reading (°)	Error (°)	Uncertainty ±(°)
1	Clockwise	0/360	360	359	-1	3.0
2		45	45	42	-3	3.0
3		90	90	87	-3	3.0
4		135	135	132	-3	3.0
5		180	180	178	-2	3.0
6		225	225	227	2	3.0
7		270	270	273	3	3.0
8		315	315	318	3	3.0
9	Counter Clockwise	0/360	360	359	-1	3.0
10		45	45	42	-3	3.0
11		90	90	87	-3	3.0
12		135	135	132	-3	3.0
13		180	180	178	-2	3.0
14		225	225	227	2	3.0
15		270	270	273	3	3.0
16		315	315	318	3	3.0

UUC*: Unc Under Calibration The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No: WS-11072021
Page 1 of 2 pages

Measurement Item : Cup anemometer with data logger.

Manufactures : Data logger: Novallink.
Cup anemometer: Novallink.

Model/Type : Data logger: 200-WS-26LB.
Cup anemometer: WS-32P.

Serial Number : Data logger: A5369.
Cup anemometer: -

ID No : Data logger: RYG F50411.
Cup anemometer: -

Customer : A.S. Laboratory group (Thailand) Co. Ltd.
104 Phatthanasen 40, Phatthanasen Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Test Conditions : Wind tunnel, cross test section area 900 cm²
Anemometer frontal area 100 cm²
Diameter of mounting pipe 1 mm
Blockage ratio of test object 0.111 [-]

Test Conditions : Air temperature 24.2 ±0.8 °C
Air pressure 1009.6 ±1.4 hPa
Relative air humidity 55.5 ±3.6 100%

Calibration Procedure : Calibration was carried out based on:
JIS S 61400-12-1 (2011), 2006-Power Performance Measurements of Electricity Producing Wind Turbines.
MDS&N Anemometer Calibration Procedure - Version 2, 2005.

Traceability : This calibration documents the traceability to national standard, W/We realize the unit of measurements according to the international system of units (SI) through National Institute of Metrology Thailand (NIMT).

Measurement Date : Jul. 29, 2021.
Issued Date : Jul. 29, 2021.

Calibrated by:
☒ Mr. Sorakul Thairasakul
☐ Miss Chaitra Witthakulaya



Approved Signatory:
Mr. Panya Booncharoen
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No: WS-11072021
Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment.

Calibration in the range of 1 – 15 m/s at a calibration interval of 1 m/s.

The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} Reading m/s	V _{meas} Reading m/s	Error (m/s)	Uncertainty (%)
2.084	1.9	-0.2	2.6
4.102	4.1	0.0	1.2
6.09	6.1	0.1	0.97
8.00	8.0	0.0	0.73
10.02	12.1	0.1	0.63
11.99	12.2	0.2	0.69
13.98	14.3	0.3	0.62
15.99	16.3	0.3	0.69
18.00	18.4	0.4	0.65
19.99	19.1	-0.1	0.67
21.00	21.1	0.1	0.61
23.01	23.1	0.1	0.63
24.99	24.0	-0.9	0.64
26.99	27.1	0.1	0.63
28.99	29.0	0.0	0.63
30.99	31.0	0.0	0.63
32.99	33.0	0.0	0.63

UUC*: Unc Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

Appendix 1: Instrumentations

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Pressure Sensor	TEDEA HUNTLEIGH	1051C-100	Jul. 16, 2021	WS-1051C-100	0 ~ 100 kPa
2	Pressure Sensor	TEDEA HUNTLEIGH	1051C-100	Jul. 16, 2021	WS-1051C-100	0 ~ 100 kPa
3	Air velocity Instrument (Hot Wire)	TSI INC	8445-12	Jul. 27, 2021	WS-8445-12	0 ~ 5 m/s
4	Temperature	Beckhoff	ED0301	Jul. 27, 2021	WS-ED0301	20 ~ 100 °C
5	Relative Humidity	Beckhoff	ED0301	Jul. 27, 2021	WS-ED0301	20 ~ 100 % RH
6	Atmospheric pressure	Beckhoff	ED0301	Jul. 27, 2021	WS-ED0301	900 ~ 1013 hPa
7	Wind gauge	TSI INC	1051C-100	Jul. 16, 2021	WS-1051C-100	0 ~ 100 kPa

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No: WD-11072021
Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger.

Manufacturer : Data logger: Novallink.
Wind direction sensor: Novallink.

Model/Type : Data logger: 200-WS-26LB.
Wind direction sensor: WS-02P.

Serial Number : Data logger: A5369.
Wind direction sensor: -

ID No : Data logger: RYG F50411.
Wind direction sensor: -

Customer : A.S. Laboratory group (Thailand) Co. Ltd.
104 Phatthanasen 40, Phatthanasen Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Environmental Condition : The measurement was carried out in an ambient temperature of (23±5)°C and relative humidity of (40±10)%.

Measurement Method:

The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and line laser is used for axis control. The measurement were taken at 45° intervals in clockwise and counterclockwise directions.

Notes: The calibration was performed prior to the installation being performed.

Traceability:

The measurement results are comparable to the international system of units (SI) through Certificate No: DC563-47-00445. Certificate No: WD-11072021.

Measurement Date : Jul. 29, 2021.
Issued Date : Jul. 29, 2021.

Performed by:
☒ Mr. Sorakul Thairasakul
☐ Miss Chaitra Witthakulaya



Approved Signatory:
Mr. Panya Booncharoen
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No: WD-11072021
Page 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment.

Calibration in the range of 0 - 360 ° at a calibration interval of 45°.

The results of calibration and associated measurement uncertainties are reported in table below.

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UUC* Reading (°)	Error (°)	Uncertainty ±(°)
1	Clockwise	0/360	360	359	-1	3.0
2		45	45	42	-3	3.0
3		90	90	87	-3	3.0
4		135	135	132	-3	3.0
5		180	180	180	0	3.0
6		225	225	226	3	3.0
7		270	270	273	3	3.0
8		315	315	318	3	3.0
9	Counter Clockwise	0/360	360	359	-1	3.0
10		45	45	42	-3	3.0
11		90	90	87	-3	3.0
12		135	135	132	-3	3.0
13		180	180	180	0	3.0
14		225	225	226	3	3.0
15		270	270	273	3	3.0
16		315	315	318	3	3.0

UUC*: Unit Under Calibration The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%

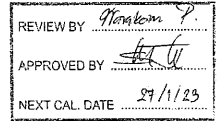
End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No: WS-14072021
Page 1 of 2 pages

Measurement Item	: Cup anemometer with data logger.
Manufacturer	: Data logger: Novasynx. : Cup anemometer: Novasynx.
Model/Type	: Data logger: 200-WS-25LB. : Cup anemometer: WS-02P.
Serial Number	: Data logger: A5376. : Cup anemometer: -
ID No	: Data logger: RYG_F50414. : Cup anemometer: -
Customer	: ALS laboratory group (Thailand) co., Ltd. : 104 Phatthanakan 40, Phatthanakan Rd, Kwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
Test Conditions	: Wind Tunnel cross test section area 900 cm ² : Anemometer frontal area 105 cm ² : Diameter of mounting pipe mm : Blockage ratio of test object 0.111 [-]
Test Conditions	: Air temperature 25.2 ±0.8 °C : Air pressure 1006.6 ±0.4 hPa : Relative air humidity 61.4 ±5.5 %RH
Calibration Procedure	: Calibration was carried out base on: : ISO 61400-12-1 601: 2005-Power Performance Measurements of Electricity Producing Wind Turbines. : MEASNET Anemometer Calibration Procedure - Version 2: 2309.
Traceability	: This calibration documents the traceable to national standard, which realize the unit of measurements according to the International system of units (SI) through National Institute of Metrology Thailand (NIMT).
Measurement Date	: Jul. 29, 2021.
Issued Date	: Jul. 29, 2021.



Calibrated by:
☒ Mr. Soravit Thachalad
☐ Miss Orathai Wathavithaya



Approved Signatory:
Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No: WS-14072021
Page 2 of 2 pages

Result of calibration: ☒ Without adjustment ☐ With adjustment

Calibration in the range of 1 - 16 m/s at a calibration interval of 1 m/s

The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} Reading m/s	V _{unc} Reading m/s	Error (m/s)	Uncertainty (%)
2.067	1.8	-0.3	3.1
4.135	4.0	-0.1	1.3
6.09	6.0	0.0	2.1
7.99	8.0	0.0	0.74
10.00	10.1	0.1	0.69
11.99	12.0	0.0	0.72
13.98	14.2	0.2	0.48
15.98	16.2	0.2	0.77
14.99	15.2	0.2	0.49
13.00	13.1	0.1	0.52
11.01	11.0	0.0	0.94
9.01	9.0	0.0	0.81
6.99	7.0	0.0	2.0
5.189	5.1	-0.1	0.96
2.587	3.0	0.0	2.0
1.034	0.8	-0.2	5.3

UUC*: Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%

Appendix 1: Instrumentation

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Flat plate	TESTO INC.	06352146	July 15, 2020	MA-00335-20	5 - 30 m/s
2	Precision Differential Pressure Meter	Zorglab	CPM2300	July 15, 2020	MA-00335-20	5 - 30 m/s
3	Air velocity transducer (flat wire)	TSI INC.	8425-12	July 20, 2020	MA-00364-20	0 - 5 m/s
4	Temperature	Zorglab	DSR-TMP	March 30, 2021	PL-027-64	-30 - 70 °C
5	Relative humidity	Zorglab	DSR-TMP	March 30, 2021	PL-03032021	0 - 100 %RH
6	Atmospheric pressure	Zorglab	DSR-TMP	March 30, 2021	BP-01032021	500 - 1100 hPa
7	Wind tunnel	GSSOM	MP3300			0 - 60 m/s

End of certificate of calibration



CERTIFICATE OF CALIBRATION

Certificate No: WD-14072021
Page 1 of 2 pages

Measurement Item	: Wind direction sensor with data logger.
Manufacturer	: Data logger: Novasynx. : Wind direction sensor: Novasynx.
Model/Type	: Data logger: 200-WS-25LB. : Wind direction sensor: WS-02P.
Serial Number	: Data logger: A5376. : Wind direction sensor: -
ID No	: Data logger: RYG_F50414. : Wind direction sensor: -
Customer	: ALS laboratory group (Thailand) Co., Ltd. : 104 Phatthanakan 40, Phatthanakan Rd, Kwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
Environmental Condition	: The measurement was carried out in an ambient temperature of (23±3) °C and relative humidity of (40±10) %.
Measurement Method	: The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and the laser is used for axis control. The measurement were taken at 45° intervals in clockwise and counterclockwise directions.
Traceability	: The measurement results are traceable to the international system of units (SI) through Certificate No: 00563-07-0045. Certificate No: WWS63/0044.
Measurement Date	: Jul. 29, 2021.
Issued Date	: Jul. 29, 2021.

Performed by:
☒ Mr. Soravit Thachalad
☐ Miss Orathai Wathavithaya



Approved Signatory:
Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Certificate of System Qualification

GC-OQ + GCMS-OQ

Continuation of Certificate of Calibration Number

Certificate No: WD-14072021
Pages 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment.

Calibration in the range of 0 - 360 ° at a calibration interval of 45°.

The results of calibration and associated measurement uncertainties are reported in table below.

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UUC* Reading (°)	Error (°)	Uncertainty ±(°)
1	Clockwise	0/360	360	359	-1	3.0
2		45	45	43	-2	3.0
3		90	90	87	-3	3.0
4		135	135	132	-3	3.0
5		180	180	179	-1	3.0
6		225	225	228	3	3.0
7		270	270	273	3	3.0
8		315	315	318	3	3.0
9	Counter Clockwise	0/360	360	359	-1	3.0
10		45	45	43	-2	3.0
11		90	90	87	-3	3.0
12		135	135	132	-3	3.0
13		180	180	179	-1	3.0
14		225	225	228	3	3.0
15		270	270	273	3	3.0
16		315	315	318	3	3.0

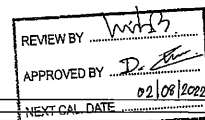
UUC*: Unit Under Calibration The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

End of Certificate of Calibration



System ID: RYG_EN0136
Organization Name: ALS Laboratory Group (Thailand) Co Ltd.
Organization Location: Tambol Pluak Daeng, Amphoe Pluak Daeng, Rayong, 21140, Thailand

Date: February 2, 2021 11:38:25 AM
EQP Name: Agilent/Recommended , Agilent/Recommended
EQP Revision: GC.02.50, GCMS.02.50
Overall Qualification Status: Pass



System Inspection and Basic Safety and Operation

Name: 7890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL
Setpoint Status: Pass
Setpoint Actual
Inlet Pressure: 25.0 psi 25.1 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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Setpoint Status: Pass
Zone: Oven
Setpoint/Actual
Temperature: 230.0 231.3 °C
Accuracy: 1.3 °C
Agilent Recommended: ≥ -1.0 % setpoint in K (-5.0 °C)
≤ 1.0 % setpoint in K (5.0 °C)

Data for this setpoint was entered manually.

Reason: No Data Logging Software

Setpoint Status: Pass
Zone: Oven
Setpoint/Actual
Temperature: 100.0 99.8 °C
Accuracy: -0.2 °C
Agilent Recommended: ≥ -1.0 % setpoint in K (-3.7 °C)
≤ 1.0 % setpoint in K (3.7 °C)

Data for this setpoint was entered manually.

Reason: No Data Logging Software

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890
Setpoint Status: Pass
Setpoint/Average
Temperature: 100.0 99.8 °C
Stability: 0.0 °C
Agilent Recommended: ≤ 0.5

Data for this setpoint was entered manually.

Reason: No Data Logging Software

Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1 Front SSL / External SQ
Name: 5977B
Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ
Name: 5977B
Setpoint Status: Pass
Amu: 1050 m/z
Drift After Five Minutes: 1 mV
RFPA Voltage: 475 mV
Agilent Recommended: ≥ -100 and ≤ 100 ≤ 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ
Name: 5977B
Setpoint Status: Pass
Filament: 1
Setpoint Status: Pass
Filament: 2

Overall Tune EI Test Status

Pass

Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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Signal to Noise EI

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977B			
Source:	EI - Extractor	Filament:	1	
Setpoint Status:	Pass			
Signal to Noise:	7105			
Agilent Recommended:	≥ 1200			
Source:	EI - Extractor	Filament:	2	
Setpoint Status:	Pass			
Signal to Noise:	3440			
Agilent Recommended:	≥ 1200			

This test's 0 comment(s) and 1 deviation(s) are available in the Attachments section.

Overall Signal to Noise EI Test Status

Pass

Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID RYG_EN0136
Manufacturer Agilent Technologies
Name 7890

Tested Combination1

Injection Technique Manual Injection
Inlet Front
Detector External
LTM Included? No

Sampler 1

Manufacturer Agilent Technologies
Type Manual Injection
Usage Sample Injection
Syringe Volume (µL) 10

Mainframe 1

Manufacturer Agilent Technologies
Name 7890
Model Number G3442B
Serial Number CN16463238
Firmware Revision B.02.04.3
Component ID/Asset No. 081117000236
Oven Type Standard

Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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Inlet 1

Manufacturer Agilent Technologies
Name 7890
Type SSL
Location Front
Carrier Gas Helium
Control Type Electronic Pressure Control (EPC)
Purged Inlet Yes

Detector 1

Manufacturer Agilent Technologies
Name Mass Spectrometer
Type Mass Spectrometer
Location External

Mass Spectrometer 1

Manufacturer Agilent Technologies
Type SQ
Name 5977B
Serial Number US1701M008
Firmware Revision 5977 6.00.34
High Vacuum System Turbo Pump
Scouting Run Standard OFN Std
Component ID/Asset No. 081117000236

MS EI Source 1

Manufacturer Agilent Technologies
Source Type EI - Extractor
Number of filaments 2

Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer: Eaknarin Puangsopa
Logged On User Name: eaknarin_puangsoa@agilent.com
Signature Creation Date: February 2, 2021
Reason for Signature: Executed protocol and published this original version of document

Regulatory Disclaimer

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Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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User Name: eaknarin_puangsoipa
Hostname: ASRYGW7002
System ID: RYG_EN0136
Print Date: February 2, 2021 11:38:27 AM

ALS_US1701M008 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 1, 2021 12:00:51 PM	Audit	SessionCreated	Session	None
February 1, 2021 12:00:51 PM	Start	Configuration	Session	None
February 1, 2021 12:00:51 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
February 1, 2021 12:08:57 PM	Audit	ExpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks\Gc\Configurations\02.50\Gc.02.50.exp], EQP File Name: [Gc.02.50.exp], EQP Name: [AgilentRecommended] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks\GcMs\Configurations\02.50\GcMs.02.50.exp], EQP File Name: [GcMs.02.50.exp], EQP Name: [AgilentRecommended]
February 1, 2021 12:09:02 PM	End	Configuration	Session	None
February 1, 2021 12:09:06 PM	Start	Qualification	Session	OQ
February 1, 2021 12:09:07 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7880: - Qualitative Test - No setpoints associated	None

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Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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User Name: eaknarin_puangsoipa
Hostname: ASRYGW7002
System ID: RYG_EN0136
Print Date: February 2, 2021 11:38:27 AM

ALS_US1701M008 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 1, 2021 12:10:04 PM	End	Execution	System Inspection and Basic Safety and Operation - 7880: - Qualitative Test - No setpoints associated	Run Count: 1
February 1, 2021 12:10:07 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
February 1, 2021 12:19:39 PM	End	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
February 1, 2021 12:18:42 PM	Start	Execution	GC Oven Temperature Accuracy - 7880: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
February 1, 2021 12:28:41 PM	Start	Execution	GC Oven Temperature Accuracy - 7880: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
February 1, 2021 12:28:44 PM	Start	Execution	GC Oven Temperature Accuracy - 7880: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
February 1, 2021 12:28:32 PM	Audit	Data	GC Oven Temperature Accuracy - 7880: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
February 1, 2021 12:29:36 PM	End	Execution	GC Oven Temperature Accuracy - 7880: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
February 1, 2021 12:28:41 PM	Start	Execution	GC Oven Temperature Accuracy - 7880: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None

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Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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User Name: eaknarin_puangsoipa
Hostname: ASRYGW7002
System ID: RYG_EN0136
Print Date: February 2, 2021 11:38:27 AM

ALS_US1701M008 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 1, 2021 12:37:42 PM	Audit	Data	GC Oven Temperature Accuracy - 7880: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
February 1, 2021 12:37:45 PM	End	Execution	GC Oven Temperature Accuracy - 7880: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
February 1, 2021 12:37:51 PM	Start	Execution	GC Oven Temperature Stability - 7880: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
February 1, 2021 1:00:14 PM	Audit	Data	GC Oven Temperature Stability - 7880: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
February 1, 2021 1:00:34 PM	End	Execution	GC Oven Temperature Stability - 7880: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count: 1
February 1, 2021 1:01:19 PM	Audit	AccClosed	Session	None
February 2, 2021 9:04:47 AM	Audit	AccRestarted	Session	None
February 2, 2021 9:04:48 AM	Audit	SessionReloaded	Session	None
February 2, 2021 9:04:51 AM	Start	Qualification	Session	OQ
February 2, 2021 9:05:06 AM	Start	Execution	Log Amp - 5977B SQ: - Source: None EI - Extractor	None
February 2, 2021 9:15:18 AM	End	Execution	Log Amp - 5977B SQ: - Source: None EI - Extractor	Run Count: 1
February 2, 2021 9:16:21 AM	Start	Execution	RPPA - 5977B SQ: - Source: None EI - Extractor	None

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Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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User Name: eaknarin_puangsoipa
Hostname: ASRYGW7002
System ID: RYG_EN0136
Print Date: February 2, 2021 11:38:27 AM

ALS_US1701M008 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 2, 2021 9:33:28 AM	End	Execution	RPPA - 5977B SQ: - Source: None EI - Extractor	Run Count: 1
February 2, 2021 9:33:30 AM	Start	Execution	Tune EI - 5977B SQ: - Source: None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
February 2, 2021 9:35:22 AM	End	Qualification	Session	OQ
February 2, 2021 9:35:22 AM	Start	Reporting	Session	None
February 2, 2021 9:53:31 AM	End	Reporting	Session	None
February 2, 2021 9:53:31 AM	Start	Qualification	Session	OQ
February 2, 2021 9:53:31 AM	Start	Execution	Tune EI - 5977B SQ: - Source: None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
February 2, 2021 9:53:55 AM	End	Execution	Tune EI - 5977B SQ: - Source: None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count: 1
February 2, 2021 9:53:57 AM	Start	Execution	Tune EI - 5977B SQ: - Source: None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None
February 2, 2021 9:54:15 AM	End	Qualification	Session	OQ
February 2, 2021 9:54:15 AM	Start	Reporting	Session	None
February 2, 2021 10:04:03 AM	End	Reporting	Session	None

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Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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ROTA METER CALIBRATION RESULT JANUARY 2022

User Name: oaks0ar0_puangsope
Host Name: ASRYGW1002
System ID: RYG_EN0136
Print Date: February 2, 2021 11:38:27 AM

ALS_US1701M008 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 2, 2021 10:04:03 AM	Start	Qualification	Session	OQ
February 2, 2021 10:04:03 AM	Start	Execution	Tune EI - 59779 SQ - Source: - None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
February 2, 2021 10:04:12 AM	End	Execution	Tune EI - 59779 SQ - Source: - Run Count: 1 EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
February 2, 2021 10:04:14 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	None
February 2, 2021 10:10:50 AM	End	Qualification	Session	OQ
February 2, 2021 10:10:50 AM	Start	Reporting	Session	None
February 2, 2021 10:27:59 AM	End	Reporting	Session	None
February 2, 2021 10:27:59 AM	Start	Qualification	Session	OQ
February 2, 2021 10:27:59 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	None
February 2, 2021 10:43:04 AM	End	Qualification	Session	OQ
February 2, 2021 10:43:04 AM	Start	Reporting	Session	None

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Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

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ROTA METER CALIBRATION RESULT APRIL 2022

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS1029	05 Jan 22	Y = 0.9935x + 0.8234	1.0000
BKK_FS1030	05 Jan 22	Y = 1.0039x + 0.515	0.9999
BKK_FS1031	05 Jan 22	Y = 1.009x - 79.295	0.9998
BKK_FS1039	04 Jan 22	Y = 0.9916x + 6.1524	0.9988
BKK_FS1040	04 Jan 22	Y = 1.0133x - 10.177	0.9985
BKK_FS1041	04 Jan 22	Y = 1.0805x - 1.7381	0.9998
BKK_FS1042	04 Jan 22	Y = 1.0061x + 1.3405	0.9994
BKK_FS1043	04 Jan 22	Y = 1.0112x - 10.393	0.9999
BKK_FS1044	04 Jan 22	Y = 1.0495x - 1.0136	0.9996
BKK_FS1161	05 Jan 22	Y = 0.9812x + 15571	1.0000
BKK_FS1162	05 Jan 22	Y = 0.9932x + 5.0014	0.9997
BKK_FS1163	05 Jan 22	Y = 1.0082x - 82.062	0.9998
BKK_FS1164	05 Jan 22	Y = 0.9914x + 0.8427	0.9997
BKK_FS1165	05 Jan 22	Y = 0.9893x + 6.5919	0.9998
BKK_FS1166	05 Jan 22	Y = 1.0031x - 77.881	0.9996
RYG_FS0197	04 Jan 22	Y = 1.0068x + 1.7152	0.9998
RYG_FS0198	04 Jan 22	Y = 0.9986x + 18.196	0.9995
RYG_FS0199	04 Jan 22	Y = 1.1202x - 3.5782	0.9999

Review By:

Wichan Choonharat
(Mr. Wichan Choonharat)
Enviro Field Services Manager

Approved By:

(Mr. Sarayuth Jitranont)
(Mr. Sarayuth Jitranont)
Assistant General Manager

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS0577	01 Apr 22	Y = 1.0202x + 0.1976	1.0000
BKK_FS0579	01 Apr 22	Y = 1.0078x + 0.4789	0.9998
BKK_FS0583	01 Apr 22	Y = 1.016x + 0.3922	1.0000
BKK_FS0584	01 Apr 22	Y = 1.0036x + 2.2262	0.9997
BKK_FS0585	01 Apr 22	Y = 1.0189x - 5.6476	0.9997
BKK_FS0586	01 Apr 22	Y = 1.0095x - 1.1524	0.9995
BKK_FS0587	01 Apr 22	Y = 1.013x - 3.6619	0.9996
BKK_FS0588	01 Apr 22	Y = 1.0154x + 4.8357	0.9999
BKK_FS0589	01 Apr 22	Y = 0.9918x + 4.8069	0.9999
BKK_FS0590	01 Apr 22	Y = 1.0038x - 0.4857	0.9996
BKK_FS0591	01 Apr 22	Y = 0.9705x - 52.174	0.9986
BKK_FS0592	01 Apr 22	Y = 0.9646x - 37.642	0.9985
BKK_FS0593	01 Apr 22	Y = 0.9767x - 58.445	0.9988
BKK_FS0594	01 Apr 22	Y = 0.9902x - 62.87	0.9999
BKK_FS0595	01 Apr 22	Y = 1.0249x - 98.162	0.9999
BKK_FS0596	01 Apr 22	Y = 0.9843x - 26.806	0.9991
BKK_FS0597	01 Apr 22	Y = 0.9802x - 61.653	0.9978
BKK_FS1004	01 Apr 22	Y = 0.9696x + 17.69	0.9990
BKK_FS1005	01 Apr 22	Y = 1.0065x + 5.6786	0.9997
BKK_FS1006	01 Apr 22	Y = 1.2142x - 7.1037	0.9993
BKK_FS1007	01 Apr 22	Y = 0.9917x + 1.6592	1.0000
BKK_FS1008	01 Apr 22	Y = 1.0132x + 0.7207	1.0000
BKK_FS1009	01 Apr 22	Y = 1.0132x + 1.1633	0.9960
BKK_FS1010	01 Apr 22	Y = 1.0033x + 0.5758	0.9999
BKK_FS1011	01 Apr 22	Y = 1.0234x + 0.1759	0.9996
BKK_FS1012	01 Apr 22	Y = 1.0106x - 2.0048	0.9997
BKK_FS1013	01 Apr 22	Y = 0.9677x - 35.851	0.9997
BKK_FS1014	01 Apr 22	Y = 1.0021x + 0.3148	0.9998
BKK_FS1015	01 Apr 22	Y = 0.9994x + 1.786	1.0000
BKK_FS1016	01 Apr 22	Y = 1.0105x - 80.256	0.9998
BKK_FS1017	01 Apr 22	Y = 0.9995x + 0.649	1.0000
BKK_FS1018	01 Apr 22	Y = 1.0011x + 1.1786	1.0000
BKK_FS1019	01 Apr 22	Y = 1.0023x - 68.424	0.9996
BKK_FS1020	01 Apr 22	Y = 1.0547x - 0.666	0.9998
BKK_FS1021	01 Apr 22	Y = 1.018x - 3.3286	0.9998
BKK_FS1022	01 Apr 22	Y = 0.9932x - 57.035	0.9986
BKK_FS1023	01 Apr 22	Y = 1.0094x + 0.0717	0.9999
BKK_FS1024	01 Apr 22	Y = 1.0042x + 0.4086	0.9997

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ALS Laboratory Group



ROTA METER CALIBRATION RESULT APRIL 2022

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS1025	01 Apr 22	Y = 1.0132x - 88.507	0.9996
BKK_FS1026	01 Apr 22	Y = 1.0018x + 1.0776	0.9997
BKK_FS1027	01 Apr 22	Y = 1.0053x + 0.231	0.9995
BKK_FS1028	01 Apr 22	Y = 0.9792x - 60.312	0.9982
BKK_FS1029	01 Apr 22	Y = 0.9935x + 0.8234	1.0000
BKK_FS1030	01 Apr 22	Y = 1.0039x + 0.515	0.9999
BKK_FS1031	01 Apr 22	Y = 1.009x - 79.295	0.9998
BKK_FS1039	01 Apr 22	Y = 0.9868x + 7.8119	0.9993
BKK_FS1040	01 Apr 22	Y = 1.0096x - 7.2905	0.9990
BKK_FS1041	01 Apr 22	Y = 1.076x - 2.0503	0.9999
BKK_FS1042	01 Apr 22	Y = 1.0054x + 1.6095	0.9995
BKK_FS1043	01 Apr 22	Y = 1.0108x - 11.048	0.9999
BKK_FS1044	01 Apr 22	Y = 1.0468x - 0.9391	0.9997
BKK_FS1161	01 Apr 22	Y = 1.0126x + 0.7738	0.9999
BKK_FS1162	01 Apr 22	Y = 0.9994x + 2.6357	0.9995
BKK_FS1163	01 Apr 22	Y = 0.977x - 55.03	0.9987
BKK_FS1164	01 Apr 22	Y = 0.9914x + 0.8427	0.9997
BKK_FS1165	01 Apr 22	Y = 0.9893x + 6.5919	0.9998
BKK_FS1166	01 Apr 22	Y = 1.0031x - 77.881	0.9996
RYG_FS0197	01 Apr 22	Y = 1.0055x + 1.1914	0.9998
RYG_FS0198	01 Apr 22	Y = 0.996x + 23.788	0.9996
RYG_FS0199	01 Apr 22	Y = 1.1166x - 3.3942	0.9998

Review By: Wichan Choonharat
(Mr. Wichan Choonharat)
Enviro Field Services Manager

Approved By: Mr. Sarayuth Jitranont
(Mr. Sarayuth Jitranont)
Assistant General Manager

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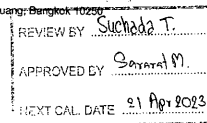
Agilent CrossLab Compliance Services

Certificate of System Qualification

GC-OQ

System ID: GC-6
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Phattanakarn 40, Phattanakarn Rd., Suan Luang, Bangkok 10250

Date: October 21, 2021 10:05:40 AM
EQP Name: Agilent Recommended
EQP Revision: GC.02.50
Overall Qualification Status: Pass



System Inspection and Basic Safety and Operation

Name: 7890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status
Pass

Inlet Pressure Decay

Name: 7890
Front SSL
Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: 0.0 psi / 5 minutes
Agilent Recommended: >= -2.0 and <= 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL

Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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ALS Laboratory Group

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Agilent CrossLab Compliance Services

Setpoint Status: Pass
Setpoint: 25.0 psi
Actual: 24.9 psi
Accuracy: 0.1 psi
Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status
Pass

Inlet Pressure Decay

Name: 7890
Back SSL
Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: 0.0 psi / 5 minutes
Agilent Recommended: >= -2.0 and <= 0.5

Overall Inlet Pressure Decay Test Status
Pass

Inlet Pressure Accuracy

Name: 7890
Back SSL
Setpoint Status: Pass
Setpoint: 25.0 psi
Actual: 24.9 psi
Accuracy: 0.1 psi
Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status
Pass

Detector Flow Accuracy

Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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Agilent CrossLab Compliance Services

Name: 7890
Front FID
Setpoint Status: Pass
Flow Type: Fuel
Setpoint: 30.0 mL/min
Measured Flow: 30.5 mL/min
Accuracy: 0.5 mL/min
Agilent Recommended: <= 10.0 % setpoint (3.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass
Flow Type: Oxidizer
Setpoint: 400.0 mL/min
Measured Flow: 394.0 mL/min
Accuracy: 6.0 mL/min
Agilent Recommended: <= 10.0 % setpoint (40.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass
Flow Type: Makeup
Setpoint: 25.0 mL/min
Measured Flow: 24.2 mL/min
Accuracy: 0.8 mL/min
Agilent Recommended: <= 10.0 % setpoint (2.5 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status
Pass

Detector Flow Accuracy

Name: 7890
Back FID

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Setpoint Status: Pass

Flow Type: Fuel

Setpoint: 30.0 mL/min Measured Flow: 29.1 mL/min

Accuracy: 0.9 mL/min

Agilent Recommended: ≤ 10.0 % setpoint (3.0 mL/min)

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer

Setpoint: 400.0 mL/min Measured Flow: 397.3 mL/min

Accuracy: 2.7 mL/min

Agilent Recommended: ≤ 10.0 % setpoint (40.0 mL/min)

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup

Setpoint: 25.0 mL/min Measured Flow: 24.4 mL/min

Accuracy: 0.6 mL/min

Agilent Recommended: ≤ 10.0 % setpoint (2.5 mL/min)

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: October 21, 2021 10:05:40 AM
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Setpoint Status: Pass

Zone: Oven

Setpoint/Actual: 230.0 231.5 °C

Temperature: 230.0 231.5 °C

Accuracy: 1.5 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-5.0 °C)
≤ 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual: 100.0 100.5 °C

Temperature: 100.0 100.5 °C

Accuracy: 0.5 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-3.7 °C)
≤ 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average: 100.0 100.4667 °C

Temperature: 100.0 100.4667 °C

Stability: 0.1 °C

Agilent Recommended: ≤ 0.5 °C

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7693A

Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status
Completed

Noise and Drift

Tested Combination1 Front SSL / Front FID

Name: 7890

Setpoint Status: Pass

Base Signal: 12.7 pA

ASTM Noise pA

Drift pA/Hr

Agilent Recommended: ≤ 0.10 ≤ 2.50

Status: Pass Pass

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front FID

Name: 7693A

Setpoint Status: Pass

Injection Volume on Column: 1.0 uL

Area RSD: 0.42 % Retention Time RSD: 0.16 %

Agilent Recommended: ≤ 3.00 ≤ 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

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Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7890

Setpoint Status: Pass

Signal to Noise: 1174861

Agilent Recommended: ≥ 300000

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2 Back SSL / Back FID

Injection Tower

Name: 7693A

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2 Back SSL / Back FID

Name: 7890

Setpoint Status: Pass

Base Signal: 10.4 pA

ASTM Noise pA

Drift pA/Hr

Agilent Recommended: ≤ 0.10 ≤ 2.50

Status: Pass Pass

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Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2	Back	SSL	/ Back	FID
Name:	7693A			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0	µL		
Area RSD:	1.16	%	Retention Time RSD:	0.12
Agilent Recommended:	<= 3.00		<= 1.00	

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2	Back	SSL	/ Back	FID
	Injection Tower			
Name:	7890			
Setpoint Status:	Pass			
Signal to Noise:	805466			
Agilent Recommended:	>= 300000			

Overall Signal to Noise Test Status

Pass

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Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GC-6
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Sampler Identifier	Sampler 2
Inlet	Front
Detector	Front
LTM Included?	No

Tested Combination2

Injection Technique	Injection Tower
Sampler Identifier	Sampler 3
Inlet	Back
Detector	Back
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN15380030
Firmware Revision	A.11.01
Vial Heater	Not Installed

Date: October 21, 2021 10:05:40 AM
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Sampler 2

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN10340103
Firmware Revision	A.10.09
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 3

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16280128
Firmware Revision	A.10.09
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN11461066
Firmware Revision	Version 4.27
Component ID/Asset No.	GC-6
Oven Type	Standard

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Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Inlet 2

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

Date: October 21, 2021 10:05:40 AM
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Electronic Signature

Purpose

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Details

Full Name of Signer: Suriya Thongkaew
Logged On User Name: suriya.thongkaew@non.agilent.com
Signature Creation Date: October 21, 2021
Reason for Signature: Executed protocol and published this original version of document

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User Name: suriya.thongkaew

Hostname: ASBKNW7015

System ID: GC-6

Print Date: October 21, 2021 10:05:46 AM

OQ GC ALS CN11461066 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 20, 2021 12:18:50 PM	Audit	SessionCreated	Session	None
October 20, 2021 12:18:50 PM	Start	Configuration	Session	None
October 20, 2021 12:18:50 PM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
October 20, 2021 12:24:57 PM	Audit	EgptLoaded	Session	EOP details for primary technique [Gc] - File path: (ProtocolPacks\Gc\Configurations\02_51\Gc_02_51.exe) EOP File Name: (Gc_02_51.ecp), EOP Name: (AgilentRecommended)
October 20, 2021 12:25:02 PM	End	Configuration	Session	None
October 20, 2021 12:25:09 PM	Start	Qualification	Session	OO
October 20, 2021 12:25:09 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No setpoints associated	None
October 20, 2021 12:30:25 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No setpoints associated	Run Count : 1
October 20, 2021 12:56:29 PM	Start	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None

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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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User Name: suriya.thongkaew

Hostname: ASBKNW7015

System ID: GC-6

Print Date: October 21, 2021 10:05:46 AM

OQ GC ALS CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 20, 2021 1:02:16 PM	End	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 20, 2021 1:02:18 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 20, 2021 1:02:26 PM	End	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 20, 2021 1:02:29 PM	Start	Execution	Inlet Pressure Decay - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 20, 2021 1:04:21 PM	End	Execution	Inlet Pressure Decay - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 20, 2021 1:07:53 PM	Start	Execution	Inlet Pressure Accuracy - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 20, 2021 1:08:11 PM	End	Execution	Inlet Pressure Accuracy - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 20, 2021 1:08:16 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:20:23 PM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 20, 2021 1:20:26 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1

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User Name: suriya.thongkaew
 Hostname: ASBKNW7015

System ID: GC-6
 Print Date: October 21, 2021 10:05:46 AM

OQ GC ALS CN11461066 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 20, 2021 1:20:29 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:23:27 PM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 20, 2021 1:23:29 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 20, 2021 1:23:31 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:27:40 PM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 20, 2021 1:27:42 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 20, 2021 1:27:46 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:32:10 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 20, 2021 1:32:12 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 20, 2021 1:32:14 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:34:13 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry

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Date: October 21, 2021 10:05:40 AM
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User Name: suriya.thongkawe
Hostname: ASBKXW7015
Print Date: October 21, 2021 10:05:46 AM
System ID: GC-6

QC GC ALS CN11461066 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 20, 2021 1:34:16 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Outflow - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
October 20, 2021 1:34:46 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:36:33 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 20, 2021 1:36:36 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
October 20, 2021 1:36:38 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 20, 2021 2:04:31 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 20, 2021 2:04:32 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
October 20, 2021 2:04:34 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 20, 2021 2:10:47 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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User Name: suriya.thongkawe
Hostname: ASBKXW7015
Print Date: October 21, 2021 10:05:46 AM
System ID: GC-6

QC GC ALS CN11461066 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 20, 2021 2:10:49 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
October 20, 2021 2:10:51 PM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 100.0°C - L: <= 0.5°C	None
October 20, 2021 2:31:39 PM	Audit	Data	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
October 20, 2021 2:31:41 PM	End	Execution	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 100.0°C - L: <= 0.5°C	Run Count: 1
October 20, 2021 2:31:44 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID - Part of System Preparation - No limits associated	None
October 20, 2021 2:43:05 PM	Audit	AccClosed	Session	None
October 21, 2021 6:18:59 AM	Audit	AccRestarted	Session	None
October 21, 2021 8:18:02 AM	Audit	SessionReloaded	Session	None
October 21, 2021 9:19:09 AM	Start	Qualification	Session	OQ
October 21, 2021 9:19:09 AM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID - Part of System Preparation - No limits associated	None
October 21, 2021 9:19:41 AM	Audit	AccClosed	Session	None

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User Name: suriya.thongkawe
Hostname: ASBKXW7015
Print Date: October 21, 2021 10:05:46 AM
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QC GC ALS CN11461066 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:20:08 AM	Audit	AccRestarted	Session	None
October 21, 2021 9:20:09 AM	Audit	SessionReloaded	Session	None
October 21, 2021 9:20:13 AM	Start	Qualification	Session	OQ
October 21, 2021 9:20:13 AM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID - Part of System Preparation - No limits associated	None
October 21, 2021 9:29:45 AM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front FID - Part of System Preparation - No limits associated	Data files Path: C:\Chem32\1\DATA\AQOPV20 21\OQPV2021_F_2021-10-20 15:49-01\SIGNSDRF_F001.D\FID1A.ch
October 21, 2021 9:30:05 AM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID - Part of System Preparation - No limits associated	Run Count: 1
October 21, 2021 9:30:08 AM	Start	Execution	Noise and Drift - Front FID - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 21, 2021 9:30:41 AM	Audit	Data	Noise and Drift - Front FID - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path: C:\Chem32\1\DATA\AQOPV20 21\OQPV2021_F_2021-10-20 15:49-01\SIGNSDRF_F001.D\FID1A.ch
October 21, 2021 9:31:10 AM	End	Execution	Noise and Drift - Front FID - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count: 1

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User Name: suriya.thongkawe
Hostname: ASBKXW7015
Print Date: October 21, 2021 10:05:46 AM
System ID: GC-6

QC GC ALS CN11461066 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:31:42 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None
October 21, 2021 9:32:55 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path: C:\Chem32\1\DATA\AQOPV20 21\OQPV2021_F_2021-10-20 16:51-16\NUPREC_F002.D\FID1A.ch
October 21, 2021 9:32:55 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path: C:\Chem32\1\DATA\AQOPV20 21\OQPV2021_F_2021-10-20 16:51-16\NUPREC_F003.D\FID1A.ch
October 21, 2021 9:32:56 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path: C:\Chem32\1\DATA\AQOPV20 21\OQPV2021_F_2021-10-20 16:51-16\NUPREC_F004.D\FID1A.ch
October 21, 2021 9:32:56 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path: C:\Chem32\1\DATA\AQOPV20 21\OQPV2021_F_2021-10-20 16:51-16\NUPREC_F005.D\FID1A.ch
October 21, 2021 9:32:56 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path: C:\Chem32\1\DATA\AQOPV20 21\OQPV2021_F_2021-10-20 16:51-16\NUPREC_F006.D\FID1A.ch
October 21, 2021 9:32:56 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path: C:\Chem32\1\DATA\AQOPV20 21\OQPV2021_F_2021-10-20 16:51-16\NUPREC_F007.D\FID1A.ch

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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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User Name: suriya.thongkaw Hostname: ASBKWW7015			System ID: GC-6 Print Date: October 21, 2021 10:05:46 AM	
OQ GC ALS CN11461066 Transaction log :				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:33:07 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Run Count : 1
October 21, 2021 9:33:33 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID - Detector FID - L >= 300000	None
October 21, 2021 9:34:01 AM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front FID - Detector FID - L >= 300000	Data files Path : C:\Chem32\1\DATA\OQPV20\21OQPV2021_F_2021-10-20\16-51-16SIGSTONS_F001.D\FID1A.ch
October 21, 2021 9:34:15 AM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID - Detector FID - L >= 300000	Run Count : 1
October 21, 2021 9:34:19 AM	Start	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID - Part of System Preparation - No limits associated	None
October 21, 2021 9:35:04 AM	Audit	Data	GC Scouting Run - Injection Tower, Back SSL, Back FID - Part of System Preparation - No limits associated	Data files Path : C:\Chem32\1\DATA\OQPV20\21OQPV2021_B_2021-10-20\17-13-45INSCOUT_8001.D\FID2B.ch
October 21, 2021 9:35:27 AM	End	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID - Part of System Preparation - No limits associated	Run Count : 1
October 21, 2021 9:35:32 AM	Start	Execution	Noise and Drift - Back FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/hour	None

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User Name: suriya.thongkaw Hostname: ASBKWW7015			System ID: GC-6 Print Date: October 21, 2021 10:05:46 AM	
OQ GC ALS CN11461066 Transaction log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:36:06 AM	Audit	Data	Noise and Drift - Back FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/hour	Data files Path: C:\Chem32\1\DATA\OQPV20\21OQPV2021_B_2021-10-20\17-13-45\INUPREC_B001.D\FID2B.ch
October 21, 2021 9:36:16 AM	End	Execution	Noise and Drift - Back FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/hour	Run Count: 1
October 21, 2021 9:36:20 AM	Start	Execution	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	None
October 21, 2021 9:38:57 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem32\1\DATA\OQPV20\21OQPV2021_B_2021-10-20\17-13-45\INUPREC_B002.D\FID2B.ch
October 21, 2021 9:38:57 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem32\1\DATA\OQPV20\21OQPV2021_B_2021-10-20\17-13-45\INUPREC_B003.D\FID2B.ch
October 21, 2021 9:38:57 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem32\1\DATA\OQPV20\21OQPV2021_B_2021-10-20\17-13-45\INUPREC_B004.D\FID2B.ch
October 21, 2021 9:38:57 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem32\1\DATA\OQPV20\21OQPV2021_B_2021-10-20\17-13-45\INUPREC_B005.D\FID2B.ch

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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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User Name: suriya.thongkaw

Hostname: ASBKWW7015

System ID: GC-6

Print Date: October 21, 2021 10:05:46 AM

OQ GC ALS CN11461066 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:38:57 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem32\1\DATA\OQPV20\21OQPV2021_B_2021-10-20\17-13-45INUPREC_B006.D\FID2B.ch
October 21, 2021 9:38:57 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem32\1\DATA\OQPV20\21OQPV2021_B_2021-10-20\17-13-45INUPREC_B007.D\FID2B.ch
October 21, 2021 9:39:06 AM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Run Count: 1
October 21, 2021 9:39:11 AM	Start	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L >= 300000	None
October 21, 2021 9:39:28 AM	Audit	Data	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L >= 300000	Data files Path: C:\Chem32\1\DATA\OQPV20\21OQPV2021_B_2021-10-20\17-13-45\SIGTONS_B001.D\FID2B.ch
October 21, 2021 9:39:39 AM	End	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L >= 300000	Run Count: 1
October 21, 2021 9:39:43 AM	End	Qualification	Session	OO
October 21, 2021 9:39:43 AM	Start	Reporting	Session	Noise
October 21, 2021 10:04:15 AM	Audit	Reporting	Session	Report Generated: Certificate

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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Ramad Road
Siam Bangkok Bangkok Thailand 10500
Tel: 02-6324330 Fax: 02-6375466-7
www.barascientific.com



Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-290/21
Equipment UV-Vis Spectrophotometer
Model UV-1800
Manufacturer Shimadzu
Serial No. A11454908533CD
ID No. BKK_EN0018
Date of receipt 15 October 2021
Date of calibration 15 October 2021
Date of issue 25 October 2021

Customer name ALS Laboratory Group (Thailand) Co., Ltd.
Address 104 Soi Phatthanakan 40, Phatthanakan Road, Phatthanakan, Suan Luang, Bangkok 10250

Temperature (25.0 - 26.4) °C (On site)
Humidity (49.5 - 53.4) %RH (On site)

Equipment condition Good Operation

Calibration Location Organic Prep

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability Wavelength Accuracy is traceable to certificate No. 87839 and 87844
Photometric Accuracy is traceable to certificate No. 87846 and 87877
Stray Light is traceable to certificate No. 87825
The above certificate are traceable to SI unit through Starra Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr. Wanchana Janloy

Approved by

Mr. Kanchit Choothep
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report. No further advertising the report. Certificate and publicity of the results are prohibited and shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.



Bara Scientific Co., Ltd.
988 U Chu Liang Building Floor7 Rama4 Road
Siam Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Certificate No. BSCC-UV-290/21

Number of Page(s) 2 of 3

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
241.70	241.55	-0.15	0.18
334.02	333.80	-0.22	0.18
418.53	418.40	-0.13	0.18
572.99	572.85	-0.14	0.18
879.41	879.15	-0.26	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000 0.7174	0.0000 0.7198	0.0000 0.0024	0.0075 0.0075
257	0.0000 0.8362	-0.0001 0.8377	-0.0001 0.0015	0.0075 0.0075
313	0.0000 0.2778	0.0000 0.2803	0.0000 0.0025	0.0075 0.0075
350	0.0000 0.6202	-0.0001 0.6221	-0.0001 0.0019	0.0075 0.0075

*CNR = Customer not request

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FM-UV-708-02 Rev 01 (23/01/63)



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988 U Chu Liang Building Floor7 Rama4 Road
Siam Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
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Certificate of Calibration

Certificate No. BSCC-UV-290/21

Number of Page(s) 3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000 0.5631 0.7390 1.0863	0.0000 0.5570 0.7334 1.0816	0.0000 -0.0061 -0.0056 -0.0047	0.0042 0.0042 0.0042 0.0042
440.0	0.0000 0.5524 0.7217 1.0806	0.0000 0.5469 0.7166 1.0570	0.0000 -0.0055 -0.0051 -0.0036	0.0042 0.0042 0.0042 0.0042
465.0	0.0000 0.5018 0.6657 0.9775	0.0000 0.4966 0.6610 0.9740	0.0000 -0.0052 -0.0047 -0.0035	0.0042 0.0042 0.0042 0.0042
546.1	0.0000 0.5147 0.6743 0.9909	0.0000 0.5113 0.6705 0.9890	0.0000 -0.0034 -0.0038 -0.0019	0.0042 0.0042 0.0042 0.0042
590.0	0.0000 0.5427 0.7037 1.0338	0.0000 0.5394 0.7001 1.0323	0.0000 -0.0033 -0.0036 -0.0015	0.0042 0.0042 0.0042 0.0042
635.0	0.0000 0.5268 0.6720 0.9864	0.0000 0.5235 0.6685 0.9847	0.0000 -0.0033 -0.0035 -0.0017	0.0042 0.0042 0.0042 0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.91±0.11nm	200.31	0.9399	2.0274

The Stray light transmission reference is less than 1.0% T and Stray light absorbance reference is greater than 2.00A
*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

End of Certificate

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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FM-UV-708-02 Rev 01 (23/01/63)

CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Barometric Pressure (mm.Hg) : 760
Relative Humidity (%) : 55.0
Temperature (°C) : 28.0
Reference Dry Gas Meter Data
Serial No. : 1607009
Model No. : SK25EXSR-QC6
Correction Factor (Yr) : 1.0060
Next Calibration Date : 8 Apr 22

Calibration No. : C-120122-BKK_FS0468
Dry Gas Meter No. : BKK_FS0468
Console Serial No. : 1302005
Console Model No. : XC-572-V

ΔH (mm.L.O)	Minutes	Reference Dry Gas Meter Calibration					Console Control Dry Gas Meter					Dry Gas Meter Correction Factor (Yr)	Office Calibration Factor ΔHing
		Vr (liters)		Tr (°C)		Vr (liters)	Tr (°C)		Avg. Trm (°C)				
		Final	Initial	Total	Final		Initial	Total					
15	12.38	150.00	0.00	150.00	30.0	2564504.0	2564955.0	149.00	29.0	29.0	1.0079	47.0425	
25	9.33	150.00	0.00	150.00	31.0	2564661.0	2564910.0	151.00	30.0	30.0	0.9926	44.6773	
50	6.57	150.00	0.00	150.00	31.0	2564821.0	2564970.0	151.00	31.0	31.0	0.9945	44.1625	
80	5.14	150.00	0.00	150.00	31.0	2564983.0	2565030.0	153.00	32.0	32.0	0.9919	43.1065	
120	4.18	150.00	0.00	150.00	32.0	2565149.0	2564995.0	154.00	32.0	32.0	0.9866	43.0440	
									Avg.	Avg.	0.9893	44.4066	

Y Ratio of reading of reference to dry gas meter : tolerance for individual values ± 0.02 from average.

ΔHing - Office pressure differential that equates to 21.24 in of air @ 25 °C and 760 mm of mercury, mmHgO, tolerance for individual values ± 5.08 from average.
Procedure: 40 CFR 60/APP A.METH. SEC 5.3 A.7

Calibrated by: *Saksit Praisapthaisit*

Approved by: *Wichan Choonharat*

(Mr. Saksit Praisapthaisit)
Field Scientist (S)

(Mr. Wichan Choonharat)
Manager



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date : 12-Jan-22		Ambient Temperature (°C) 28		
Calibration sheet No. : C-120122-BKK_FS0469		Relative Humidity (%) : 55		
Digital Temperature ID BKK_FS0469		Reference Temperature ID BKK_FS0609		
Serial No. : 1302005		Serial No. : 7888004		
Model : XC-572-V		Model : FLUKE 714		
		Next Calibrate : 13 Jan 22		
Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	0	0	
	25	24	-1	
	50	49	-1	
	100	98	-2	
	150	148	-2	
	200	197	-3	
	250	247	-3	
	300	297	-3	
	500	497	-3	
	1000	997	-3	
Probe	1200	1197	-3	
	100	99	-1	
	125	124	-1	
Oven	150	149	-1	
	100	99	-1	
Filter	125	124	-1	
	150	149	-1	
	100	100	0	
	125	125	0	
Exit	150	149	-1	
	0	0	0	
	10	11	1	
Meter	20	21	1	
	0	0	0	
	25	25	0	
AUX	50	50	0	
	0	0	0	
	25	25	0	
	50	50	0	

Calibrated by: *Saksit Praisapthaisit*

(Mr. Saksit Praisapthaisit)

Field Scientist (4)

Approved by: *Wichan Choonharat*

(Mr. Wichan Choonharat)

Manager

Form 281-048 (02/05/02)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0472 Calibration Date : 12 Jan 22
 Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
 Calibration Sheet No. : C-120122-BKK_FS0472 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP , mm.H ₂ O)	Type s pitot tube (ΔP , mm.H ₂ O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			\bar{C}_p	0.842	0.842

$$Cp(S) = Cp_{std} \sqrt{\frac{\Delta P(Std)}{\Delta P(S)}}$$

$$|\bar{C}_{p(A)} - \bar{C}_{p(B)}| \text{ must BE } \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum_{i=1}^3 [Cp(s) - Cp(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by Saksit Phaisanphiset Approved by Wichan Choonharat
 (Mr.Saksit Phaisanphiset) Mr.Wichan Choonharat
 Field Scientist (4) Manager

Form 281-046 (04/03/02)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0473 Calibration Date : 12 Jan 22
 Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
 Calibration Sheet No. : C-120122-BKK_FS0473 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP , mm.H ₂ O)	Type s pitot tube (ΔP , mm.H ₂ O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			\bar{C}_p	0.842	0.842

$$Cp(S) = Cp_{std} \sqrt{\frac{\Delta P(Std)}{\Delta P(S)}}$$

$$|\bar{C}_{p(A)} - \bar{C}_{p(B)}| \text{ must BE } \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum_{i=1}^3 [Cp(s) - Cp(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by Saksit Phaisanphiset Approved by Wichan Choonharat
 (Mr.Saksit Phaisanphiset) Mr.Wichan Choonharat
 Field Scientist (4) Manager

Form 281-046 (04/03/02)



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date 12 Jan 22		Nozzle Set ID. : BKK_FS0474	
Calibration Sheet No. : C-120122-BKK_FS0474		Vernier Caliper ID. : BKK_FS0626	

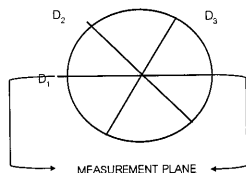
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo	$(D_1 + D_2 + D_3) / 3$
	D ₁	D ₂	D ₃	ΔD	D _{avg}
1	0.300	0.300	0.300	0.000	0.300
2	0.450	0.450	0.450	0.000	0.450
3	0.600	0.600	0.600	0.000	0.600
4	0.780	0.780	0.780	0.000	0.780
5	0.932	0.932	0.932	0.000	0.932
6	1.094	1.094	1.094	0.000	1.094
7	1.264	1.264	1.264	0.000	1.264

Where :

D_1, D_2, D_3 = There different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm.

ΔD = Maximum distance between any two diameters, must be ≤ 0.100 mm.

D_{avg} = $(D_1 + D_2 + D_3) / 3$



Calibrated by Saksit Phaisanphiset Approved by Wichan Choonharat
 (Mr.Saksit Phaisanphiset) Mr.Wichan Choonharat
 Field Scientist (4) Manager

Form No. 05 281-029 (13/01/03)



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
 TEL: 0-2717-3000-24 FAX: 0-2719-9484



Certificate of Calibration

Certificate No. : 21P1350
 Page : 1 of 2

Equipment : Digital Vacuum Gauge
 Manufacturer : Dwyer
 Model : DPGA-00
 Serial No. : DVG03
 ID No. : BKK_FS0435
 Condition As-Received: Used Item
 Received Date : 09 April 2021
 Calibration Date : 20 April 2021

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

Reference: 2104-0323WSC
 Ambient Temperature: $(23 \pm 2) ^\circ C$
 Relative Humidity: $(50 \pm 15) \%$
 Atmospheric Pressure: 1010 mbar

Submitted by: ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd.,
 Khwaeng Phatthanakan, Khet Suan Luang,
 Bangkok 10250 Thailand

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P06, using "DKD-R 6-1 ; Calibration of Pressure Gauges, Edition 03/2014 " as a guidelines.

Condition of this result of calibration

1.Reference standards Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0113-20	14 Jul 2021

2.This instrument was installed in vertical orientation and lower groove of pressure sensor was used as the reference level.

3.This result of calibration was made on requested at the point specified by customer.

4.Scale and conversion factor is 1 kPa = 0.2953 inHg

5.This instrument was used clean air as pressure media.

6.The certificate is valid only to the item calibrated on date and place of calibration.

7.This Certification is traceable to the International System of Unit maintained at:-
 -National Institute of Metrology Thailand (NIMT)

REVIEW BY Narakorn P.
 APPROVED BY [Signature]
 NEXT CAL DATE 8/10/22

Calibrated by : Suwit Aussarnee
 Issue Date : 21 April 2021

Approved Signatory : Attapol P.
 [] Phalinee Prabpaipal
 [] Sura Suwannasri
 [x] Attapol Panurach

B 0256843

Cert.No.: 21P1350
Page: 2 of 2

Certificate of Calibration

Result of calibration:- Without adjustment
Function:- Vacuum Pressure MeasurementRange: 0 inHg to -30 inHg
Resolution: 0.01 inHg

Increasing Pressure

Applied Pressure (inHg)	0.000	-4.988	-9.996	-14.994	-19.992	-24.987
UUC* Indication (inHg)	0.00	-5.05	-10.10	-15.20	-20.30	-25.30
Error (inHg)	0.000	-0.052	-0.104	-0.206	-0.308	-0.413

Decreasing Pressure

Applied Pressure (inHg)	-26.487	-19.992	-14.994	-9.996	-4.988	0.000
UUC* Indication (inHg)	-26.90	-20.30	-15.20	-10.10	-5.05	0.00
Error (inHg)	-0.413	-0.308	-0.206	-0.104	-0.052	0.000

The uncertainty of measurement was ± 0.090 inHg

* UUC = Unit Under Calibration

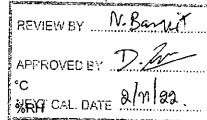
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95 %.

-000-

Equipment: SPECTROPHOTOMETER
Model: DR3900
Serial No. (or ID.): 2021761 (RYG_EN0179)
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06210513
Issued Date: 02 November 2021
Job No.: KSPR2114660
Page: 1 of 2

Customer: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand.



Environment Condition: Temperature 22.2 °C \pm 0.6
Humidity 61.8 %RH \pm 2.5

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch) (Wet Chemistry)
616/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr. Chattaphon Foithong
Calibration Date: 02 November 2021
The Method used: In house method, SPCC-WI-24, base on ASTM E 275-08 and ASTM E 387-04
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Stama Scientific Limited.

The standard for Wavelength Certificate No. 87146 and 87152
The standard for Photometric Certificate No. 87220

(Mr. Chattaphon Foithong)
Person in charge

บริษัท เอสซี ซีที จำกัด
SPC RT Co., Ltd.

(Mr. Dumrong Boonsopon)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of SPC RT Co., Ltd.

Attapol P.

a 1046981

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SPC RT CO., LTD.
สาขา 00003 1194 ซอยวิเศษนครินทร์ 57 ถนนสุขุมวิท 101/1 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Branch 00003 1194 So. Wichitsathornnarin 57 Sukhumvit 101/1 Road, Bangkok, Phraekong, Bangkok 10260 Thailand
Tel: 0 2185 4333 Ext. 3300-3308 Fax: 0 2185 4424 E-mail: info@specter.com Website: www.spcrt.com

SPCC-FM-C06-12: 23 Nov 2020

Certificate No.: C06210513 Page 2 of 2

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2114660

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR3900

หมายเลขเครื่อง: 2021761

Calibration Results:
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.40	418	0.40	0.59
537.00	536	1.00	0.59
638.00	638	0.00	0.59
747.61	748	-0.39	0.59
807.04	807	0.04	0.59

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5890	0.587	0.0020	0.0045
	0.7616	0.759	0.0026	0.0045
	1.0263	1.023	0.0033	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5787	0.575	0.0037	0.0045
	0.7442	0.741	0.0032	0.0045
	1.0039	1.000	0.0039	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5292	0.528	0.0012	0.0045
	0.6865	0.686	0.0005	0.0045
	0.9534	0.952	0.0014	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5468	0.545	0.0018	0.0045
	0.6957	0.694	0.0017	0.0045
	0.9991	0.998	0.0011	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5851	0.582	0.0031	0.0045
	0.7238	0.721	0.0028	0.0045
	1.0957	1.061	0.0047	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5692	0.567	0.0022	0.0045
	0.6914	0.690	0.0014	0.0045
	1.0881	1.086	0.0021	0.0045

The End of Certificate

บริษัท เอสซี ซีที จำกัด
SPC RT CO., LTD.
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Branch 00003 1194 So. Wichitsathornnarin 57 Sukhumvit 101/1 Road, Bangkok, Phraekong, Bangkok 10260 Thailand
Tel: 0 2185 4333 Ext. 3300-3308 Fax: 0 2185 4424 E-mail: info@specter.com Website: www.spcrt.com

SPCC-FM-C06-12: 23 Nov 2020

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2114660

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR3900

หมายเลขเครื่อง: 2021761

ตรวจสอบ (รับ)	02 Nov 2021	รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
			02 Nov 2021	02 Nov 2021	
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
General					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิทช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Spectrophotometer					
<input type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่สำรอง (Battery Backup) ≥ 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	807 ได้ 807.3 nm
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV $< 3,000$ hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible $< 5,000$ hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
pH Meter and Conductivity Meter					
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันเปื้อน Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
Turbidimeter					
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระบบการส่องสว่างของแสง (≥ 2.5 ไมเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
Automatic titrator					
<input type="checkbox"/>	<input type="checkbox"/>	18. สลอป Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เห็นด้วย/ขอแก้ไข:

Mr. Chattaphon Foithong
Service Engineer

บริษัท เอสซี ซีที จำกัด
SPC RT CO., LTD.
สาขา 00003 1194 ซอยวิเศษนครินทร์ 57 ถนนสุขุมวิท 101/1 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
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Tel: 0 2185 4333 Ext. 3300-3308 Fax: 0 2185 4424 E-mail: info@specter.com Website: www.spcrt.com

SPCC-FM-R31-07: 23 Nov 2020

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8361-5, e-mail: service.thailand@sartorius.com



SARTORIUS

REVIEW BY: Thamirak
APPROVED BY: P. Sakitt
NEXT CAL. DATE: 31/05/2022

Certificate of Calibration

Model Number: **MSU224S-100-DU** Certificate No.: **218C10111rev1**
Description: **Analytical Balance** Issued Date: **Monday, April 26, 2021**
Serial Number: **31709552** Reference No.: **501627**
Manufacturer: **Sartorius** Page No.: **1 Of 2**

Customer Name: **ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)**
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong, 21140, Thailand.

Calibrated Place: **ALS Laboratory Group (Thailand) Co., Ltd. (Balance Room)**
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong, 21140, Thailand.

Calibrated By: **Mr.Chonchai Inthana** Calibration Procedure No.: **This calibration was conducted by**
Calibration Date: **Wednesday, March 31, 2021** Using in-house calibration procedure number (WI-003)
Based on UKAS LAB 14

Metrological data: Capacity: **220 g** Readability: **0.0001 g** Ambients Conditions:
Temperature: **24.0 °C ± 5.0 °C**
Humidity: **60.0 % RH ± 10.0 % RH**
Pressure: **±**

Reasons for calibration ☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ Maintenance Equipment Condition: ☒ Good Operate ☐ Fair

Measurement Method UKAS Publication Ref: Lab 14

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

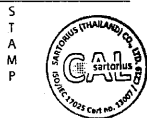
Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YC011-522-00	Sartorius weight set 1mg - 200g E2, YC011-522-00	Sartorius	119934 D-K-19398-01-00	10-Sep-2021
MHB-3825D	Humidity/Barometer/Temp Lutron MHB-3825D	SPC-RT	C19203076	1-Sep-2021

This certificate relate and apply this equipment only.
This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division Sartorius (Thailand) Co., Ltd.

ISO/IEC17025:RF15 26/03/2020 R2

Mr.Chonchai Inthana(Technical Manager)



Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8361-5 Fax: +66 2643 8367, e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number: **MSU224S-100-DU** Certificate No.: **218C10111rev1**
Description: **Analytical Balance** Issued Date: **Monday, April 26, 2021**
Serial Number: **31709552** Reference No.: **501627**
Manufacturer: **Sartorius** Page No.: **2 of 2**

Calibration Results: Without Adjustment

Repeatability			Eccentricity (Off-center loading error)		
The repeatability is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement range is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability quantitatively.			The off-center loading error is yielded by the difference between the readout of the load, i.e. 10 or 100 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).		
Nominal Value: (Low Load)	20.0000	200.0001	Nominal value:	50	g
20 g	20.0000	200.0001	Tolerance	0.0004	g
Tolerance	20.0000	200.0001	Difference		
0.0001 g	20.0000	200.0000	1		
Nominal Value: (High Load)	20.0001	200.0001	2		
200 g	20.0000	200.0002	3		
Tolerance	20.0001	200.0001	4		
0.0001 g	20.0000	200.0001	5		
Standard Deviation	0.00004	0.00005	6		

Linearity

The linearity also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance 0.0002 g				
Nominal Value	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
0.01	0.0100	0.0100	0.0000	0.00012
0.1	0.1000	0.1000	0.0000	0.00012
0.5	0.5000	0.5000	0.0000	0.00012
1	1.0000	1.0000	0.0000	0.00012
5	5.0000	5.0001	0.0001	0.00013
10	10.0000	10.0000	0.0000	0.00013
20	20.0000	20.0000	0.0000	0.00013
50	50.0001	50.0001	0.0000	0.00014
100	100.0001	100.0000	-0.0001	0.00018
200	200.0001	200.0001	0.0000	0.00029

End of Report.

ISO/IEC17025:RF15 26/03/2020 R2

Note: This certificate is replacement with Certificate no.218C10111



Lot No. 21105008-1

ANALYZER CALIBRATION DATA

Client: **Dow Chemical Thailand Ltd.** Location: **TOX1 (ERU Stack)**
Date: **07 Oct 21** Test Operator: **Sakitt P.**

O₂ ANALYZER Model: **TELEDYNE API 200EH** Serial No.: **549**
Span (%): **25**

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.02	0.01	0.04
Low-Level Gas	7.93	7.95	7.94	0.04
Span Gas	16.00	16.02	16.01	0.04

NO_x ANALYZER Model: **TELEDYNE API 200EH** Serial No.: **549**
Span (ppm): **200**

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	0.00	0.02
Low-Level Gas	80.27	80.24	80.27	0.02
Span Gas	164.40	164.37	164.40	0.02

CO ANALYZER Model: **TELEDYNE API 300EM** Serial No.: **425**
Span (ppm): **500**

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.01	0.00	0.00
Low-Level Gas	80.53	80.50	80.51	0.00
Span Gas	407.40	407.37	407.38	0.00

Calibrated by

Sakitt P.

(Mr. Sakitt Phaisanphit) Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 21105008-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client: **Dow Chemical Thailand Ltd.** Location: **TOX1 (ERU Stack)**
Date: **07 Oct 21** Test Operator: **Sakitt P.**

O₂ ANALYZER Cylinder Conc. (%): **16.00** Span (%): **25**

	O ₂ Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.02	0.02	0.00	0.01	0.04	0.04
Upscale Gas	16.02	16.02	0.00	16.01	0.04	0.04

NO_x ANALYZER Cylinder Conc. (ppm): **164.40** Span (ppm): **200**

	NO _x Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	-0.03	-0.03	0.00	0.00	0.02	0.02
Upscale Gas	164.37	164.37	0.00	164.40	0.02	0.02

CO ANALYZER Cylinder Conc. (ppm): **407.40** Span (ppm): **500**

	CO Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	-0.03	-0.03	0.00	-0.01	0.00	0.00
Upscale Gas	407.37	407.37	0.00	407.38	0.00	0.00

Calibrated by

Sakitt P.

(Mr. Sakitt Phaisanphit) Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Dow Chemical Thailand Ltd.	Run #	1
Date	07 Oct 21	Location	TOX1 (ERU Stack)
Start Time	11:40	Test Operator	Sakait P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	12:00
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	410
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	549
		Serial No.	425

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
11:40	9.46	8.68	20.81	-	0.53	
11:41	9.41	8.75	20.85	-	0.85	
11:42	9.42	8.75	20.92	-	1.02	
11:43	9.43	8.64	20.88	-	0.85	
11:44	9.43	8.72	20.87	-	0.85	
11:45	9.40	8.70	20.85	-	0.85	
11:46	9.38	8.80	20.78	-	0.85	
11:47	9.39	8.65	20.91	-	0.85	
11:48	9.36	8.70	21.04	-	0.77	
11:49	9.35	8.78	21.05	-	0.77	
11:50	9.35	8.75	21.03	-	0.68	
11:51	9.37	8.79	21.05	-	0.68	
11:52	9.36	8.74	21.02	-	0.68	
11:53	9.35	8.75	21.07	-	0.68	
11:54	9.35	8.68	21.10	-	0.60	
11:55	9.35	8.79	21.11	-	0.68	
11:56	9.33	8.82	20.85	-	0.76	
11:57	9.34	8.80	20.79	-	0.77	
11:58	9.34	8.76	20.72	-	0.85	
11:59	9.34	8.80	20.73	-	0.60	
12:00	9.36	8.78	20.72	-	0.60	
Average	9.37	8.74	20.91	-	0.77	

Sakait P.

(Mr. Sakait Phasaphleut)

Environmental Field Scientist (4)

FORM NO. F 06-002 REVISION NO. 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Dow Chemical Thailand Ltd.	Run #	2
Date	07 Oct 21	Location	TOX1 (ERU Stack)
Start Time	12:01	Test Operator	Sakait P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	12:21
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	410
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	549
		Serial No.	425

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:01	9.43	8.65	20.76	-	0.60	
12:02	9.53	8.58	20.56	-	0.69	
12:03	9.60	8.52	20.46	-	0.69	
12:04	9.62	8.54	20.42	-	0.69	
12:05	9.58	8.53	20.37	-	0.69	
12:06	9.60	8.60	20.39	-	0.69	
12:07	9.39	8.79	20.64	-	0.68	
12:08	9.38	8.70	20.70	-	0.68	
12:09	9.40	8.73	20.68	-	0.68	
12:10	9.41	8.72	20.57	-	0.68	
12:11	9.40	8.67	20.66	-	0.68	
12:12	9.39	8.77	20.63	-	0.68	
12:13	9.44	8.71	20.67	-	0.43	
12:14	9.47	8.64	20.65	-	0.52	
12:15	9.48	8.69	20.67	-	0.68	
12:16	9.46	8.73	20.69	-	0.77	
12:17	9.44	8.67	20.63	-	0.77	
12:18	9.44	8.74	20.53	-	0.60	
12:19	9.45	8.69	20.50	-	0.52	
12:20	9.50	8.65	20.42	-	0.60	
12:21	9.53	8.58	20.37	-	0.59	
Average	9.48	8.68	20.57	-	0.68	

Sakait P.

(Mr. Sakait Phasaphleut)

Environmental Field Scientist (4)

FORM NO. F 06-002 REVISION NO. 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Dow Chemical Thailand Ltd.	Run #	3
Date	07 Oct 21	Location	TOX1 (ERU Stack)
Start Time	12:22	Test Operator	Sakait P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	12:42
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	410
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	549
		Serial No.	425

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:22	9.54	8.67	20.45	-	0.85	
12:23	9.48	8.63	20.51	-	0.77	
12:24	9.48	8.63	20.60	-	0.68	
12:25	9.49	8.61	20.74	-	0.60	
12:26	9.48	8.65	20.74	-	0.60	
12:27	9.44	8.70	20.82	-	0.52	
12:28	9.50	8.65	21.05	-	0.43	
12:29	9.55	8.60	21.19	-	0.18	
12:30	9.91	8.35	21.23	-	0.35	
12:31	10.05	8.24	21.05	-	0.35	
12:32	10.02	8.27	20.88	-	0.35	
12:33	9.57	8.30	20.89	-	0.27	
12:34	9.54	8.38	20.95	-	0.44	
12:35	9.93	8.41	21.03	-	0.35	
12:36	9.86	8.38	21.02	-	0.35	
12:37	9.77	8.49	21.30	-	0.18	
12:38	9.60	8.56	21.61	-	0.10	
12:39	9.51	8.74	21.88	-	0.02	
12:40	9.38	8.75	21.88	-	0.10	
12:41	9.28	8.90	21.97	-	0.18	
12:42	9.26	8.80	22.20	-	0.18	
Average	9.64	8.58	21.14	-	0.38	

Sakait P.

(Mr. Sakait Phasaphleut)

Environmental Field Scientist (4)

FORM NO. F 06-002 REVISION NO. 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



ANALYZER CALIBRATION DATA

Lot No. 21105008-1

Client	Dow Chemical Thailand Ltd.	Location	TOX1 (ERU Stack)
Date	07 Oct 21	Test Operator	Sakait P.
O ₂ ANALYZER Model	TELEDYNE API 200EH	Serial No.	549
Span (%)	25		

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.02	0.01	0.04
Low-Level Gas	7.93	7.95	7.94	0.04
Span Gas	16.00	16.02	16.01	0.04

NO _x ANALYZER Model	TELEDYNE API 200EH	Serial No.	549
Span (ppm)	200		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	0.00	0.02
Low-Level Gas	80.27	80.24	80.27	0.02
Span Gas	164.40	164.37	164.40	0.02

CO ANALYZER Model	TELEDYNE API 300EM	Serial No.	425
Span (ppm)	500		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	-0.01	0.00
Low-Level Gas	80.53	80.50	80.51	0.00
Span Gas	407.40	407.37	407.38	0.00

Calibrated by

Sakait P.

(Mr. Sakait Phasaphleut)

Environmental Field Scientist (4)

FORM NO. F 06-104 REVISION NO. - ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 21105008-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client : Dow Chemical Thailand Ltd. Location : TOX1 (ERU Stack)
Date : 07 Oct 21 Test Operator : Sakit P.O₂ ANALYZER
Cylinder Conc. (%) : 18.00

Span (%) : 25

	Initial Values		Final Values		Drift (% of Span)
	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.02	0.00	0.02	0.00	0.08
Upscale Gas	16.02	0.00	16.01	0.04	0.04

NO_x ANALYZER
Cylinder Conc. (ppm) : 184.40

Span (ppm) : 200

	Initial Values		Final Values		Drift (% of Span)
	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.03	0.00	-0.03	0.00	0.02
Upscale Gas	164.37	0.00	164.40	0.02	0.02

CO ANALYZER
Cylinder Conc. (ppm) : 407.40

Span (ppm) : 500

	Initial Values		Final Values		Drift (% of Span)
	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.03	0.00	-0.01	0.00	0.00
Upscale Gas	407.37	0.00	407.38	0.00	0.00

Calibrated by

Sakit P.

(Mr. Sakit Phasaphaibud)

Environmental Field Scientist (4)

FORM NO.: F-06-104 REVISION NO.: 1 ISSUE DATE: 3/06/19

ALS Laboratory Group



CEMs Data

Client Name : Dow Chemical Thailand Ltd.										Date : 07 Oct 21	
Plant Name : AIE_HHPO-TPO Plant										Location : TOX1 (ERU Stack)	
Run No. 1						Time Base : 21 min					
Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%	Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%
07 Oct 21	1435	-	27.00	0.00	9.25	07 Oct 21	1435	-	25.90	0.00	9.30
07 Oct 21	1436	-	26.70	0.00	9.26	07 Oct 21	1436	-	25.90	0.00	9.30
07 Oct 21	1437	-	26.50	0.00	9.27	07 Oct 21	1437	-	25.90	0.00	9.30
07 Oct 21	1438	-	26.40	0.00	9.28	07 Oct 21	1438	-	25.90	0.00	9.30
07 Oct 21	1439	-	26.20	0.00	9.29	07 Oct 21	1439	-	25.90	0.00	9.30
07 Oct 21	1440	-	26.10	0.00	9.29	07 Oct 21	1440	-	25.90	0.00	9.30
07 Oct 21	1441	-	26.00	0.00	9.29	07 Oct 21	1441	-	25.90	0.00	9.30
07 Oct 21	1442	-	26.10	0.00	9.30	07 Oct 21	1442	-	25.90	0.00	9.30
07 Oct 21	1443	-	26.10	0.00	9.30	07 Oct 21	1443	-	25.90	0.00	9.30
07 Oct 21	1444	-	26.10	0.00	9.30	07 Oct 21	1444	-	25.90	0.00	9.30
07 Oct 21	1445	-	26.00	0.00	9.32	07 Oct 21	1445	-	25.90	0.00	9.30
07 Oct 21	1446	-	26.10	0.00	9.34	07 Oct 21	1446	-	25.90	0.00	9.30
07 Oct 21	1447	-	26.10	0.00	9.34	07 Oct 21	1447	-	25.90	0.00	9.30
07 Oct 21	1448	-	26.00	0.00	9.35	07 Oct 21	1448	-	25.90	0.00	9.30
07 Oct 21	1449	-	26.00	0.00	9.35	07 Oct 21	1449	-	25.90	0.00	9.30
07 Oct 21	1450	-	26.00	0.00	9.35	07 Oct 21	1450	-	25.90	0.00	9.30
07 Oct 21	1451	-	26.00	0.00	9.35	07 Oct 21	1451	-	25.90	0.00	9.30
07 Oct 21	1452	-	26.00	0.00	9.35	07 Oct 21	1452	-	25.90	0.00	9.30
07 Oct 21	1453	-	26.00	0.00	9.35	07 Oct 21	1453	-	25.90	0.00	9.30
07 Oct 21	1454	-	26.00	0.00	9.40	07 Oct 21	1454	-	25.90	0.00	9.30
07 Oct 21	1455	-	26.10	0.00	9.38	07 Oct 21	1455	-	25.90	0.00	9.30
Max		-	27.00	0.00	9.40	Max		-	25.90	0.00	9.30
Avg		-	26.31	0.00	9.32	Avg		-	25.98	0.00	9.30
Run No. 3						Time Base : 21 min					
Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%	Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%
07 Oct 21	1517	-	25.80	0.00	9.46	07 Oct 21	1518	-	25.90	0.00	9.30
07 Oct 21	1518	-	25.80	0.00	9.47	07 Oct 21	1519	-	25.90	0.00	9.30
07 Oct 21	1519	-	25.80	0.00	9.48	07 Oct 21	1520	-	25.90	0.00	9.30
07 Oct 21	1520	-	25.80	0.00	9.48	07 Oct 21	1521	-	25.90	0.00	9.30
07 Oct 21	1521	-	25.80	0.00	9.49	07 Oct 21	1522	-	25.90	0.00	9.30
07 Oct 21	1522	-	25.80	0.00	9.49	07 Oct 21	1523	-	25.90	0.00	9.30
07 Oct 21	1523	-	25.80	0.00	9.49	07 Oct 21	1524	-	25.90	0.00	9.30
07 Oct 21	1524	-	25.80	0.00	9.49	07 Oct 21	1525	-	25.90	0.00	9.30
07 Oct 21	1525	-	25.80	0.00	9.49	07 Oct 21	1526	-	25.90	0.00	9.30
07 Oct 21	1526	-	25.80	0.00	9.49	07 Oct 21	1527	-	25.90	0.00	9.30
07 Oct 21	1527	-	25.80	0.00	9.49	07 Oct 21	1528	-	25.90	0.00	9.30
07 Oct 21	1528	-	25.80	0.00	9.49	07 Oct 21	1529	-	25.90	0.00	9.30
07 Oct 21	1529	-	25.80	0.00	9.49	07 Oct 21	1530	-	25.90	0.00	9.30
07 Oct 21	1530	-	25.80	0.00	9.49	07 Oct 21	1531	-	25.90	0.00	9.30
07 Oct 21	1531	-	25.80	0.00	9.49	07 Oct 21	1532	-	25.90	0.00	9.30
07 Oct 21	1532	-	25.80	0.00	9.49	07 Oct 21	1533	-	25.90	0.00	9.30
07 Oct 21	1533	-	25.70	0.00	9.50	07 Oct 21	1534	-	25.90	0.00	9.30
07 Oct 21	1534	-	25.70	0.00	9.41	07 Oct 21	1535	-	25.90	0.00	9.30
07 Oct 21	1535	-	25.80	0.00	9.38	07 Oct 21	1536	-	25.90	0.00	9.30
07 Oct 21	1536	-	25.70	0.00	9.39	07 Oct 21	1537	-	25.90	0.00	9.30
07 Oct 21	1537	-	25.80	0.00	9.37	07 Oct 21	1538	-	25.90	0.00	9.30
Max		-	26.00	0.00	9.46	Max		-	26.00	0.00	9.30
Avg		-	25.81	0.00	9.41	Avg		-	25.77	0.00	9.30
Run No. 5						Time Base : 21 min					
Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%	Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%
07 Oct 21	1609	-	25.70	0.00	9.36	07 Oct 21	1610	-	25.80	0.00	9.36
07 Oct 21	1610	-	25.70	0.00	9.37	07 Oct 21	1611	-	25.80	0.00	9.36
07 Oct 21	1611	-	25.70	0.00	9.37	07 Oct 21	1612	-	25.80	0.00	9.36
07 Oct 21	1612	-	25.70	0.00	9.37	07 Oct 21	1613	-	25.80	0.00	9.36
07 Oct 21	1613	-	25.70	0.00	9.37	07 Oct 21	1614	-	25.80	0.00	9.36
07 Oct 21	1614	-	25.70	0.00	9.37	07 Oct 21	1615	-	25.80	0.00	9.36
07 Oct 21	1615	-	25.70	0.00	9.37	07 Oct 21	1616	-	25.80	0.00	9.36
07 Oct 21	1616	-	25.70	0.00	9.37	07 Oct 21	1617	-	25.80	0.00	9.36
07 Oct 21	1617	-	25.70	0.00	9.37	07 Oct 21	1618	-	25.80	0.00	9.36
07 Oct 21	1618	-	25.70	0.00	9.37	07 Oct 21	1619	-	25.80	0.00	9.36
07 Oct 21	1619	-	25.70	0.00	9.37	07 Oct 21	1620	-	25.80	0.00	9.36
Max		-	25.80	0.00	9.41	Max		-	25.80	0.00	9.36
Avg		-	25.61	0.00	9.37	Avg		-	25.71	0.00	9.36



CEMs Data

Client Name : Dow Chemical Thailand Ltd.										Date : 07 Oct 21	
Plant Name : AIE_HHPO-TPO Plant										Location : TOX1 (ERU Stack)	
Run No. 7						Run No. 8					
Time Base : 21 min						Time Base : 21 min					
Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%	Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%
07 Oct 21	1641	-	26.30	0.10	9.30	07 Oct 21	1702	-	26.40	0.30	9.36
07 Oct 21	1642	-	26.40	0.20	9.32	07 Oct 21	1703	-	26.50	0.10	9.32
07 Oct 21	1643	-	26.40	0.00	9.37	07 Oct 21	1704	-	26.40	0.00	9.31
07 Oct 21	1644	-	26.00	0.00	9.37	07 Oct 21	1705	-	25.90	0.00	9.46
07 Oct 21	1645	-	26.10	0.00	9.31	07 Oct 21	1706	-	25.90	0.00	9.39
07 Oct 21	1646	-	26.00	0.00	9.31	07 Oct 21	1707	-	26.00	0.00	9.39
07 Oct 21	1647	-	26.30	0.30	9.30	07 Oct 21	1708	-	25.90	0.00	9.37
07 Oct 21	1648	-	26.00	0.10	9.30	07 Oct 21	1709	-	25.90	0.00	9.40
07 Oct 21	1649	-	26.10	0.00	9.30	07 Oct 21	1710	-	25.90	0.00	9.40
07 Oct 21	1650	-	26.00	0.20	9.31	07 Oct 21	1711	-	25.90	0.00	9.39
07 Oct 21	1651	-	26.00	0.10	9.30	07 Oct 21	1712	-	25.90	0.00	9.39
07 Oct 21	1652	-	26.10	0.00	9.30	07 Oct 21	1713	-	25.90	0.00	9.39
07 Oct 21	1653	-	26.00	0.10	9.30	07 Oct 21	1714	-	25.90	0.00	9.39
07 Oct 21	1654	-	26.00	0.10	9.30	07 Oct 21	1715	-	25.90	0.00	9.39
07 Oct 21	1655	-	26.00	0.10	9.30	07 Oct 21	1716	-	25.90	0.00	9.39
07 Oct 21	1656	-	26.00	0.10	9.30	07 Oct 21	1717	-	25.90	0.00	9.39
07 Oct 21	1657	-	26.10	0.10	9.30	07 Oct 21	1718	-	25.90	0.00	9.39
07 Oct 21	1658	-	26.00	0.10	9.30	07 Oct 21	1719	-	25.90	0.00	9.39
07 Oct 21	1659	-	26.00	0.10	9.30	07 Oct 21	1720	-	25.90	0.00	9.39
07 Oct 21	1660	-	26.00	0.10	9.30	07 Oct 21	1721	-	25.90	0.00	9.39
07 Oct 21	1661	-	26.00	0.10	9.30	07 Oct 21	1722	-	25.90	0.00	9.39
Max		-	26.40	0.30	9.36	Max		-	26.40	0.30	9.36
Avg		-	26.30	0.10	9.31	Avg		-	25.98	0.10	9.36
Run No. 9						Run No. 10					
Time Base : 21 min						Time Base : 21 min					
Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%	Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%
07 Oct 21	1723	-	26.00	0.10	9.30	07 Oct 21	1744	-	25.80	0.00	9.31
07 Oct 21	1724	-	26.20	0.10	9.30	07 Oct 21	1745	-	25.90	0.00	9.01
07 Oct 21	1725	-	26.10	0.40	9.12	07 Oct 21	1746	-	25.10	0.00	9.00
07 Oct 21	1726	-	26.10	2.10	9.10	07 Oct 21	1747	-	25.30	0.00	9.05
07 Oct 21	1727	-	26.20	2.80	9.11	07 Oct 21	1748	-	24.80	0.10	9.15
07 Oct 21	1728	-	26.00	2.30	9.09	07 Oct 21	1749	-	24.70	0.00	9.28
07 Oct 21	1729	-	26.10	2.10	9.09	07 Oct 21	1750	-	24.10	0.10	9.08
07 Oct 21	1730	-	26.00	0.40	9.37	07 Oct 21	1751	-	24.30	0.20	8.97
07 Oct 21	1731	-	24.00	0.00	9.67	07 Oct 21	1752	-	24.30	0.10	9.44
07 Oct 21	1732	-	24.00	0.00	9.69	07 Oct 21	1753	-	24.10	0.20	9.48
07 Oct 21	1733	-	24.00	0.10	9.51	07 Oct 21	1754	-	24.10	0.30	9.72
07 Oct 21	1734	-	24.00	0.00	9.44	07 Oct 21	1755	-	24.30	0.10	8.41
07 Oct 21	1735	-	24.00	0.10	9.35	07 Oct 21	1756	-	25.10	0.10	8.41
07 Oct 21	1736	-	24.00	0.00	9.41	07 Oct 21	1757	-	25.10	0.00	8.48
07 Oct 21	1737	-	24.00	0.00	9.82	07 Oct 21	1758	-	25.00	0.00	9.70
07 Oct 21	1738	-	25.20	0.00	9.82	07 Oct 21	1759	-	25.00	0.00	9.37
07 Oct 21	1739	-	25.20	0.00	9.82	07 Oct 21	1800	-	25.00	0.00	9.76
07 Oct 21	1740	-	25.10	0.00	9.88	07 Oct 21	1801	-	24.40	0.40	9.80
07 Oct 21	1741	-	25.30	0.10	9.88	07 Oct 21	1802	-	24.10	0.30	9.80
07 Oct 21	1742	-	25.00	0.00	9.86	07 Oct 21	1803	-	24.10	0.10	9.23
07 Oct 21	1743	-	25.10	0.00	9.90	07 Oct 21	1804	-	24.40	0.00	9.06
Max		-	26.20	2.80	9.12	Max		-	25.80	0.10	9.01
Avg		-	24.10	0.80	9.41	Avg		-	24.61	0.10	9.32



Reference Method Data

Client Name Dow Chemical Thailand Ltd.
Plant Name AIE_HFPO-TPO PlantDate 07 Oct 21
Location TOX2 (ERU Stack)

Run No. 7							Run No. 8						
Time Base: 21 min							Time Base: 21 min						
Date	Time	SO ₂ ppm	NO _x ppm	CO ppm	O ₂ Vol%	CO ₂ Vol%	Date	Time	SO ₂ ppm	NO _x ppm	CO ppm	O ₂ Vol%	CO ₂ Vol%
07 Oct 21	16:41	-	21.66	0.30	8.97	8.34	07 Oct 21	17:02	-	21.30	0.28	8.24	8.92
07 Oct 21	16:42	-	20.81	0.30	9.10	8.14	07 Oct 21	17:03	-	21.81	0.36	7.98	10.01
07 Oct 21	16:43	-	21.19	0.65	7.96	8.79	07 Oct 21	17:04	-	21.77	0.75	8.62	9.06
07 Oct 21	16:44	-	21.68	0.39	8.40	8.83	07 Oct 21	17:05	-	21.79	0.38	8.86	8.43
07 Oct 21	16:45	-	21.47	0.38	8.83	8.49	07 Oct 21	17:06	-	21.69	0.83	8.86	9.70
07 Oct 21	16:46	-	21.18	0.48	9.13	8.45	07 Oct 21	17:07	-	21.87	0.57	9.29	8.71
07 Oct 21	16:47	-	20.68	0.29	8.68	8.57	07 Oct 21	17:08	-	21.82	0.74	8.87	8.76
07 Oct 21	16:48	-	20.75	0.48	9.58	8.46	07 Oct 21	17:09	-	21.38	0.86	9.37	8.71
07 Oct 21	16:49	-	20.78	0.20	8.05	8.74	07 Oct 21	17:10	-	21.44	0.74	9.30	8.54
07 Oct 21	16:50	-	20.85	1.57	8.85	8.51	07 Oct 21	17:11	-	21.30	0.86	9.18	9.77
07 Oct 21	16:51	-	20.31	1.83	8.11	9.37	07 Oct 21	17:12	-	21.58	0.56	9.52	9.29
07 Oct 21	16:52	-	20.51	0.82	8.81	7.80	07 Oct 21	17:13	-	21.27	0.29	9.18	8.28
07 Oct 21	16:53	-	19.73	0.18	7.38	7.30	07 Oct 21	17:14	-	21.04	0.57	8.87	8.97
07 Oct 21	16:54	-	19.07	13.89	9.71	8.98	07 Oct 21	17:15	-	21.29	0.47	8.72	8.46
07 Oct 21	16:55	-	20.85	1.19	7.76	10.04	07 Oct 21	17:16	-	21.22	0.38	8.43	8.54
07 Oct 21	16:56	-	21.77	0.11	7.81	9.84	07 Oct 21	17:17	-	21.39	0.46	8.76	9.11
07 Oct 21	16:57	-	22.14	1.49	16.15	7.85	07 Oct 21	17:18	-	21.15	0.47	9.12	9.30
07 Oct 21	16:58	-	21.19	0.84	8.27	9.18	07 Oct 21	17:19	-	21.45	0.86	9.23	8.53
07 Oct 21	16:59	-	21.90	0.47	8.58	8.64	07 Oct 21	17:20	-	21.23	0.38	9.16	9.29
07 Oct 21	17:00	-	21.27	0.48	8.99	8.12	07 Oct 21	17:21	-	21.24	0.47	8.96	8.86
07 Oct 21	17:01	-	21.35	0.29	8.33	8.78	07 Oct 21	17:22	-	21.12	0.02	10.17	8.15
Max		-	22.14	11.36	11.32	10.04	Max		-	21.81	0.89	10.17	10.81
Avg		-	20.89	3.94	9.18	8.91	Avg		-	21.44	0.52	8.89	9.07

Run No. 9							Run No. 10						
Time Base: 21 min							Time Base: 21 min						
Date	Time	SO ₂ ppm	NO _x ppm	CO ppm	O ₂ Vol%	CO ₂ Vol%	Date	Time	SO ₂ ppm	NO _x ppm	CO ppm	O ₂ Vol%	CO ₂ Vol%
07 Oct 21	17:23	-	20.99	0.75	10.23	8.08	07 Oct 21	17:44	-	21.31	0.86	9.05	8.96
07 Oct 21	17:24	-	19.64	1.21	10.18	8.12	07 Oct 21	17:45	-	21.31	0.86	9.06	9.02
07 Oct 21	17:25	-	19.43	1.86	10.14	8.15	07 Oct 21	17:46	-	21.29	0.36	9.05	8.97
07 Oct 21	17:26	-	19.32	1.87	10.17	8.12	07 Oct 21	17:47	-	21.27	0.56	9.11	8.99
07 Oct 21	17:27	-	19.29	2.22	10.14	8.20	07 Oct 21	17:48	-	21.12	0.57	9.24	8.84
07 Oct 21	17:28	-	19.20	1.95	10.13	8.19	07 Oct 21	17:49	-	20.88	0.57	9.45	8.65
07 Oct 21	17:29	-	19.28	1.39	9.99	8.24	07 Oct 21	17:50	-	20.51	0.38	8.89	8.58
07 Oct 21	17:30	-	19.54	0.11	9.01	9.19	07 Oct 21	17:51	-	20.59	0.39	8.64	9.27
07 Oct 21	17:31	-	20.30	0.47	8.85	9.04	07 Oct 21	17:52	-	20.48	0.11	9.71	8.54
07 Oct 21	17:32	-	20.58	0.39	9.40	8.71	07 Oct 21	17:53	-	20.30	0.11	9.71	8.49
07 Oct 21	17:33	-	20.81	0.38	9.53	8.66	07 Oct 21	17:54	-	20.28	0.20	9.72	9.37
07 Oct 21	17:34	-	20.50	0.38	9.44	8.72	07 Oct 21	17:55	-	20.38	0.38	9.14	9.09
07 Oct 21	17:35	-	20.52	0.47	9.30	9.44	07 Oct 21	17:56	-	20.78	0.46	8.96	9.10
07 Oct 21	17:36	-	20.72	0.38	9.08	8.98	07 Oct 21	17:57	-	21.04	0.48	9.30	9.39
07 Oct 21	17:37	-	20.84	0.56	8.96	9.06	07 Oct 21	17:58	-	20.88	0.56	8.83	9.20
07 Oct 21	17:38	-	21.12	0.47	8.98	9.04	07 Oct 21	17:59	-	20.84	0.47	8.43	8.82
07 Oct 21	17:39	-	21.31	0.65	8.96	9.05	07 Oct 21	18:00	-	21.15	0.47	8.97	8.83
07 Oct 21	17:40	-	21.33	0.85	8.97	9.11	07 Oct 21	18:01	-	20.73	0.30	10.10	8.19
07 Oct 21	17:41	-	21.41	0.85	8.98	9.10	07 Oct 21	18:02	-	20.23	0.11	9.71	8.54
07 Oct 21	17:42	-	21.44	0.75	9.06	9.07	07 Oct 21	18:03	-	20.13	0.47	9.17	8.86
07 Oct 21	17:43	-	21.31	0.85	9.04	8.99	07 Oct 21	18:04	-	20.69	0.56	9.14	8.88
Max		-	21.44	2.22	10.23	9.19	Max		-	21.31	0.86	10.10	9.30
Avg		-	20.41	0.86	9.45	8.69	Avg		-	20.77	0.43	9.36	8.76

Run No. 11							Run No. 12						
Time Base: 21 min							Time Base: 21 min						
Date	Time	SO ₂ ppm	NO _x ppm	CO ppm	O ₂ Vol%	CO ₂ Vol%	Date	Time	SO ₂ ppm	NO _x ppm	CO ppm	O ₂ Vol%	CO ₂ Vol%
07 Oct 21	18:05	-	20.97	0.86	8.17	8.81	07 Oct 21	18:26	-	20.89	0.75	9.28	8.77
07 Oct 21	18:06	-	21.82	0.47	9.20	8.96	07 Oct 21	18:27	-	20.70	0.86	9.28	8.85
07 Oct 21	18:07	-	21.01	0.86	9.24	8.89	07 Oct 21	18:28	-	20.81	0.86	9.28	9.14
07 Oct 21	18:08	-	20.88	0.66	9.25	8.83	07 Oct 21	18:29	-	20.73	0.66	9.30	8.77
07 Oct 21	18:09	-	21.87	0.86	9.27	8.77	07 Oct 21	18:30	-	20.64	0.86	9.28	8.96
07 Oct 21	18:10	-	21.87	0.86	9.27	8.83	07 Oct 21	18:31	-	20.99	0.86	9.32	8.88
07 Oct 21	18:11	-	21.15	0.97	9.28	8.84	07 Oct 21	18:32	-	20.85	0.86	9.27	8.88
07 Oct 21	18:12	-	20.98	0.66	9.30	8.83	07 Oct 21	18:33	-	20.73	0.86	9.28	8.95
07 Oct 21	18:13	-	20.91	0.66	9.30	8.83	07 Oct 21	18:34	-	20.70	0.75	9.28	8.88
07 Oct 21	18:14	-	20.82	0.57	9.27	8.84	07 Oct 21	18:35	-	20.80	0.75	9.28	8.88
07 Oct 21	18:15	-	20.87	0.66	9.28	8.86	07 Oct 21	18:36	-	20.88	0.66	9.24	8.93
07 Oct 21	18:16	-	20.81	0.75	9.27	8.88	07 Oct 21	18:37	-	20.88	0.56	9.25	8.92
07 Oct 21	18:17	-	20.87	0.66	9.29	8.89	07 Oct 21	18:38	-	20.82	0.57	9.24	8.84
07 Oct 21	18:18	-	20.86	0.66	9.28	8.89	07 Oct 21	18:39	-	20.82	0.86	9.25	8.93
07 Oct 21	18:19	-	20.69	0.66	9.28	8.89	07 Oct 21	18:40	-	20.88	0.75	9.24	8.89
07 Oct 21	18:20	-	20.74	0.75	9.29	8.86	07 Oct 21	18:41	-	20.90	0.75	9.25	8.81
07 Oct 21	18:21	-	20.85	0.57	9.26	8.85	07 Oct 21	18:42	-	20.89	0.66	9.23	8.88
07 Oct 21	18:22	-	20.73	0.66	9.28	8.81	07 Oct 21	18:43	-	20.84	0.56	9.25	8.84
07 Oct 21	18:23	-	20.74	0.66	9.29	8.80	07 Oct 21	18:44	-	20.84	0.75	9.25	8.84
07 Oct 21	18:24	-	20.84	0.66	9.28	8.88	07 Oct 21	18:45	-	20.88	0.86	9.26	8.85
07 Oct 21	18:25	-	20.89	0.47	9.28	8.80	07 Oct 21	18:46	-	20.57	0.66	9.27	8.87
Max		-	21.15	0.75	9.30	8.91	Max		-	20.94	0.75	9.32	8.87
Avg		-	20.89	0.83	9.27	8.84	Avg		-	20.84	0.66	9.28	8.88

Lot No. 21105023-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client : Dow Chemical Thailand Ltd. Location : TOX2 (ERU Stack)
Date : 06 Oct 21 Test Operator : Sakait P.O₂ ANALYZER
Cylinder Conc. (%) : 16.00 Span (%) : 25

	O ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.06	0.06	0.00	0.02	0.16	0.16
Upscale Gas	16.06	16.06	0.00	16.02	0.16	0.16

NO_x ANALYZER
Cylinder Conc. (ppm) : 164.40 Span (ppm) : 200

	NO _x Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.09	0.09	0.00	0.02	0.04	0.04
Upscale Gas	164.49	164.49	0.00	164.41	0.04	0.04

CO ANALYZER
Cylinder Conc. (ppm) : 407.40 Span (ppm) : 500

	CO Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.03	-0.03	0.00	-0.01	0.00	0.00
Upscale Gas	407.37	407.37	0.00	407.38	0.00	0.00

Calibrated by

Sakait P.
(Mr. Sakait Phasaphant)

Environmental Field Scientist (4)

FORM NO. F 06-062 REVISION NO. 2 ISSUE DATE: 10/6/19

ALS Laboratory Group



Lot No. 21105023-1

ANALYZER CALIBRATION DATA

Client : Dow Chemical Thailand Ltd. Location : TOX2 (ERU Stack)
Date : 06 Oct 21 Test Operator : Sakait P.O₂ ANALYZER
Model : TELEDYNE API 200EH Serial No. : 549
Span (%) : 25



EMISSION TEST RESULT

Client	Dow Chemical Thailand Ltd.	Run #	2
Date	06 Oct 21	Location	TOX2 (ERU Stack)
Start Time	12:01	Test Operator	Sakait P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	12:21
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	410
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	549
		Serial No.	425

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:01	9.29	8.31	11.22	-	0.69	
12:02	9.28	8.37	11.26	-	0.69	
12:03	9.27	8.39	11.30	-	0.60	
12:04	9.26	8.41	11.34	-	0.60	
12:05	9.31	8.37	11.36	-	0.60	
12:06	9.32	8.26	11.40	-	0.69	
12:07	9.34	8.34	11.38	-	0.69	
12:08	9.30	8.36	11.38	-	0.60	
12:09	9.28	8.33	11.43	-	0.52	
12:10	9.27	8.36	11.41	-	0.52	
12:11	9.27	8.34	11.39	-	0.52	
12:12	9.26	8.35	11.38	-	0.52	
12:13	9.28	8.32	11.41	-	0.52	
12:14	9.29	8.42	11.38	-	0.60	
12:15	9.28	8.31	11.41	-	0.44	
12:16	9.29	8.29	11.43	-	0.44	
12:17	9.28	8.39	11.37	-	0.44	
12:18	9.27	8.35	11.32	-	0.52	
12:19	9.29	8.33	11.24	-	0.44	
12:20	9.27	8.35	11.21	-	0.35	
12:21	9.26	8.41	11.19	-	0.35	
Average	9.28	8.35	11.34	-	0.54	

Sakait P.

(Mr. Sakait Phaisanphaisut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 30/6/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Dow Chemical Thailand Ltd.	Run #	3
Date	06 Oct 21	Location	TOX2 (ERU Stack)
Start Time	12:22	Test Operator	Sakait P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	12:42
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	410
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	549
		Serial No.	425

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:22	9.25	8.39	11.23	-	0.27	
12:23	9.26	8.37	11.23	-	0.35	
12:24	9.29	8.34	11.27	-	0.44	
12:25	9.29	8.32	11.24	-	0.35	
12:26	9.30	8.33	11.15	-	0.35	
12:27	9.29	8.33	11.11	-	0.44	
12:28	9.27	8.34	11.03	-	0.35	
12:29	9.24	8.36	10.95	-	0.27	
12:30	9.24	8.38	11.01	-	0.35	
12:31	9.22	8.43	11.12	-	0.35	
12:32	9.26	8.31	11.12	-	0.27	
12:33	9.29	8.28	11.14	-	0.35	
12:34	9.29	8.30	11.23	-	0.27	
12:35	9.28	8.31	11.25	-	0.27	
12:36	9.26	8.37	11.19	-	0.27	
12:37	9.23	8.38	11.18	-	0.27	
12:38	9.25	8.36	11.17	-	0.27	
12:39	9.26	8.38	11.20	-	0.18	
12:40	9.29	8.32	11.28	-	0.18	
12:41	9.31	8.31	11.27	-	0.18	
12:42	9.30	8.35	11.23	-	0.18	
Average	9.27	8.35	11.17	-	0.30	

Sakait P.

(Mr. Sakait Phaisanphaisut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 30/6/19

ALS Laboratory Group



ANALYZER CALIBRATION DATA

Client	Dow Chemical Thailand Ltd.	Location	TOX2 (ERU Stack)
Date	06 Oct 21	Test Operator	Sakait P.
O ₂ ANALYZER Model	TELEDYNE API 200EH	Serial No.	549
Span (%)	25		

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.06	0.02	0.16
Low-Level Gas	7.93	7.98	7.95	0.12
Span Gas	16.00	16.06	16.02	0.16

NO _x ANALYZER Model	TELEDYNE API 200EH	Serial No.	549
Span (ppm)	200		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.09	0.02	0.04
Low-Level Gas	80.27	80.32	80.30	0.01
Span Gas	164.40	164.49	164.41	0.04

CO ANALYZER Model	TELEDYNE API 300EM	Serial No.	425
Span (ppm)	500		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	-0.01	0.00
Low-Level Gas	80.53	80.50	80.51	0.00
Span Gas	407.40	407.37	407.38	0.00

Calibrated by

Sakait P.

(Mr. Sakait Phaisanphaisut)

Environmental Field Scientist (4)

FORM NO.: F 06-104 REVISION NO.: - ISSUE DATE: 30/6/19

ALS Laboratory Group



SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client	Dow Chemical Thailand Ltd.	Location	TOX2 (ERU Stack)
Date	06 Oct 21	Test Operator	Sakait P.

O ₂ ANALYZER Cylinder Conc. (%)	16.00	Span (%)	25
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	O ₂ Analyzer Calibration Response	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.06	0.06	0.00	0.02	0.16	0.16
Upscale Gas	16.06	16.06	0.00	16.02	0.16	0.16

NO _x ANALYZER Cylinder Conc. (ppm)	164.40	Span (ppm)	200
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	NO _x Analyzer Calibration Response	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.09	0.09	0.00	0.02	0.04	0.04
Upscale Gas	164.49	164.49	0.00	164.41	0.04	0.04

CO ANALYZER Cylinder Conc. (ppm)	407.40	Span (ppm)	500
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	CO Analyzer Calibration Response	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	-0.03	-0.03	0.00	-0.01	0.00	0.00
Upscale Gas	407.37	407.37	0.00	407.38	0.00	0.00

Calibrated by

Sakait P.

(Mr. Sakait Phaisanphaisut)

Environmental Field Scientist (4)

FORM NO.: F 06-104 REVISION NO.: - ISSUE DATE: 30/6/19

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CeMs Data

Client Name							Date						
Plant Name							Location						
Dow Chemical Thailand Ltd.							06 Oct 21						
AIE_HPPD-TPO Plant							TOXQ (ERU Stack)						
Run No: 1							Run No: 2						
Time Base: 21 min							Time Base: 21 min						
Date	Time	SO2	NOx	CO	O2	CO2	Date	Time	SO2	NOx	CO	O2	CO2
				ppm	%	ppm					ppm	%	ppm
06 Oct 21	12:50	-	6.20	2.20	9.13	-	06 Oct 21	13:11	-	6.10	2.20	9.13	-
06 Oct 21	12:51	-	6.20	2.20	9.13	-	06 Oct 21	13:12	-	6.10	2.10	9.13	-
06 Oct 21	12:52	-	6.10	2.20	9.11	-	06 Oct 21	13:13	-	6.20	2.10	9.13	-
06 Oct 21	12:53	-	6.10	2.20	9.11	-	06 Oct 21	13:14	-	6.10	2.10	9.14	-
06 Oct 21	12:54	-	6.10	2.10	9.10	-	06 Oct 21	13:15	-	6.20	2.20	9.10	-
06 Oct 21	12:55	-	6.00	2.10	9.10	-	06 Oct 21	13:16	-	5.90	2.30	9.10	-
06 Oct 21	12:56	-	6.00	2.10	9.17	-	06 Oct 21	13:17	-	5.90	2.30	9.12	-
06 Oct 21	12:57	-	6.00	2.20	9.13	-	06 Oct 21	13:18	-	5.90	2.30	9.10	-
06 Oct 21	12:58	-	5.90	2.70	9.14	-	06 Oct 21	13:19	-	5.90	2.40	9.14	-
06 Oct 21	12:59	-	6.10	2.40	9.11	-	06 Oct 21	13:20	-	5.70	2.30	9.17	-
06 Oct 21	13:00	-	6.40	2.20	9.07	-	06 Oct 21	13:21	-	5.90	2.30	9.09	-
06 Oct 21	13:01	-	6.60	2.70	9.02	-	06 Oct 21	13:22	-	5.90	2.40	9.17	-
06 Oct 21	13:02	-	6.40	2.30	9.06	-	06 Oct 21	13:23	-	5.90	2.30	9.16	-
06 Oct 21	13:03	-	6.40	2.30	9.07	-	06 Oct 21	13:24	-	5.90	2.40	9.10	-
06 Oct 21	13:04	-	6.20	2.60	9.07	-	06 Oct 21	13:25	-	6.00	2.40	9.13	-
06 Oct 21	13:05	-	6.30	2.30	9.03	-	06 Oct 21	13:26	-	5.90	2.40	9.15	-
06 Oct 21	13:06	-	6.30	2.40	9.06	-	06 Oct 21	13:27	-	5.90	2.30	9.11	-
06 Oct 21	13:07	-	5.90	2.10	9.09	-	06 Oct 21	13:28	-	5.90	2.40	9.11	-
06 Oct 21	13:08	-	6.10	2.30	9.09	-	06 Oct 21	13:29	-	5.90	2.40	9.15	-
06 Oct 21	13:09	-	6.10	2.30	9.09	-	06 Oct 21	13:30	-	5.70	2.20	9.12	-
06 Oct 21	13:10	-	6.30	2.00	9.11	-	06 Oct 21	13:31	-	5.90	2.30	9.13	-
Max	-	-	6.60	2.70	9.17	-	Max	-	-	6.20	2.40	9.16	-
Avg	-	-	6.17	2.34	9.08	-	Avg	-	-	5.92	2.31	9.14	-

Run No: 3 Time Base: 21 min						
Date	Time	SO2	NOx	CO	O2	CO2
		ppm	ppm	ppm	%	ppm
06 Oct 21	13:32	-	5.90	2.30	9.12	-
06 Oct 21	13:33	-	5.90	2.10	9.18	-
06 Oct 21	13:34	-	5.90	2.00	9.10	-
06 Oct 21	13:35	-	5.70	2.40	9.14	-
06 Oct 21	13:36	-	5.90	2.10	9.10	-
06 Oct 21	13:37	-	5.90	2.30	9.18	-
06 Oct 21	13:38	-	6.10	2.30	9.12	-
06 Oct 21	13:39	-	6.10	2.30	9.12	-
06 Oct 21	13:40	-	5.90	2.40	9.12	-
06 Oct 21	13:41	-	5.90	2.40	9.12	-
06 Oct 21	13:42	-	6.10	2.30	9.12	-
06 Oct 21	13:43	-	6.00	2.30	9.14	-
06 Oct 21	13:44	-	6.00	2.10	9.14	-
06 Oct 21	13:45	-	5.70	2.10	9.16	-
06 Oct 21	13:46	-	5.90	2.10	9.16	-
06 Oct 21	13:47	-	5.90	2.30	9.18	-
06 Oct 21	13:48	-	5.90	2.10	9.16	-
06 Oct 21	13:49	-	5.90	2.30	9.18	-
06 Oct 21	13:50	-	5.90	2.30	9.14	-
06 Oct 21	13:51	-	5.90	2.10	9.14	-
06 Oct 21	13:52	-	5.90	2.20	9.18	-
Max	-	-	6.10	2.40	9.18	-
Avg	-	-	5.87	2.23	9.14	-

Date	Time	SO2	NOx	CO	O2	CO2
		ppm	ppm	ppm	%	ppm
06 Oct 21	13:53	-	5.90	2.30	9.18	-
06 Oct 21	13:54	-	5.90	2.10	9.18	-
06 Oct 21	13:55	-	5.90	1.90	9.18	-
06 Oct 21	13:56	-	5.90	1.70	9.18	-
06 Oct 21	13:57	-	5.90	1.90	9.18	-
06 Oct 21	13:58	-	5.90	1.90	9.14	-
06 Oct 21	13:59	-	5.90	1.90	9.14	-
06 Oct 21	14:00	-	5.90	1.90	9.13	-
06 Oct 21	14:01	-	5.90	2.10	9.13	-
06 Oct 21	14:02	-	5.90	2.10	9.14	-
06 Oct 21	14:03	-	5.90	2.10	9.14	-
06 Oct 21	14:04	-	5.90	2.30	9.13	-
06 Oct 21	14:05	-	5.90	2.30	9.13	-
06 Oct 21	14:06	-	5.70	2.10	9.12	-
06 Oct 21	14:07	-	5.70	2.00	9.12	-
06 Oct 21	14:08	-	5.70	2.00	9.15	-
06 Oct 21	14:09	-	5.70	2.10	9.15	-
06 Oct 21	14:10	-	5.70	2.00	9.15	-
06 Oct 21	14:11	-	5.70	2.00	9.14	-
06 Oct 21	14:12	-	5.70	2.00	9.12	-
06 Oct 21	14:13	-	5.90	1.80	9.14	-
Max	-	-	5.90	2.40	9.18	-
Avg	-	-	5.77	2.01	9.14	-

Time Base: 21 min							Run No: 6							Time Base: 21 min						
Date	Time	SO2	NOx	CO	O2	CO2	Date	Time	SO2	NOx	CO	O2	CO2	Date	Time	SO2	NOx	CO	O2	CO2
		ppm	ppm	ppm	%	ppm			ppm	ppm	ppm	%	ppm			ppm	ppm	ppm	%	ppm
06 Oct 21	14:14	-	5.90	2.30	9.13	-	06 Oct 21	14:35	-	5.90	1.90	9.10	-	06 Oct 21	14:56	-	5.90	2.10	9.11	-
06 Oct 21	14:15	-	5.70	2.10	9.18	-	06 Oct 21	14:36	-	6.00	2.00	9.08	-	06 Oct 21	14:57	-	5.90	2.10	9.11	-
06 Oct 21	14:16	-	5.90	2.10	9.18	-	06 Oct 21	14:37	-	6.00	2.00	9.08	-	06 Oct 21	14:58	-	5.90	2.10	9.11	-
06 Oct 21	14:17	-	5.70	2.30	9.17	-	06 Oct 21	14:38	-	6.00	2.00	9.08	-	06 Oct 21	14:59	-	5.90	2.10	9.11	-
06 Oct 21	14:18	-	5.90	2.10	9.18	-	06 Oct 21	14:39	-	6.00	2.00	9.08	-	06 Oct 21	15:00	-	5.90	2.10	9.11	-
06 Oct 21	14:19	-	5.90	2.10	9.18	-	06 Oct 21	14:40	-	5.90	1.90	9.10	-	06 Oct 21	15:01	-	5.90	2.10	9.11	-
06 Oct 21	14:20	-	5.90	2.10	9.12	-	06 Oct 21	14:41	-	5.90	2.00	9.08	-	06 Oct 21	15:02	-	5.90	2.10	9.11	-
06 Oct 21	14:21	-	5.70	2.30	9.08	-	06 Oct 21	14:42	-	5.90	1.90	9.07	-	06 Oct 21	15:03	-	5.90	2.10	9.11	-
06 Oct 21	14:22	-	5.90	2.10	9.12	-	06 Oct 21	14:43	-	5.90	1.90	9.07	-	06 Oct 21	15:04	-	5.90	2.10	9.11	-
06 Oct 21	14:23	-	5.90	2.30	9.10	-	06 Oct 21	14:44	-	5.90	1.90	9.07	-	06 Oct 21	15:05	-	5.90	2.10	9.11	-
06 Oct 21	14:24	-	5.70	2.30	9.11	-	06 Oct 21	14:45	-	5.90	2.20	9.11	-	06 Oct 21	15:06	-	5.90	2.10	9.11	-
06 Oct 21	14:25	-	5.90	2.30	9.10	-	06 Oct 21	14:46	-	5.90	2.20	9.11	-	06 Oct 21	15:07	-	5.90	2.10	9.11	-
06 Oct 21	14:26	-	5.90	2.30	9.10	-	06 Oct 21	14:47	-	5.90	2.10	9.08	-	06 Oct 21	15:08	-	5.90	2.10	9.11	-
06 Oct 21	14:27	-	5.70	2.30	9.08	-	06 Oct 21	14:48	-	5.90	2.20	9.08	-	06 Oct 21	15:09	-	5.90	2.10	9.11	-
06 Oct 21	14:28	-	5.90	2.10	9.10	-	06 Oct 21	14:49	-	5.90	2.20	9.08	-	06 Oct 21	15:10	-	5.90	2.10	9.11	-
06 Oct 21	14:29	-	5.70	2.10	9.10	-	06 Oct 21	14:50	-	5.90	2.30	9.08	-	06 Oct 21	15:11	-	5.90	2.10	9.11	-
06 Oct 21	14:30	-	5.90	1.90	9.10	-	06 Oct 21	14:51	-	6.00	2.40	9.10	-	06 Oct 21	15:12	-	5.90	2.10	9.11	-
06 Oct 21	14:31	-	5.90	2.10	9.14	-	06 Oct 21	14:52	-	6.00	2.40	9.10	-	06 Oct 21	15:13	-	5.90	2.10	9.11	-
06 Oct 21	14:32	-	5.70	1.90	9.14	-	06 Oct 21	14:53	-	5.90	2.30	9.07	-	06 Oct 21	15:14	-	5.90	2.10	9.11	-
06 Oct 21	14:33	-	5.90	2.30	9.13	-	06 Oct 21	14:54	-	5.90	2.10	9.05	-	06 Oct 21	15:15	-	5.90	2.10	9.11	-
06 Oct 21	14:34	-	5.90	2.30	9.11	-	06 Oct 21	14:55	-	5.90	1.90	9.06	-	06 Oct 21	15:16	-	5.90	2.10	9.11	-
Max	-	-	5.90	2.30	9.17	-	Max	-	-	6.20	2.50	9.11	-	Max	-	-	5.90	2.10	9.11	-
Avg	-	-	5.75	2.16	9.12	-	Avg	-	-	5.98	2.10	9.08	-	Avg	-	-	5.98	2.10	9.08	-

Reference Method Data

Client Name Dow Chemical Thailand Ltd.

Date 06 Oct 21

Plant Name AIE_HIPPO-TPO Plant

Location TOX2 (ERU Stack)

Run No: 1 Time Base: 21 min

Run No: 2 Time Base: 21 min

Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%	CO2 Vol%
06 Oct 21	12:50	-	11.21	0.30	9.24	8.37
06 Oct 21	12:51	-	11.16	0.30	9.26	8.32
06 Oct 21	12:52	-	11.04	0.20	9.24	8.35
Max			11.21	0.30	9.24	8.37
Avg			11.14	0.27	9.25	8.35

Date	Time	SO2 ppm	NOx ppm	CO ppm	O2 Vol%	CO2 Vol%
06 Oct 21	13:11	-	11.16	0.82	8.25	8.38
06 Oct 21	13:12	-	11.22	0.11	8.26	8.34
06 Oct 21	13:13	-	11.23	0.11	8.24	8.35
Max			11.23	0.82	8.26	8.38
Avg			11.20	0.35	8.25	8.36



CEMs Data

Client Name		Dow Chemical Thailand Ltd.		Location		TOX1 (ERU Stack)	
Plant Name		AIE_HPPO-TPO Plant					
Run No: 1		Run No: 2		Run No: 3		Run No: 4	
Date	Time	Flowrate kg/hr	Date	Time	Flowrate kg/hr	Date	Time
7-Oct-21	14:30	52574.06	7-Oct-21	14:52	52522.85	7-Oct-21	15:14
7-Oct-21	14:31	52572.15	7-Oct-21	14:53	52523.91	7-Oct-21	15:15
7-Oct-21	14:32	52523.98	7-Oct-21	14:54	52522.48	7-Oct-21	15:16
7-Oct-21	14:33	52587.66	7-Oct-21	14:55	52647.87	7-Oct-21	15:17
7-Oct-21	14:34	52654.05	7-Oct-21	14:56	52706.16	7-Oct-21	15:18
7-Oct-21	14:35	52760.54	7-Oct-21	14:57	52626.71	7-Oct-21	15:19
7-Oct-21	14:36	52706.26	7-Oct-21	14:58	52770.07	7-Oct-21	15:20
7-Oct-21	14:37	52712.62	7-Oct-21	14:59	53048.58	7-Oct-21	15:21
7-Oct-21	14:38	52622.63	7-Oct-21	15:00	53068.82	7-Oct-21	15:22
7-Oct-21	14:39	53027.23	7-Oct-21	15:01	52965.36	7-Oct-21	15:23
7-Oct-21	14:40	52947.68	7-Oct-21	15:02	53127.75	7-Oct-21	15:24
7-Oct-21	14:41	52937.89	7-Oct-21	15:03	53061.96	7-Oct-21	15:25
7-Oct-21	14:42	53010.34	7-Oct-21	15:04	52915.02	7-Oct-21	15:26
7-Oct-21	14:43	52937.45	7-Oct-21	15:05	52950.67	7-Oct-21	15:27
7-Oct-21	14:44	52920.28	7-Oct-21	15:06	52846.87	7-Oct-21	15:28
7-Oct-21	14:45	52949.67	7-Oct-21	15:07	52921.81	7-Oct-21	15:29
Max		53027.03	Max		53127.75	Max	
Avg		52780.58	Avg		52889.84	Avg	



CEMs Data

Client Name		Dow Chemical Thailand Ltd.		Location		TOX1 (ERU Stack)	
Plant Name		AIE_HPPO-TPO Plant					
Run No: 5		Run No: 6		Run No: 7		Run No: 8	
Date	Time	Flowrate kg/hr	Date	Time	Flowrate kg/hr	Date	Time
7-Oct-21	15:56	53113.96	7-Oct-21	16:20	53097.75	7-Oct-21	16:42
7-Oct-21	15:58	53221.41	7-Oct-21	16:21	53063.61	7-Oct-21	16:43
7-Oct-21	16:00	53263.55	7-Oct-21	16:22	53197.94	7-Oct-21	16:44
7-Oct-21	16:01	53093.41	7-Oct-21	16:23	53097.82	7-Oct-21	16:45
7-Oct-21	16:02	53441.56	7-Oct-21	16:24	53257.23	7-Oct-21	16:46
7-Oct-21	16:03	53121.40	7-Oct-21	16:25	53115.43	7-Oct-21	16:47
7-Oct-21	16:04	53116.25	7-Oct-21	16:26	53238.22	7-Oct-21	16:48
7-Oct-21	16:05	53072.69	7-Oct-21	16:27	53006.72	7-Oct-21	16:49
7-Oct-21	16:06	53038.28	7-Oct-21	16:28	51115.12	7-Oct-21	16:50
7-Oct-21	16:07	53180.41	7-Oct-21	16:29	50912.07	7-Oct-21	16:51
7-Oct-21	16:08	53202.05	7-Oct-21	16:30	50666.79	7-Oct-21	16:52
7-Oct-21	16:09	53242.47	7-Oct-21	16:31	50602.51	7-Oct-21	16:53
7-Oct-21	16:10	53232.94	7-Oct-21	16:32	50414.19	7-Oct-21	16:54
7-Oct-21	16:11	53232.98	7-Oct-21	16:33	50511.88	7-Oct-21	16:55
7-Oct-21	16:12	53010.33	7-Oct-21	16:34	50210.38	7-Oct-21	16:56
7-Oct-21	16:13	53318.17	7-Oct-21	16:35	50103.35	7-Oct-21	16:57
Max		53441.56	Max		53257.23	Max	
Avg		53233.45	Avg		51780.05	Avg	



CEMs Data

Client Name		Dow Chemical Thailand Ltd.		Location		TOX1 (ERU Stack)	
Plant Name		AIE_HPPO-TPO Plant					
Run No: 9		Run No: 10		Run No: 11		Run No: 12	
Date	Time	Flowrate kg/hr	Date	Time	Flowrate kg/hr	Date	Time
7-Oct-21	17:36	52620.89	7-Oct-21	17:58	53351.86	7-Oct-21	18:20
7-Oct-21	17:37	52832.20	7-Oct-21	17:59	53332.06	7-Oct-21	18:21
7-Oct-21	17:38	52802.74	7-Oct-21	18:00	52788.22	7-Oct-21	18:22
7-Oct-21	17:39	52877.83	7-Oct-21	18:01	54229.33	7-Oct-21	18:23
7-Oct-21	17:40	52763.71	7-Oct-21	18:02	54119.62	7-Oct-21	18:24
7-Oct-21	17:41	52836.80	7-Oct-21	18:03	52917.23	7-Oct-21	18:25
7-Oct-21	17:42	52741.44	7-Oct-21	18:04	54512.78	7-Oct-21	18:26
7-Oct-21	17:43	52712.83	7-Oct-21	18:05	53897.78	7-Oct-21	18:27
7-Oct-21	17:44	52748.19	7-Oct-21	18:06	52711.13	7-Oct-21	18:28
7-Oct-21	17:45	52856.15	7-Oct-21	18:07	52729.34	7-Oct-21	18:29
7-Oct-21	17:46	53154.49	7-Oct-21	18:08	52859.62	7-Oct-21	18:30
7-Oct-21	17:47	53131.24	7-Oct-21	18:09	52734.67	7-Oct-21	18:31
7-Oct-21	17:48	53148.58	7-Oct-21	18:10	52713.82	7-Oct-21	18:32
7-Oct-21	17:49	53031.93	7-Oct-21	18:11	52736.04	7-Oct-21	18:33
7-Oct-21	17:50	53053.31	7-Oct-21	18:12	52749.40	7-Oct-21	18:34
7-Oct-21	17:51	54379.22	7-Oct-21	18:13	52829.90	7-Oct-21	18:35
Max		54379.22	Max		54229.33	Max	
Avg		53046.23	Avg		53185.23	Avg	



CEMs Data

Client Name		Dow Chemical Thailand Ltd.		Location		TOX2 (ERU Stack)	
Plant Name		AIE_HPPO-TPO Plant					
Run No: 1		Run No: 2		Run No: 3		Run No: 4	
Date	Time	Flowrate kg/hr	Date	Time	Flowrate kg/hr	Date	Time
8-Oct-21	12:56	70222.18	8-Oct-21	13:12	71220.51	8-Oct-21	13:28
8-Oct-21	12:51	70203.96	8-Oct-21	13:13	71218.13	8-Oct-21	13:29
8-Oct-21	12:52	70228.60	8-Oct-21	13:14	71189.03	8-Oct-21	13:30
8-Oct-21	12:53	70771.84	8-Oct-21	13:15	71193.97	8-Oct-21	13:31
8-Oct-21	12:54	70722.77	8-Oct-21	13:16	71148.18	8-Oct-21	13:32
8-Oct-21	12:55	70808.85	8-Oct-21	13:17	71148.46	8-Oct-21	13:33
8-Oct-21	12:56	70808.59	8-Oct-21	13:18	71097.42	8-Oct-21	13:34
8-Oct-21	12:57	70858.22	8-Oct-21	13:19	71132.70	8-Oct-21	13:35
8-Oct-21	12:58	70828.90	8-Oct-21	13:20	71160.09	8-Oct-21	13:36
8-Oct-21	12:59	70814.22	8-Oct-21	13:21	71142.18	8-Oct-21	13:37
8-Oct-21	13:00	70878.29	8-Oct-21	13:22	71151.56	8-Oct-21	13:38
8-Oct-21	13:01	70845.38	8-Oct-21	13:23	70988.42	8-Oct-21	13:39
8-Oct-21	13:02	70846.76	8-Oct-21	13:24	71138.32	8-Oct-21	13:40
8-Oct-21	13:03	71000.33	8-Oct-21	13:25	71118.77	8-Oct-21	13:41
8-Oct-21	13:04	70897.38	8-Oct-21	13:26	71096.85	8-Oct-21	13:42
8-Oct-21	13:05	70905.61	8-Oct-21	13:27	71191.37	8-Oct-21	13:43
Max		71000.33	Max		71220.51	Max	
Avg		70805.08	Avg		71147.58	Avg	



CEMs Data

Client Name		Dow Chemical Thailand Ltd.		Location		TOX2 (ERU Stack)	
Plant Name		AIE HPPD-TPO Plant					
Run No. 5		Run No. 6		Run No. 7		Run No. 8	
Date	Time	Fluoride light	Date	Time	Fluoride light	Date	Time
6-Oct-21	14:20	70983.87	6-Oct-21	14:42	70733.70	6-Oct-21	15:14
6-Oct-21	14:21	70785.10	6-Oct-21	14:43	70685.14	6-Oct-21	15:15
6-Oct-21	14:22	70857.25	6-Oct-21	14:44	70734.81	6-Oct-21	15:16
6-Oct-21	14:23	70831.82	6-Oct-21	14:45	70801.38	6-Oct-21	15:17
6-Oct-21	14:24	71007.53	6-Oct-21	14:46	70762.11	6-Oct-21	15:18
6-Oct-21	14:25	70880.38	6-Oct-21	14:47	70718.83	6-Oct-21	15:19
6-Oct-21	14:26	70878.06	6-Oct-21	14:48	70629.09	6-Oct-21	15:20
6-Oct-21	14:27	70973.13	6-Oct-21	14:49	70623.91	6-Oct-21	15:21
6-Oct-21	14:28	70994.85	6-Oct-21	14:50	70616.40	6-Oct-21	15:22
6-Oct-21	14:29	70906.43	6-Oct-21	14:51	70646.67	6-Oct-21	15:23
6-Oct-21	14:30	70833.34	6-Oct-21	14:52	70627.84	6-Oct-21	15:24
6-Oct-21	14:31	70689.00	6-Oct-21	14:53	70611.01	6-Oct-21	15:25
6-Oct-21	14:32	70639.67	6-Oct-21	14:54	70606.34	6-Oct-21	15:26
6-Oct-21	14:33	70637.22	6-Oct-21	14:55	70608.18	6-Oct-21	15:27
6-Oct-21	14:34	70648.76	6-Oct-21	14:56	70647.41	6-Oct-21	15:28
6-Oct-21	14:35	70638.03	6-Oct-21	14:57	70613.30	6-Oct-21	15:29
Max		71007.53	Max		70784.81	Max	
Avg		70765.53	Avg		70629.38	Avg	



CEMs Data

Client Name		Dow Chemical Thailand Ltd.		Location		TOX2 (ERU Stack)	
Plant Name		AIE HPPD-TPO Plant					
Run No. 9		Run No. 10		Run No. 11		Run No. 12	
Date	Time	Fluoride light	Date	Time	Fluoride light	Date	Time
6-Oct-21	15:57	69937.07	6-Oct-21	16:20	71893.34	6-Oct-21	16:42
6-Oct-21	15:58	69986.16	6-Oct-21	16:21	71823.81	6-Oct-21	16:43
6-Oct-21	15:59	70346.21	6-Oct-21	16:22	71763.31	6-Oct-21	16:44
6-Oct-21	16:00	70666.25	6-Oct-21	16:23	71817.83	6-Oct-21	16:45
6-Oct-21	16:01	70877.36	6-Oct-21	16:24	71822.24	6-Oct-21	16:46
6-Oct-21	16:02	71004.84	6-Oct-21	16:25	71844.21	6-Oct-21	16:47
6-Oct-21	16:03	71476.31	6-Oct-21	16:26	71885.10	6-Oct-21	16:48
6-Oct-21	16:04	71839.88	6-Oct-21	16:27	71832.98	6-Oct-21	16:49
6-Oct-21	16:05	71893.70	6-Oct-21	16:28	71762.96	6-Oct-21	16:50
6-Oct-21	16:06	71748.55	6-Oct-21	16:29	71677.21	6-Oct-21	16:51
6-Oct-21	16:07	71802.16	6-Oct-21	16:30	71727.74	6-Oct-21	16:52
6-Oct-21	16:08	71644.47	6-Oct-21	16:31	71291.15	6-Oct-21	16:53
6-Oct-21	16:09	71895.34	6-Oct-21	16:32	70926.71	6-Oct-21	16:54
6-Oct-21	16:10	71919.38	6-Oct-21	16:33	70646.35	6-Oct-21	16:55
6-Oct-21	16:11	71747.48	6-Oct-21	16:34	70443.58	6-Oct-21	16:56
6-Oct-21	16:12	71560.87	6-Oct-21	16:35	70348.70	6-Oct-21	16:57
Max		71919.38	Max		71885.10	Max	
Avg		71299.06	Avg		71429.60	Avg	



Airgas Specialty Gases
Airgas USA, LLC
6141 Easton Road
Bldg. 1
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N189E15A0440
Cylinder Number: EB0137377
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12020
Gas Code: CO,NO,NOX,SO2,BALN
Reference Number: 160-401907847-1
Cylinder Volume: 144.4 Cubic Feet
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Oct 06, 2020
Expiration Date: Oct 06, 2028

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	80.00 PPM	80.27 PPM	G1	+/- 1.4% NIST Traceable	09/29/2020, 10/06/2020
CARBON MONOXIDE	80.00 PPM	80.53 PPM	G1	+/- 1.0% NIST Traceable	09/29/2020
NITRIC OXIDE	80.00 PPM	80.27 PPM	G1	+/- 1.4% NIST Traceable	09/29/2020, 10/06/2020
SULFUR DIOXIDE	80.00 PPM	79.00 PPM	G1	+/- 1.0% NIST Traceable	09/29/2020, 10/06/2020
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	11010130	KAL004536	97.31 PPM CARBON MONOXIDE/NITROGEN	+/- 0.4%	Oct 04, 2022
PRM	12386	D665025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
NTRM	17060226	EB0079109	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	07060227	EB0079116	100.8 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
NTRM	16010235	KAL004419	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	11010416	KAL004802	99.6 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jul 28, 2023

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet ISSO FTIR AUP2010245 CO	FTIR	Sep 21, 2020
Nicolet ISSO FTIR AUP2010245 NO	FTIR	Sep 14, 2020
Nicolet ISSO FTIR AUP2010245 NO2	FTIR	Sep 22, 2020
Nicolet ISSO FTIR AUP2010245 SO2	FTIR	Sep 16, 2020

Triad Data Available Upon Request

NOTES: Gross Weight: 27.8 Kg, Net Weight: 4.6 Kg.



Approved for Release

Page 1 of 160-401907847-1



Airgas Specialty Gases
Airgas USA, LLC
600 Union Landing Road
Cinnaminson, NJ 08077-0000
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N189E3H-A0026
Cylinder Number: ND62877
Laboratory: 124 - Riverton (SAP) - NJ
PGVP Number: B52018
Gas Code: CO,NO,NOX,SO2,BALN
Reference Number: 82-401257890-1
Cylinder Volume: 247.2 CF
Cylinder Pressure: 2215 PSIG
Valve Outlet: 660
Certification Date: Aug 07, 2018
Expiration Date: Aug 07, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	160.0 PPM	164.4 PPM	G1	+/- 1.1% NIST Traceable	07/30/2018, 08/07/2018
NITRIC OXIDE	160.0 PPM	164.4 PPM	G1	+/- 1.1% NIST Traceable	07/30/2018, 08/07/2018
SULFUR DIOXIDE	160.0 PPM	159.9 PPM	G1	+/- 1.1% NIST Traceable	07/30/2018, 08/07/2018
CARBON MONOXIDE	400.0 PPM	407.4 PPM	G1	+/- 1.1% NIST Traceable	07/30/2018
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	17060241	EB0079587	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	May 11, 2019
PRM	12386	5604119	29.86 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Jun 02, 2017
GMIS	704201014	CC303941	5.101 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Jun 01, 2020
NTRM	11010414	KAL004792	99.8 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.9%	Jul 28, 2023
NTRM	15080538	CC453507	491.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jan 08, 2021

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 8700 APW1100391 CO	FTIR	Jul 19, 2018
Nicolet 8700 APW1100391 NO	FTIR	Jul 12, 2018
Nicolet 8700 APW1100391 NO2	FTIR	Aug 03, 2018
Nicolet 8700 APW1100391 SO2	FTIR	Aug 02, 2018

Triad Data Available Upon Request

NOTES:
Net weight: 8107 grams
Gross weight: 47090 grams

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Document EPA-600/R-12/531. All testing processes and measurements conform to the ISO/IEC 17025 and to Airgas ISO 9001:2008 and relate only to items identified on this document as being NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



Approved for Release

Page 1 of 82-401257890-1

CERTIFICATE OF ANALYSIS

Customer Detail:

ALS Laboratory Group (Thailand)

Production Order Number: 90132928

Material Number: 478100-J-44

Certification Date: 20-Jan-2016

Expiry Date: 20-Jan-2024

Cylinder Description:

Steel 47 L

The measurement of this reference material is traceable to SI through the reference standard which is traceable to Swiss National Standard of Mass. The Assay of this Standard has been performed in accordance with the EPA Traceability Protocol EPA-600/B-12531 for the Assay and Certification of Gaseous Calibration Standards using procedure G1. The results are expressed on a mole/mole basis, unless otherwise specified. The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k=2, providing a level of confidence of approximately 95%.

Certificate Number:

4676/15

Analyst:

THIRAT LOYRAT

Cylinder Number:

S50730

Nominal Cylinder Content:

6.520 M³

Approve:

SUKANYA KAMUTHARAT

Nominal Pressure:

145.0 Bar

Valve Outlet:

CGA 590 BRASS

To Re-Order Please Quote:

478100-J-44

Comment:

- It is recommended that this product be not used below 5% of actual contents or should not be used when its gas pressure is below 150psig.
- Other impurities that detect by analytical condition of this mixture shall be report if it is more than 10% of minimum minor component.
- Keep and use in well-ventilated and secure area.

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

1515 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110

เบอร์ 15 โทรสาร 02-2622111-14 แฟกซ์ 02-2622111-15

โรงงานอุตสาหกรรม 10540 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110

เบอร์โทรสาร: 105 โทร 5 อุตสาหกรรม อุตสาหกรรม 24180

โทรสาร (66) 38.570-479-93 โทรสาร (66) 38.570-323

Linde (Thailand) Public Company Limited

P.O. Box 151515, Bangkok 10110

15th Floor, Bangna Tower A, 2/3 Moo 14, Bangna Trad RM, 6.5 Road, Bangnaew

Bangkok, Samutprakan 10540, Tel (66) 2338-6100 Fax (66) 2338-6333

Wellgrow Plant: 105 Moo 5, 1.Bangnamak, A.Bangkok, Chachoengsao 24180

Thailand, Tel (66) 38.570-479-93 Fax (66) 38.570-323

CERTIFICATE OF ANALYSIS

Analytical Result

Component	Request Concentration	Certified Concentration	Certified Uncertainty	Method	Assay Date
Oxygen in Nitrogen	8.00 %	7.93 %	±1% relative	(2) I-PB-354	20-Jan-2015

Reference Standard used in Assay

Reference Standard	Cylinder No.	Concentration	Expired Date
Oxygen in Nitrogen	24362SSG	25.08 ± 0.13 %	19-Aug-2017

Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Servomex 4100 O2 Analyzer	Paramagnetic	23-Dec-2015

Method of Analysis

- Gas Chromatograph
- Paramagnetic Oxygen Analyzer
- Electrochemical Oxygen Analyzer
- Electrochemical Moisture Analyzer
- Total Hydrocarbon Analyzer
- Other specified

Cylinder Number: S50730

Production Order Number: 90132928

Certification Date: 20-Jan-2016

Expiration Date: 20-Jan-2024

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

1515 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110

เบอร์ 15 โทรสาร 02-2622111-14 แฟกซ์ 02-2622111-15

โรงงานอุตสาหกรรม 10540 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110

เบอร์โทรสาร: 105 โทร 5 อุตสาหกรรม อุตสาหกรรม 24180

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Bangkok, Samutprakan 10540, Tel (66) 2338-6100 Fax (66) 2338-6333

Wellgrow Plant: 105 Moo 5, 1.Bangnamak, A.Bangkok, Chachoengsao 24180

Thailand, Tel (66) 38.570-479-93 Fax (66) 38.570-323

CERTIFICATE OF ANALYSIS

Customer Detail:

ALS Laboratory Group (Thailand)

Production Order Number: 90137389

Material Number: 557200-J-44

Certification Date: 24-Sep-2016

Expiry Date: 24-Sep-2024

Cylinder Description:

STEEL 47 L

The measurement of this reference material is traceable to SI through the reference standard which is traceable to Swiss National Standard of Mass. The Assay of this Standard has been performed in accordance with the EPA Traceability Protocol EPA-600/B-12531 for the Assay and Certification of Gaseous Calibration Standards using procedure G1. The results are expressed on a mole/mole basis, unless otherwise specified. The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k=2, providing a level of confidence of approximately 95%.

Certificate Number:

2857/16

Analyst:

THIRAT LOYRAT

Cylinder Number:

363075

Nominal Cylinder Content:

6.560 M³

Approve:

SUKANYA KAMUTHARAT

Nominal Pressure:

145.0 Bar

Valve Outlet:

CGA 590 BRASS

To Re-Order Please Quote:

557200-J-44

Comment:

- It is recommended that this product be not used below 5% of actual contents or should not be used when its gas pressure is below 150psig.
- Other impurities that detect by analytical condition of this mixture shall be report if it is more than 10% of minimum minor component.
- Keep and use in well-ventilated and secure area.

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

1515 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110

เบอร์ 15 โทรสาร 02-2622111-14 แฟกซ์ 02-2622111-15

โรงงานอุตสาหกรรม 10540 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110

เบอร์โทรสาร: 105 โทร 5 อุตสาหกรรม อุตสาหกรรม 24180

โทรสาร (66) 38.570-479-93 โทรสาร (66) 38.570-323

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Wellgrow Plant: 105 Moo 5, 1.Bangnamak, A.Bangkok, Chachoengsao 24180

Thailand, Tel (66) 38.570-479-93 Fax (66) 38.570-323

CERTIFICATE OF ANALYSIS

Analytical Result

Component	Request Concentration	Certified Concentration	Certified Uncertainty	Method	Assay Date
Oxygen in Nitrogen	16.0 %	16.0 %	±1% relative	(2) I-PB-354	24-Sep-2016

Reference Standard used in Assay

Reference Standard	Cylinder No.	Concentration	Expired Date
Oxygen in Nitrogen	24362SSG	25.08 ± 0.13 %	19-Aug-2017

Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Servomex 4100 O2 Analyzer	Paramagnetic	24-Sep-2016

Method of Analysis

- Gas Chromatograph
- Paramagnetic Oxygen Analyzer
- Electrochemical Oxygen Analyzer
- Electrochemical Moisture Analyzer
- Total Hydrocarbon Analyzer
- Other specified

Cylinder Number: 363075

Production Order Number: 90137389

Certification Date: 24-Sep-2016

Expiration Date: 24-Sep-2024

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

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Wellgrow Plant: 105 Moo 5, 1.Bangnamak, A.Bangkok, Chachoengsao 24180

Thailand, Tel (66) 38.570-479-93 Fax (66) 38.570-323



CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date : 18 Jul 21
Next Cal. Date : 18 Jan 22
Barometric Pressure (mm.Hg) : 755
Relative Humidity (%) : 60.0
Temperature (°C) : 26.0
Reference Dry Gas Meter Data
Serial No. : 1807009
Model No. : DGM-SK29RW-QS8
Correction Factor (Vr) : 1.0060
Next Calibration Date : 8 Apr 22

ΔH (mm.H ₂ O)	Θ Minutes	Reference Dry Gas Meter Calibration				Console Control : Drygas Meter								Dry Gas Meter Correction Factor (V)	Orifice Calibration Factor ΔH/g
		Vr (Liters)		Tr (°C)		Vm (Liters)		Ti (°C)		To (°C)		Avg.Tm (°C)			
15	12.45	Final	Initial	Total		Frcit	Initial	Total							
	150.00	0.00	150.00	26.0		1389851.4	1390706.0	145.40		26.0	26.0	26.0	1.0383	47.1028	
25	9.80	150.00	0.00	150.00	26.0	1390005.0	1390860.0	145.80		26.0	26.0	26.0	1.0382	46.6766	
50	6.75	150.00	0.00	150.00	26.0	1390156.8	1390917.0	144.80		26.0	26.0	26.0	1.0371	46.1524	
80	5.23	150.00	0.00	150.00	26.0	1390316.8	1390917.0	144.80		27.0	27.0	27.0	1.0390	44.1835	
120	4.25	150.00	0.00	150.00	26.0	1390481.0	1390937.0	144.00		27.0	27.0	27.0	1.0393	43.7549	
													Avg:	45.5761	

Y Ratio of reading of reference to dry gas meter; tolerance for individual values ± 0.02 from average.
ΔH_g Orifice pressure differential that equals to 21.24 in of air @ 20 C and 760 mm of mercury, mmH₂O; tolerance for individual values ± 5.08 from average.
Procedure: 40 CFR 60 APP A.METH. SEC 5.3 & 7

Calibrated by : Saksit Phaisanphisit
(Mr. Saksit Phaisanphisit)
Field Scientist (4)

Approved by : Wichan Choonharat
(Mr. Wichan Choonharat)
Manager



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	18-Jul-21	Ambient Temperature (°C) :	26
Calibration sheet No. :	C-180721-BKK_FS0557	Relative Humidity (%) :	60
Digital Temperature ID	BKK_FS0557	Reference Temperature ID :	BKK_FS0609
Console Serial No. :	1606041	Serial No. :	7888004
Console Model :	XC-572-V	Model :	FLUKE 714
		Next Calibrate :	13 Jan 22

Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	1	1	
	25	26	1	
	50	51	1	
	100	102	2	
	150	153	3	
	200	202	2	
	250	251	1	
	300	302	2	
	500	503	3	
	1000	1001	1	
Probe	1200	1201	1	
	100	102	2	
	125	128	3	
Oven	150	153	3	
	100	102	2	
	125	128	3	
Filter	150	153	3	
	100	102	2	
	125	128	3	
Exit	150	153	3	
	0	1	1	
	10	11	1	
Meter	20	20	0	
	0	1	1	
	25	26	1	
AUX	50	51	1	
	0	1	1	
	25	26	1	
	50	51	1	

Calibrated by : Saksit Phaisanphisit
(Mr. Saksit Phaisanphisit)
Field Scientist (4)

Approved by : Wichan Choonharat
Mr. Wichan Choonharat
Manager

Form 281-048 (02/03/02)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0560
Lab test duct Number : 258-1-13-01
Calibration Sheet No. : C-180721-BKK_FS0560
Calibration Date : 18 Jul 21
Standard Pitot ID : BKK_FS0441
Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm.H ₂ O)	Type s pitot tube (ΔP, mm.H ₂ O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			C _p	0.842	0.842

$$Cp(S) = Cp \cdot \sqrt{\frac{\Delta P (std)}{\Delta P (s)}}$$
$$[Cp_{(A)} - Cp_{(B)}] \text{ must BE } \leq 0.01$$
$$\text{Average deviation (A or B)} = \frac{\sum [Cp (s) - Cp (A or B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by : Saksit Phaisanphisit
(Mr. Saksit Phaisanphisit)
Field Scientist (4)

Approved by : Wichan Choonharat
(Mr. Wichan Choonharat)
Manager

Form 281-046 (14/03/02)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0561
Lab test duct Number : 258-1-13-01
Calibration Sheet No. : C-180721-BKK_FS0561
Calibration Date : 18 Jul 21
Standard Pitot ID : BKK_FS0441
Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm.H ₂ O)	Type s pitot tube (ΔP, mm.H ₂ O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			C _p	0.842	0.842

$$Cp(S) = Cp \cdot \sqrt{\frac{\Delta P (std)}{\Delta P (s)}}$$
$$[Cp_{(A)} - Cp_{(B)}] \text{ must BE } \leq 0.01$$
$$\text{Average deviation (A or B)} = \frac{\sum [Cp (s) - Cp (A or B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by : Saksit Phaisanphisit
(Mr. Saksit Phaisanphisit)
Field Scientist (4)

Approved by : Wichan Choonharat
(Mr. Wichan Choonharat)
Manager

Form 281-046 (14/03/02)



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date	18 Jul 21	Nozzle Set ID.:	BKK_FS0562
Calibration Sheet No.:	C-180721-BKK_FS0562	Vernier Caliper ID.:	BKK_FS0626

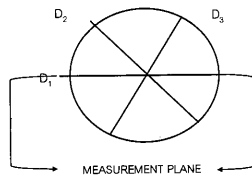
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo ΔD	$(D_1 + D_2 + D_3) / 3$ D_{avg}
	D_1	D_2	D_3		
1	0.300	0.306	0.302	0.006	0.303
2	0.480	0.475	0.480	0.005	0.478
3	0.625	0.630	0.630	0.005	0.628
4	0.755	0.750	0.765	0.015	0.757
5	0.975	0.980	0.970	0.010	0.975
6	1.095	1.090	1.095	0.005	1.093
7	1.275	1.275	1.270	0.005	1.273
8	1.610	1.610	1.610	0.000	1.610

Where:

D_1, D_2, D_3 = There different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm.

ΔD = Maximum distance between any two diameters, must be ≤ 0.100 mm.

D_{avg} = $(D_1 + D_2 + D_3) / 3$



Calibrated by: Saksit Phaisanphisit Approved by: Wichan Choonharat
(Mr. Saksit Phaisanphisit) (Mr. Wichan Choonharat)
Field Scientist (4) Manager

Form No. Q5 281-025 (13/01/03)

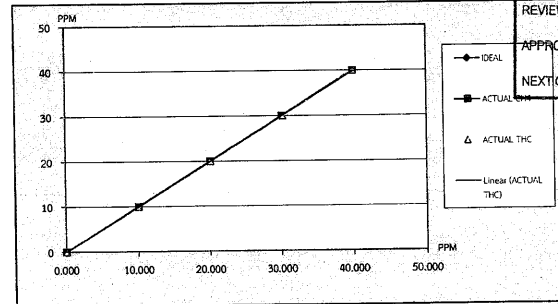


TEST REPORT

CUSTOMER NAME	ALS Laboratory Group (Thailand) Co., Ltd. (บริษัท แอลเอส แล็บราทอรี กรุ๊ป (ประเทศไทย) จำกัด)		
EQUIPMENT NAME	THC Analyzer		
MANUFACTURER	HORIBA	MODEL	APHA-370
SERIAL NO.	U430GTHB		
STANDARD GAS CONCENTRATION (PPM)	506.1 PPM		
CYLINDER NO.	CC734373		
CYLINDER PRESSURE (psig)	1,000 PSI		
CERTIFIED DATE	12/05/2020		
CERTIFIED BY	AIRGAS		
EXPIRED DATE	12/05/2028		

TEST RESULTS

POINT NO	IDEAL	ACTUAL CH4	ERROR CH4	%ERROR CH4	ACTUAL THC	ERROR THC	%ERROR THC
ZERO	0.000	0.000	0.000	-	0.000	0.000	-
1	10.000	10.040	0.040	0.40	10.090	0.090	0.90
2	20.000	20.080	0.080	0.40	20.200	0.200	1.00
3	30.000	30.120	0.120	0.40	30.320	0.320	1.07
4	40.000	39.990	-0.010	-0.02	40.020	0.020	0.05
AVERAGE (%)				0.29			0.75



REVIEW BY: Thamthak
APPROVED BY: De
NEXT CAL DATE: 8/7/2022

CALIBRATED BY: Wichan Choonharat DATE: 8/7/21
CHECKED BY: Rug DATE: 8/7/21

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม: กรุณาติดต่อฝ่ายบริการลูกค้า โทร 02-868-0812 # 15,16, E-Mail: Engineer@jiranatee.com
เลขที่ 63/14-15,67/35-36 ถนนเพชรเกษม 7/7 แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพมหานคร 10600 โทร 02-868-0812-13 โทรสาร 02-868-1889

FO-EN-206 R01/22-10-14



CHECK LIST

CUSTOMER NAME	ALS Laboratory Group (Thailand) Co., Ltd. (บริษัท แอลเอส แล็บราทอรี กรุ๊ป (ประเทศไทย) จำกัด)		
EQUIPMENT NAME	THC Analyzer		
MANUFACTURER	HORIBA	MODEL	APHA-370
SERIAL NO.	U430GTHB		

TEST VALUES			
NO.	THC Analyzer (APHA-370)	UNIT	BEFORE AFTER
1	Signal (THC)	mV	25.60 25.70
2	Signal (CH4)	mV	31.90 34.30
3	Detector	Temp °C, Standard Value: Ambient temp(5°C to 15°C) Pressure kPa, Standard Value: (Ambient/1013x100-20)±4kPa	49.50 47.80 81.10 80.80
4	Ambient	kPa current atmospheric pressure	100.70 100.40
5	Purifire	°C, Standard Value: 390 °C to 430 °C	419.90 420.00
6	NMHC	kPa, Normal value: 6 kPa to 25 kPa	10.30 10.30
7	DC 24 V	°C, Standard Value: 230 °C to 260 °C	242.90 243.50
8	DC 5 V	V, Standard Value: 24 V ± 0.5 V	23.90 23.90
9	Bypass (Optional)	V, Standard Value: 5 V ± 0.5 V	5.00 5.00
10	Over Flow (Optional)	L/min, Normal value: 0.9 L/min ± 0.3 L/min	- -
11	CH4 Sampling Reading	L/min, Standard Value: 0.8 L/min or More	- -
12	THC Sampling Reading	PPM	2.65 2.02
13	NMHC Sampling Reading	PPM	0.44 0.54
14	Zero Gas CH4/THC	PPM	3.09 2.56
15	Sapn Gas	PPM	0.16/0.25 0.00/0.00
16	G Gas H2 20/L.300	PPM	29.42/29.3 39.99/40.02

อาการที่ตรวจพบ

- เครื่องปกติ

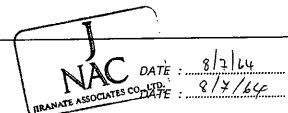
รายละเอียดการดำเนินการ

- จด Check list Analyzer, ทำการ calibrate Zero/Span และทำ Calibrat แบบ Multi Point

ผลการดำเนินการ

- เครื่องใช้งานได้ปกติ

CALIBRATED BY: Wichan Choonharat
CHECKED BY: Rug



ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม: กรุณาติดต่อฝ่ายบริการลูกค้า โทร 02-868-0812 # 15-16, E-Mail: Engineer@jiranatee.com
เลขที่ 63/14-15 ซอยเพชรเกษม 7 ถนนเพชรเกษม แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพมหานคร 10600 โทร 02-868-0812-13 โทรสาร 02-868-1889

FO-EN-207 R01/22-09-14



ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,

Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860-8 Fax: +66 2324 0917-8



Certificate No.: 0147SV21
Operation No.: CP2021030034

Certificate of Calibration

Equipment: Sound Calibrator

Manufacturer: RION

Model/Type: NC-74

Serial No.: 34178121

ID No.: RYG_FS0213

Customer: ALS Laboratory Group (Thailand) Co., Ltd.

Address: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan Khet Suan Luang, Bangkok 10250 Thailand

Received Date: 19 March 2021

Calibrated Date: 24 March 2021

Issued Date: 25 March 2021

Calibrated by: Ms. Juntaporn Kunhakom

REVIEW BY: Nantawong P.
APPROVED BY: De
NEXT CAL DATE: 8/7/22

Approved by:

(Mr. Sittichai Swaksuriyawong)
Group Manager

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor $k = 2.00$, providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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F-CAL-004 Ed.0



Certificate No.: 01475V21

Calibration Report

Equipment: Sound Calibrator
Manufacturer: RION
Model/Type: NC-74
Serial No.: 34178121
ID No.: RYG_FS0213
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-
IEC 60942:2017

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1013-20	12 May 2021
2) Waveform Generator	33511B	MY52302264	0100RF20	17 June 2021
3) Audio Analyzing DMM	2015-P	000136E	E1U203927	16 November 2021
4) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P200051 0305TE20	31 May 2021 29 June 2021

2. This result of calibration was found accurate as shown on date and place of calibration only.

3. This certification is traceable to the international system of unit maintained at :-

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- Electrical and Electronics Institute; ONSC Accredited Calibration No.0119

Result of Calibration:

1. Function : Sound pressure level

Normal	Specified Sound	Measured value	Deviated value ^[1]	Acceptance limit ^[3]
Frequency (Hz)	Pressure level (dB)	(dB)	(dB)	(dB)
1000	94	94.16	0.16	±0.25

2. Function : Frequency

Normal Sound	Specified Frequency	Measured value	Deviated value ^[2]	Acceptance limit ^[3]
Pressure level (dB)	(Hz)	(Hz)	(%)	(%)
94	1000	1003.1	0.3	±0.7

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd, Bangbunru, Bangkok 10700 THAILAND
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22025
Pages : 1 of 8

Calibration Certificate

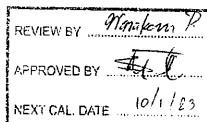
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00734221 / 145286 / 34371
ID No.: RYG_FS0027

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 05 JANUARY 2022
Calibration Date : 10-12 JANUARY 2022
Date of Issue : 13 JANUARY 2022



Calibrated by : Nathakorn Pisutpaisan

Approved by :

(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.



Certificate No.: 01475V21

Calibration Report

3. Function : Total distortion + noise

Normal	Normal	Measured value ^[4]	Acceptance limit ^[5]
Sound Pressure level (dB)	Frequency (Hz)	(%)	(%)
94	1000	1.6	2.5

Uncertainty of measurement

Function	Uncertainty	Maximum-permitted uncertainty of measurement
Sound pressure level	0.10 dB	0.15 dB
Frequency	0.10 %	0.20 %
Total distortion + noise	0.40 %	0.50 %

Note: [1] The deviated value is the absolute value of the difference between the measured value and the corresponding specified sound pressure level.
[2] The deviated value is the absolute value of the difference in percent between the measured value and the corresponding specified frequency.
[3] The acceptance limit is for the deviated value.
[4] The measured value is the total distortion + noise, measured over the frequency range from 20 Hz to 20 kHz.
[5] The acceptance limit is for the Measured value.

Remarks: 1. Using the 1/2-inch microphone adaptor NC-74-002.

2. Acceptance limit was IEC 60942:2017 Class 1.

-- End of Report --

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP./05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Continuation of Calibration Certificate

Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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Continuation of Calibration Certificate

Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
16.2

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	18.0
Flat	23.9

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.6	± 1.5
1000	0.0	0.0	0.1	± 1.0
8000	-2.3	-2.3	-2.3	± 5.0

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Continuation of Calibration Certificate

Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.1	0.1	± 0.3

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Continuation of Calibration Certificate

Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.0	0.0	± 1.1

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Continuation of Calibration Certificate

Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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Continuation of Calibration Certificate

Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.6	0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

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→ P.T.A



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT
975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280
Tel: +66 2709 4860-8 Fax: +66 2324 0917-8



ISO 9001:2015
CALIBRATION 0119

Certificate No.: 0168SV21
Operation No.: CP2021040004

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: RION

Model/Type: NL-42 (Meter), UC-52 (Microphone), NH-24 (Preamplifier)

Serial No.: 00734223 (Meter), 157777 (Microphone), 22653 (Preamplifier)

ID No.: RYG_FS0029

Customer: ALS Laboratory Group (Thailand) Co.,Ltd.

Address: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan Khet Suan Luang, Bangkok 10250 Thailand

Received Date: 7 April 2021

Calibrated Date: 21 - 27 April 2021

Issued Date: 28 April 2021

Calibrated by: Ms. Juntaporn Kunhakom

REVIEW BY: *Mr. Sittichai Swaksuriyawong*


APPROVED BY: *Mr. Sittichai Swaksuriyawong*

NEXT CAL. DATE: 21/04/22


Approved by: *Mr. Sittichai Swaksuriyawong*
(Mr. Sittichai Swaksuriyawong)
Group Manager

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor: $k = 2.00$, providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT



ISO 9001:2015
CALIBRATION 0119

Certificate No.: 0168SV21

Calibration Report

Equipment: Sound Level Meter

Manufacturer: RION

Model/Type: NL-42 (Meter), UC-52 (Microphone), NH-24 (Preamplifier)

Serial No.: 00734223 (Meter), 157777 (Microphone), 22653 (Preamplifier)

ID No.: RYG_FS0029

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Pressure: (101.3 ± 1.5) kPa

Method of Calibration :- IEC61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1013-20	12 May 2021
2) Sine generator	1051	1501442	0151RF20	21 September 2021
3) Arbitrary Function Generator	AFG2021	C010063	0099RF20	17 June 2021
4) Programmable Attenuator	PA5	2755	EF-0034-20	10 November 2021
5) 6.5 Digit precision multimeter	8846A	9609027	0498EL20	10 August 2021
6) 6.5 Digit precision multimeter	8846A	9610014	0669EL20	27 October 2021
7) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P200051	31 May 2021
8) Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P200052	28 June 2021

2. This result of calibration was found accurate as shown on date and place of calibration only.

3. This certification is traceable to the international system of unit maintained at :-

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute; ONSC Accredited Calibration No.0119

Result of Calibration:

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.0

Note : Absolute sensitivity was established by the use of the Sound Calibrator RION Type NC-74 S/N : 34615278.

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Certificate No.: 0168SV21

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone installed

Measured value (dB)
19.1

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	12.0
C-weighting	18.5
Z-weighting	23.8

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

Meter free-field acoustic response at a level of 84 dB.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.6	0.7	0.6	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-2.4	-2.4	-2.4	±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	-0.1	0.0	±2.0
125	0.0	-0.1	0.0	±1.5
250	0.0	-0.1	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	0.1	0.0	±2.0
4000	0.1	0.0	0.0	±3.0
8000	0.1	0.1	0.0	±5.0

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

Certificate No.: 0168SV21

Calibration Report

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
124.0	124.0	0.0	±1.1
129.0	129.0	0.0	±1.1
130.0	130.0	0.0	±1.1
131.0	131.0	0.0	±1.1
132.0	132.0	0.0	±1.1
133.0	133.0	0.0	±1.1
134.0	134.0	0.0	±1.1
135.0	135.0	0.0	±1.1
136.0	136.0	0.0	±1.1
137.0	137.0	0.0	±1.1

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1

Certificate No.: 0168SV21

Calibration Report

7.2 Level Linearity on the reference level range, Lower (Cont.)

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	126.0	0.0	±1.0
	2	109.0	0.0	+1.0 ; -2.5
	0.25	99.9	-0.1	+1.5 ; -5.0
Slow	200	119.6	0.0	±1.0
	2	100.0	0.0	+1.0 ; -5.0
	200	120.0	0.0	±1.0
LAeq	2	100.0	0.0	+1.0 ; -2.5
	0.25	90.9	-0.1	+1.5 ; -5.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	125.4	125.2	-0.2	±3.0
Positive half cycle	124.4	124.1	-0.3	±2.0
Negative half cycle	124.4	124.1	-0.3	±2.0

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
139.5	139.4	-0.1	±1.5

Certificate No.: 0168SV21

Calibration Report

Function : 11. High-Level Stability

High-Level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	129.0	129.0	0.0	±0.3

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks: 1. The acceptance limit is for the deviated value.
2. Acceptance limits was IEC61672-3:2013 Class 2.

-- End of Report --

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL21098
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00472126 / 180410 / 88180
ID No.: RYG_FS0301

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 01 SEPTEMBER 2021
Calibration Date : 13-15 SEPTEMBER 2021
Date of Issue : 16 SEPTEMBER 2021

REVIEW BY: *Nathakorn P.*
APPROVED BY: *T. Petchuraj*
NEXT CAL. DATE: 13/9/22

Calibrated by : Nathakorn Pisutpaisan

Approved by : *T. Petchuraj*
(Thanakul Petchuraj)

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC0066
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC0066
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	8846A	1997025	EEL.BP. 06/0264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC0066
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
26.1

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A-weight	12.0
C-weight	18.4
Flat	23.9

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-1.6	-1.6	-1.6	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.4	0.5	0.5	± 5.0

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Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC0066
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.2	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	±0.2
Flat	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	±0.1
Leq	94.0	0.0	±0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	±0.3

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P.T.A.

Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC0066
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.1	0.1	±1.1
84.0	84.1	0.1	±1.1
79.0	79.1	0.1	±1.1
74.0	74.1	0.1	±1.1
69.0	69.1	0.1	±1.1
64.0	64.1	0.1	±1.1
59.0	59.1	0.1	±1.1
54.0	54.0	0.0	±1.1
49.0	49.1	0.1	±1.1
44.0	44.0	0.0	±1.1
39.0	39.1	0.1	±1.1
34.0	34.0	0.0	±1.1
30.0	30.1	0.1	±1.1
29.0	29.1	0.1	±1.1
28.0	28.1	0.1	±1.1
27.0	27.2	0.2	±1.1
26.0	26.2	0.2	±1.1
25.0	25.2	0.2	±1.1

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P.T.A.

Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC0066
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5; -5.0
	2	8	117.0	117.0	0.0	1.0; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5; -5.0
SEL	2	8	108.0	108.0	0.0	1.0; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.8	-0.6	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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P.T.A.

Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC0066
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.0	±1.5
89.5	89.5		

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

P.T.A.

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22059
Pages : 1 of 8

Calibration Certificate

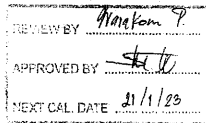
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00734220 / 145272 / 34370
ID No.: RYG_FS0026

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAEANG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 14 JANUARY 2022
Calibration Date : 21-24 JANUARY 2022
Date of Issue : 25 JANUARY 2022



Calibrated by : Nathakorn Pisutpaisan

Approved by :
(Thanakul Petchurai)

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22059
Job No. : VC65AC0043
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	I-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22059
Job No. : VC65AC0043
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22059
Job No. : VC65AC0043
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	17.8
Flat	23.7

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.6	-1.5	-1.5	± 5.0

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QF-TS 2-04-24-020664

Continuation of Calibration Certificate

Cert. No. : ACL22059
Job No. : VC65AC0043
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
				±2.0
63	0.0	0.0	0.0	±1.5
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.0
1000	0.0	0.0	0.0	±2.0
2000	0.0	0.1	0.0	±3.0
4000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

QF-TS12-04-04-020664

T. P. A.

Continuation of Calibration Certificate

Cert. No. : ACL22059
Job No. : VC65AC0043
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.1	-0.3	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QF-TS12-04-04-020664

T. P. A.

Continuation of Calibration Certificate

Cert. No. : ACL22059
Job No. : VC65AC0043
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.0	0.0	± 1.1

QF-TS12-04-04-020664

T. P. A.

Continuation of Calibration Certificate

Cert. No. : ACL22059
Job No. : VC65AC0043
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.7	0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

T. P. A.

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthon Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACC22001
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-75
Serial No. : 35002736
ID No. : - 5.16 (45)

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 05 JANUARY 2022
Calibration Date : 10 JANUARY 2022
Date of Issue : 13 JANUARY 2022

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>T. Petchur</i>
NEXT CAL DATE	10/1/23

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchur)

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22001
Job No. : VC65AC0040
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	33461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-21	10-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

T. Petchur

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22001
Job No. : VC65AC0040
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	93.99	-0.01	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1000.0	0.0	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
0.28	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %.

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petchur

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthon Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.
Telo:2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL21101
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 01173610 / 143485 / 22619
ID No. : RYG_FS0389

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 01 SEPTEMBER 2021
Calibration Date : 13-15 SEPTEMBER 2021
Date of Issue : 16 SEPTEMBER 2021

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>T. Petchur</i>
NEXT CAL DATE	15/9/22

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchur)

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Continuation of Calibration Certificate

Cert. No. : ACL21101
Job No. : VC64AC0066
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	8846A	1997025	EEL.BP. 06/0264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21101
Job No. : VC64AC0066
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.35
10. Peak C sound level	✓	-	0.2	0.25
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21101
Job No. : VC64AC0066
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
18.5

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A-weight	13.1
C-weight	19.3
Flat	24.9

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.0	0.0	±1.5
1000	-0.2	-0.2	-0.1	±1.0
8000	-0.5	-0.4	-0.4	±5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21101
Job No. : VC64AC0066
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.2	-0.1	±2.0
125	-0.1	-0.1	-0.1	±1.5
250	0.0	-0.1	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	0.0	-
C-weight	94.0	0.0	±0.2
Flat	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	±0.1
Leq	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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Continuation of Calibration Certificate

Cert. No. : ACL21101
Job No. : VC64AC0066
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.1	0.1	±1.1
136.0	136.1	0.1	±1.1
135.0	135.1	0.1	±1.1
134.0	134.1	0.1	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.1	0.1	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.1	0.1	±1.1
104.0	104.1	0.1	±1.1
99.0	99.1	0.1	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.1	0.1	±1.1
27.0	27.2	0.2	±1.1
26.0	26.2	0.2	±1.1
25.0	25.2	0.2	±1.1

Continuation of Calibration Certificate

Cert. No. : ACL21101
Job No. : VC64AC0066
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5; -5.0
	2	8	117.0	117.0	0.0	1.0; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5; -5.0
SEL	2	8	108.0	108.0	0.0	1.0; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.9	-0.5	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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Continuation of Calibration Certificate

Cert. No. : ACL21101
Job No. : VC64AC0066
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

451-451/1 Sirinthon Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL21102
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 01173611 / 172173 / 74023
ID No. : RYG_FS0390

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 01 SEPTEMBER 2021
Calibration Date : 13-15 SEPTEMBER 2021
Date of Issue : 16 SEPTEMBER 2021

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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Continuation of Calibration Certificate

Cert. No. : ACL21102
Job No. : VC64AC0066
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP. 03/0264	08-Feb-22
Digital Multimeter	8846A	1997025	EEL-BP. 06/0264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774B	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21102
Job No. : VC64AC0066
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.3	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.35
10. Peak C sound level	✓	-	0.2	0.25
11. Overload indication	✓	-	0.2	0.1
12. High level stability	✓	-	0.1	

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21102
Job No. : VC64AC0066
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	17.8
Flat	22.8

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.6	0.6	0.6	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.3	-0.2	-0.2	± 5.0

Continuation of Calibration Certificate

Cert. No. : ACL21102
Job No. : VC64AC0066
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	-0.1	±2.0
125	-0.1	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	±0.2
Flat	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	±0.1
Leq	94.0	0.0	±0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

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Continuation of Calibration Certificate

Cert. No. : ACL21102
Job No. : VC64AC0066
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.9	-0.1	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

Continuation of Calibration Certificate

Cert. No. : ACL21102
Job No. : VC64AC0066
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5; -5.0
	2	8	117.0	117.0	0.0	1.0; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5; -5.0
SEL	2	8	108.0	108.0	0.0	1.0; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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Continuation of Calibration Certificate

Cert. No. : ACL21102
Job No. : VC64AC0066
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.6	0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

451-451/1 Sirinthorn Rd., Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.comCert. No. : ACL21100
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 01173609 / 172170 / 74021
ID No. : RYG_FS0388

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK. 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 01 SEPTEMBER 2021
Calibration Date : 13-15 SEPTEMBER 2021
Date of Issue : 16 SEPTEMBER 2021

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced
other than in full, except with the prior written approval of the head of Calibration Laboratory.

Continuation of Calibration Certificate

Cert. No. : ACL21100
Job No. : VC64AC0066
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP.05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP.03/0264	08-Feb-22
Digital Multimeter	8846A	1997025	EEL.BP.06/0264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21100
Job No. : VC64AC0066
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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Continuation of Calibration Certificate

Cert. No. : ACL21100
Job No. : VC64AC0066
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.1

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A-weight	12.0
C-weight	18.1
Flat	23.9

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-0.7	-0.6	-0.6	±5.0

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Continuation of Calibration Certificate

Cert. No. : ACL21100
Job No. : VC64AC0066
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	0.0	-
C-weight	94.0	0.0	±0.2
Flat	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	±0.1
Leq	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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Continuation of Calibration Certificate

Cert. No. : ACL21100
Job No. : VC64AC0066
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.1	0.1	±1.1
27.0	27.1	0.1	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

Continuation of Calibration Certificate

Cert. No. : ACL21100
Job No. : VC64AC0066
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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Continuation of Calibration Certificate

Cert. No. : ACL21100
Job No. : VC64AC0066
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Sirinthorn Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.comCert. No. : ACC21009
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No. : 34178123
ID No. : RYG_FS0215

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 05 AUGUST 2021
Calibration Date : 09 AUGUST 2021
Date of Issue : 11 AUGUST 2021

REVIEW BY	<i>[Signature]</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	9/18/22

Calibrated by : Nathakorn Pisutpaisan

Approved by :

[Signature]
(Thanakul Petchurai)

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Continuation of Calibration Certificate

Cert. No. : ACC21009
Job No. : VC64AC0058
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	8846A	1997025	EEL.BP. 06/0264	05-Feb-22
Digital Multimeter	33461A	MY53220116	EEL.BP. 04/0264	10-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22
Audio Analyzer	AVR-3360A	V744B6069	EF-0016-21	10-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Continuation of Calibration Certificate

Cert. No. : ACC21009
Job No. : VC64AC0058
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	94.06	0.06	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1001.5	0.1	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
1.67	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY451-451/1 Sirinthorn Rd., Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel: 0-2435-8800 Fax: 0-2433-1679 e-mail: cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL22060
Pages : 1 of 8

Calibration Certificate

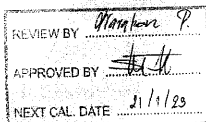
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 00734225 / 169439 / 72460
ID No. : RYG_FS0030

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 14 JANUARY 2022
Calibration Date : 21-24 JANUARY 2022
Date of Issue : 25 JANUARY 2022



Calibrated by : Nathakorn Pisutpaisan

Approved by :

(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22060
Job No. : VC65AC0043
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22060
Job No. : VC65AC0043
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.4	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QF-TS12-04-04-020664

T. R. H.

Continuation of Calibration Certificate

Cert. No. : ACL22060
Job No. : VC65AC0043
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

QF-TS12-04-04-020664

T. R. H.

Continuation of Calibration Certificate

Cert. No. : ACL22060
Job No. : VC65AC0043
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	10.8
C - weight	17.2
Flat	23.0

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.5	0.5	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-1.6	-1.5	-1.5	±5.0

QF-TS12-04-04-020664

T. R. H.

Continuation of Calibration Certificate

Cert. No. : ACL22060
Job No. : VC65AC0043
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

QF-TS12-04-04-020664

T. R. H.

Continuation of Calibration Certificate

Cert. No. : ACL22060
Job No. : VC65AC0043
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5; -5.0
	2	8	117.0	117.0	0.0	1.0; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5; -5.0
	2	8	108.0	108.0	0.0	1.0; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.8	-0.6	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QF-TS12-04-04-020664

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CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22062
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 01222723 / 143841 / 22770
ID No. : RYG_FS0022

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 14 JANUARY 2022
Calibration Date : 21-24 JANUARY 2022
Date of Issue : 25 JANUARY 2022

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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Continuation of Calibration Certificate

Cert. No. : ACL22060
Job No. : VC65AC0043
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	-0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22062
Job No. : VC65AC0043
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	33461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22062
Job No. : VC65AC0043
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22062
Job No. : VC65AC0043
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

QF-TS12-04-04-020604

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22062
Job No. : VC65AC0043
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	12.0
C - weight	18.0
Flat	24.1

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-0.4	-0.3	-0.3	±5.0

QF-TS12-04-04-020604

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22062
Job No. : VC65AC0043
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22062
Job No. : VC65AC0043
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5; -5.0
	2	8	117.0	117.0	0.0	1.0; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5; -5.0
SEL	2	8	108.0	108.0	0.0	1.0; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.8	-0.6	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbunru, Bangkok Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22032
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 01222724 / 143842 / 22771
ID No.: RYG_FS0023

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 05 JANUARY 2022
Calibration Date : 10-12 JANUARY 2022
Date of Issue : 13 JANUARY 2022

Calibrated by : Nathakorn Pisutpaisan

Approved by :

(Thanakul Petchurai)

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Continuation of Calibration Certificate

Cert. No. : ACL22062
Job No. : VC65AC0043
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22032
Job No. : VC65AC0040
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments. For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22032
Job No. : VC65AC0040
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Continuation of Calibration Certificate

Cert. No. : ACL22032
Job No. : VC65AC0040
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	12.8
C - weight	19.5
Flat	25.0

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.0	-0.9	-0.9	±5.0

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Continuation of Calibration Certificate

Cert. No. : ACL22032
Job No. : VC65AC0040
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	0.0	±2.0
125	-0.1	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

Continuation of Calibration Certificate

Cert. No. : ACL22032
Job No. : VC65AC0040
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

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Continuation of Calibration Certificate

Cert. No. : ACL22032
Job No. : VC65AC0040
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QF-TS12-04-04-020664

T. R. K.

63/14-15,67/35-36, Soi Petchkasem 7/71, Petchkasem Rd,
Walthapra, Bangkokhyai, Bangkok 10600 Thailand.
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com

CERTIFICATE OF CALIBRATION

Certificate No. : CL-045-64
Page 1 of 2Equipment Name : Heat Stress Monitor with Sensor
Manufacturer : DeltaOHM
Model: HD32.2
Serial No: 15020724
ID No: RYG_FS0228Customer
Name : ALS laboratory group (thailand) Co.,Ltd.
Address : 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.Received date : 05 JUL 2021
Calibration date : 09 JUL 2021
issue date : 13 JUL 2021REVIEW BY *Handwritten*
APPROVED BY *Handwritten*
EXT. CAL. DATE *Handwritten*Reference Used During Calibration
1. Standard Temperature Probe Model : STS-100 A500, Serial No. : 667682-09, Due date : 25 Mar 2022
2. Digital Temperature Indicator Model : DTI-1000-A MK II, Serial No. : 671407-00591 Due date : 04 June 2022Calibration Condition
Temperature : (23±3)°C
Relative Humidity : (55±15)%Calibration Procedure
The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.Traceability
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number : IT-0036-21, Certificate number : ER-0032-21Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Orathai WiwatwittayaApproved Signatory: *Handwritten*
Mr. Parinya Booncharoen
Technical Support
And Calibration Manager

Continuation of Calibration Certificate

Cert. No. : ACL22032
Job No. : VC65AC0040
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.4	-0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

T. R. K.

63/14-15,67/35-36, Soi Petchkasem 7/71, Petchkasem Rd,
Walthapra, Bangkokhyai, Bangkok 10600 Thailand.
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.comCertificate No. : CL-045-64
Page 2 of 2Result of Calibration : ☒ Without Adjustment ☐ With Adjustment

Calibration Range : 20°C - 40°C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 15031956.
Dimension : Diameter 14 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.055	20.4	0.3	0.16
30	25.046	25.3	0.3	0.099
30	30.040	30.4	0.3	0.16
30	35.036	35.3	0.2	0.14
30	40.029	40.3	0.3	0.30

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 15031951.
Dimension : Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.054	20.3	0.2	0.099
70	24.878	25.0	0.1	0.099
70	29.825	29.9	0.1	0.099
70	34.778	34.8	0.0	0.099
70	39.731	39.7	0.0	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 15028490.
Dimension : Diameter 8 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.055	20.1	0.0	0.099
110	25.046	25.1	0.1	0.099
110	30.040	30.1	0.1	0.099
110	35.035	35.1	0.1	0.099
110	40.029	40.1	0.1	0.099

UUC* : Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor $k=2$ providing a level of confidence of approximately 95%.

★ End of Certificate ★

CERTIFICATE OF CALIBRATION

Certificate No.: CL-042-65
Page 1 of 2

Equipment Name: Digital thermometer with RTD
Manufacturer: DeltaOHM
Model: HD32.2
Serial No: 20032243
ID No: RYG_FS0523

Customer
Name: ALS laboratory group (thailand) Co.,Ltd.
Address: 104 Phatthanakan 40, Phatthanakan
Rd.,Khwaeng Suan Luang, Khet Suan Luang,Bangkok
10250 Thailand.

Received date: 25 FEB 2022
Calibration date: 7 MAR 2022
Issue date: 10 MAR 2022

Reference Used During Calibration

1.Standard Temperature Probe Model: STS-100 A500,
Serial No: 667682-09, Due date: 25 Mar 2022
2.Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No: 671407-00591 Due date: 04 June 2022

Calibration Condition
Temperature: (23±3) °C
Relative Humidity: (55±15)%

Calibration Procedure

The temperature calibration was done by In-House
calibration method as WI-CL-001 according to
comparison method with standard digital temperature
indicator and standard temperature probe. The
temperature scale use was based on ITS-90.

Traceability

The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology Thailand (NIMT) Certificate
number: TT-0036-21. Certificate number: ER-0032-
21

REVIEW BY *M. Bancha*
APPROVED BY *J. J.*
NEXT CAL DATE *4/13/23*

Calibrated by
☒ Mr. Sorawit Thachelad
☐ Miss Orathai Wiwatwittaya



Approved Signatory: *J. J.*
Mr. Parinya Booncharoen
Calibration Department Manager

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION
HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-27 FAX: 0-2716-9484



Cert.No.: 22CH405
Page.: 1 of 3

Certificate of Calibration

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: Seven Compact S220
Serial No.: C104059460
ID No.: RYG_EN0183
Condition As-Received: Used Item
Received Date: 16 March 2022
Calibration Date: 17 March 2022
Reference: 2203-0611DSC-4
Submitted by: ALS Laboratory Group (Thailand) Co.,Ltd.
Rayong Branch
616/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand

Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure: In - house method :

- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

REVIEW BY *N. Bancha*
APPROVED BY *J. J.*
NEXT CAL DATE *17/13/23*

Calibrated by: Warakorn Lernagatrakul

Approved by: *M. B.*
Approved Signatory

(✓) Malee Bulkruea
() Sathip Meangmai
() Warakorn Lernagatrakul

Issue Date: 22 March 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services

Certificate No.: CL-042-65
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 21001219.
Dimension: Diameter 14 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.060	20.0	-0.1	0.099
30	25.047	25.0	0.0	0.099
30	30.034	30.0	0.0	0.099
30	35.021	35.0	0.0	0.099
30	40.005	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 21001786.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.058	20.2	0.1	0.099
70	25.045	25.1	0.1	0.099
70	30.032	30.0	0.0	0.099
70	35.021	34.9	-0.1	0.099
70	40.001	39.7	-0.3	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 21001243.
Dimension: Diameter 8 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.059	20.0	-0.1	0.099
110	25.047	25.0	0.0	0.099
110	30.032	30.0	0.0	0.099
110	35.016	35.0	0.0	0.099
110	40.007	40.0	0.0	0.099

UUC*: Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing
a level of confidence of approximately 95%.

★ End of Certificate ★



Cert.No.: 22CH405
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	21E2662	25 Aug 2022
2) Ref. Standard Thermometer	4982054	110RC044	2111201	26 Oct 2022

This certification is traceable to the International System of Unit maintained at:-
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	788995	01 Jan 2024
pH 6.982	CPA chem	761017	02 Aug 2022
pH 10.015	CPA chem	766824	04 Sep 2022

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function: mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV		
pH Meter S/N.: C104059460	4.000	177.48	177.4	0.058	2.00
	7.000	0.00	-0.1	0.058	2.00
	10.000	-177.48	-177.5	0.058	2.00



Cert.No.: 22CH405
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 1453404	4.008 6.982 10.015	4.010 6.988 10.010	177.7 3.6 -172.9	0.0046 0.0084 0.0073	2.00 2.00 2.05

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab Expert Pro-ISM
- Serial No. : 1453404

Dimension of probe;

- Length : 120 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
25.0	25.002	24.9	-0.102	0.13	2.00

Remark : - UUC* = Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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a 1100954



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TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 22E986
Page: 1 of 2

Equipment : pH Meter
Manufacturer: Mettler Toledo
Model : SevenCompact S220
Serial No.: C104059460
ID No.: RYG_EN0183

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Condition As-Received: Used Item
Received Date: 18 March 2022
Calibration Date: 21 March 2022

Reference: 2203-0811DSC
Ambient Temperature: (23 \pm 2) °C
Relative Humidity: (50 \pm 10) %
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
618/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand

Procedure used: Calibration were conducted using in-house calibration Procedure CP-E17 According to direct measurement method with Multi-Product Calibrator.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6440007	21E1444	07 May 2022
2) This result of calibration was made on requested at the point specified by customer.				
3) The certificate is valid only to the item calibrated on date and place of calibration.				
4) This Certification is traceable to the International System of Unit maintained at:- -National Institute of Metrology Thailand (NIMT)				

REVIEW BY	<i>N. Banthia</i>
APPROVED BY	<i>D. Ch</i>
NEXT CAL. DATE	21/3/23

Calibrated by : Pongsagom Boonyapom
Issue Date : 22 March 2022

Approved Signatory : *g v*
[] Phallinee Prabpaipal
[] Nuntawat Khamchai
[] Pornthipha Tameyakul

B 0284414



Cert. No.: 22E986
Page.: 2 of 2

Result of calibration :- (*) Without adjustment () After adjustment

Function: DC voltage measurement	Range: 2000 mV	Standard Value	UUC* Reading	Error	Uncertainty
		(mV)	(mV)	(mV)	(\pm μ V)
		-200.0000	-200.0	0.0	72
		-150.0000	-150.0	0.0	69
		-100.0000	-100.0	0.0	65
		-50.0000	-50.0	0.0	62
		0.0000	0.0	0.0	58
		50.0000	50.0	0.0	62
		100.0000	100.0	0.0	65
		150.0000	150.0	0.0	69
		200.0000	200.0	0.0	72

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %

*UUC= Unit Under Calibration.

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TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 21TW20
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No.: 15L102139
ID No.: RYG_EN0140
Received Date : 29 January 2021
Test Date : 02 February 2021
Reference : 2101-0817DSC-1
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
Rayong Branch
Eastern Seaboard Industrial Estate (Rayong)
64/77 Moo 4, Building No.B1, Highway 331,
Km91.5, T.Pluakdaeng, A.Pluakdaeng,
Rayong 21140 Thailand

REVIEW BY	<i>N. Banthia</i>
APPROVED BY	<i>D. Ch</i>
NEXT CAL. DATE	3/8/22

Laboratory Condition : Temperature (25 \pm 5) °C
Humidity (50 \pm 20) %
Test Procedure : In-house method : CP-CH9
by Comparison Technique with Azide Modification Method

Calibrated by : Walalai Sirithan

Approved by : *g v*
Approved Signatory

(/) Malee Butkruea
() Saithip Meangmai
() Warakorn Lemgagtrakul

Issue Date : 3 February 2021

a 1101070

B 0252485



Cert.No.: 21TW20
Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 16C100647

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.02	8.02	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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a 1038971



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Cert. No.: 21TM271
Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5100
Serial No. : 15L102139
ID No. : RYG_EN0140
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd., Rayong Branch
Eastern Seaboard Industrial Estate (Rayong)
64/77 Moo 4 Building No. B1, Highway 331 km. 91.5,
T. Pluakdaeng, A. Pluakdaeng, Rayong 21140 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 29 January 2021
Calibrated Date : 3 February 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Malee Butkruea

Approved by :
Approved Signatory

() Pornthippa Tameyakul
(✓) Suwit Imjai

Issue Date : 4 February 2021

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0024028



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2101-0817DSC-2
Procedure Used :-

Cert. No.: 21TM271
Page.: 2 of 2

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Digital Thermometer	1523	2188080	2011389	20 Nov 2021

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit maintained at:-

- National Institute of Metrology Thailand (NIMT)

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N: 16C100647

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.00	60	20.008	19.96	-0.048	0.15	2.00

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %.

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a 1038526



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM317
Page.: 1 of 3

Certificate of Calibration

Equipment : Low Temp. Incubator

Manufacturer : Memmert

Model : IPP750

Serial No. : V818.0084

ID No. : RYG_EN0154

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
(Rayong Branch)
616/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng, Rayong 21140, Thailand

Location : BOD Room

Received Order : 22 April 2022

Calibration Date : 22 April 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :
Approved Signatory

() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 3 May 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0040735



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2204-0146OC-1

Cert. No.: 22TM317
Page.: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44031769	21LM12	02 Sep 2022

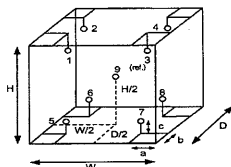
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :

Dimension of Chamber :	Value
a = 10 cm	D = 0.60 m
b = 10 cm	W = 1.0 m
c = 10 cm	H = 1.2 m
Capacity = 0.75 m ³	

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	54	58
AC Supply (Volt)	221	223

Position :	Ref. Std. ID No.:
1	9RTD-2/1
2	9RTD-2/2
3	9RTD-2/3
4	9RTD-2/4
5	9RTD-2/5
6	9RTD-2/6
7	9RTD-2/7
8	9RTD-2/8
9 (ref.)	9RTD-2/9



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2204-0146OC-1

Cert. No.: 22TM317
Page.: 3 of 3

Result of Calibration :-

(*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	20.0	20.0	0.022	0.20	0.22	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.209	20.174	20.199	20.110	20.075	20.062	20.027	20.069	20.030

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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SPC Calibration Center



SPC Calibration Center

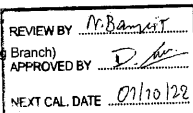


Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID.): 1627845 (RYG_EN0037)
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06210159
Issued Date: 01 April 2021
Job No.: KSPR2104738
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand.



Environment Condition: Temperature 25.1 °C ± 0.4 °C
Humidity 48.8 %RH ± 3.7 %RH

Calibration Place: ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) (Wet Chemistry Lab)
616/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr. Chattaphon Fothong

Calibration Date: 01 April 2021

The Method used: In house method, SPCC-WI-24, base on ASTM E 275-08 and ASTM E 387-04

Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Stama Scientific Limited.

The standard for Wavelength Certificate No. 87146 and 87152
The standard for Photometric Certificate No. 87220 and 87139
The standard for Stray light Certificate No. 87163 and 87161
The standard for Spectral resolution Certificate No. 87173

(Mr. Chattaphon Fothong)
Person in charge

SPC RT Co., Ltd.

(Mr. Dumrong Boonsopon)
Authorized signatory

Calibration Results:

Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.61	418.4	0.21	0.13
536.66	536.7	-0.04	0.13
637.98	638.3	-0.32	0.14
748.48	748.7	-0.22	0.14
807.03	807.4	-0.37	0.14

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5890	0.590	-0.0010	0.0045
	0.7616	0.762	-0.0004	0.0045
	1.0263	1.027	-0.0007	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5787	0.579	-0.0003	0.0045
	0.7442	0.744	0.0002	0.0045
	1.0039	1.004	-0.0001	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5292	0.530	-0.0008	0.0045
	0.6865	0.687	-0.0005	0.0045
	0.9534	0.954	-0.0006	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5468	0.546	0.0008	0.0045
	0.6957	0.695	0.0007	0.0045
	0.9991	0.998	0.0011	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5851	0.584	0.0011	0.0045
	0.7238	0.723	0.0008	0.0045
	1.0957	1.094	0.0017	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5692	0.568	0.0012	0.0045
	0.6914	0.691	0.0004	0.0045
	1.0881	1.087	0.0011	0.0045

Certificate No.: C06210159

Page 3 of 3

Calibration Results:

Without Adjustment

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7307	0.730	0.0007	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8516	0.850	0.0016	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2836	0.285	-0.0014	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6319	0.629	0.0029	0.0080

Stray light *

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
260.57 \pm 0.11 nm	260.6	1.5	1.824
392.03 \pm 0.11 nm	392.0	1.5	1.824

The stray light transmission reference is less than 1.0 T(%) and absorbance is greater than 2.0 (A)

Spectral Resolution *

Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.72	266.76	1.39	2.00
UUC: Wavelength (nm)	268.2	266.1		
Std Absorbance (A)	0.4616	0.2797		
Absorbance (A)	0.416	0.300		

* Calibration Marked "Not TISI Accredited" in this Certificate have been included for completeness.

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2104738

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: DR6000

หมายเลขเครื่อง: 1627845

ตรวจสอบ (รับ)		รายการตรวจสอบ	ตรวจสอบ (ส่ง)		หมายเหตุ
01 Apr 2021			01 Apr 2021		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตซ์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. หัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติม/ข้อแนะนำ :

Mr. Chattuphon Foithong
Service EngineerSKKI บริษัท สกกี จำกัด
SKKI CO., LTD.
จ.ปทุมธานี 1194 ซอยสุขุมวิท 57 ถนนสุขุมวิท 101/1 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
โทร: 02-0003 1194-551 Wacha-cha-nak-57 Sukhumvit 101/1 Road, Bangkok, Thailand 10260 Thailand

RYG_EN0002

PENTA CALIBRATION CO., LTD.
66/124 The Connect 33 Village Kanchanaphisek Road
Dokmai Prawet Bangkok 10250
Tel: +66 (0) 2059-9773
www.pentacal.com

Certificate of Calibration

Represent to Certificate of Calibration ,PTC/07/22103

Certificate No.: PTC/07/22103 Page: 1 of 2
Equipment: Digital Balance Condition: Normal
Manufacturer: Sartorius Serial No: 26207038
Model: MSE224S-100-DJ ID No: RYG_EN0002
Type of Balance: Single interval



Customer: ALS Laboratory Group (Thailand) Co.,Ltd.
616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,
Rayong 21140, Thailand

REVIEW BY: *Thaisakol*
APPROVED BY: *P. K.*
NEXT CAL. DATE: 09/03/25

Environment Condition: Temperature 23.9 °C \pm 0.3 °C
Humidity 58.1 %RH \pm 4.4 %RH
Air density 1.17 kg/m³

Calibration Place: ALS Laboratory Group (Thailand) Co.,Ltd.
616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,
Rayong 21140, Thailand

The Method used: In house method: PTC-WI-07, base on Euramet cg 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co.,Ltd.
NSC-ONSC Accreditation No.: Calibration 0189

Date Received: March 23, 2022

Calibration Date: March 23, 2022

Issued Date: March 25, 2022

Calibration By: Mr. Rungraje Metakul

Reviewed by:
(Mr. Kiangsak Kalasri)

Approved By:
(Mr. Kiangsak Kalasri)
Laboratory Manager

This certificate is issued the unit of measurement according to the international system of units (SI) and provides a calibration measurement in international, national standards or other recognized national standards laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard deviation multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to the Expression of Uncertainty in Measurement (GUM). The effect that the results relate only to the same category.

This calibration certificate shall not be reproduced except in full, without written approval from Penta Calibration Co., Ltd.

PTC-WI-07 Rev. 002

PENTA CALIBRATION CO., LTD.
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Dokmai Prawet Bangkok 10250
Tel: +66 (0) 2059-9773
www.pentacal.com

Represent to Certificate of Calibration ,PTC/07/22103

Certificate No.: PTC/07/22103

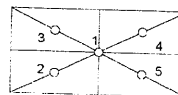
Page: 2 of 2

Measurement Results:

Without Adjustment:

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity



Eccentricity test 100 (g)				
Position (g)				
1	2	3	4	5
0.0000	0.0000	-0.0002	0.0002	0.0002
Maximum deviation: 0.0002				

Repeatability Test: Weight to be 1/2 \leq L \leq Maximum capacity

Determination of the standard deviation of weighing balance, Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
200	0.00003

Error of indication : from nominal value, Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.0000	0.0000	0.000086	2.16
0.01	0.01000	0.0100	0.0000	0.00010	2.06
0.1	0.10000	0.1000	0.0000	0.00010	2.06
1	1.00000	1.0000	0.0000	0.00010	2.06
2	2.00000	1.9999	0.0001	0.00010	2.06
5	5.00000	5.0000	0.0000	0.00010	2.06
10	10.0000	10.0000	0.0000	0.00010	2.06
20	20.0000	19.9999	0.0001	0.00011	2.05
50	50.0000	49.9999	0.0001	0.00012	2.00
100	100.0000	100.0001	-0.0001	0.00017	2.00
200	200.0000	200.0000	0.0001	0.00027	2.00

Note: Weight of adjust (g)

The End of Certificate

PTC-WI-07 Rev. 002



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/9 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM827
Page.: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UFE 500
Serial No. : G511.1572
ID No. : RYG_EN0010
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng,
Rayong 21140 Thailand
Location : Oven Room
Received Order : 5 May 2021
Calibration Date : 5 May 2021
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Khit Ruttanaprapachai
Approved by :
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 14 May 2021

REVIEW BY
APPROVED BY
NEXT CAL. DATE 3/1/22



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-4
Procedure Used :-

Cert. No.: 21TM827
Page.: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

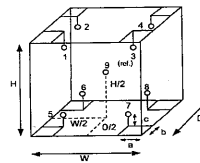
1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	21LM3	26 Feb 2022

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Result of Calibration :- () Without Adjustment

Function of UUC* : Temperature Source
Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.40 m
b = 5.0 cm W = 0.56 m
c = 5.0 cm H = 0.48 m
Capacity = 0.11 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	29
REL.Humid. (%)	59	56
AC Supply (Volt)	220	221

Ref. Std. ID No.: @ Calibration Point		
Position	(104) °C	(180) °C
1	21-17RTD-01	19-17TC-01
2	21-17RTD-02	19-17TC-02
3	17RTD-03	19-17TC-03
4	17RTD-04	19-17TC-04
5	17RTD-05	19-17TC-05
6	17RTD-06	19-17TC-06
7	17RTD-07	19-17TC-07
8	17RTD-08	19-17TC-08
9 (ref.)	17RTD-09	19-17TC-09

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services & Equipment Calibration and Testing Services.

A 0028099

a 1054287

RYG_EN0006



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-4
Result of Calibration :- () Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM827
Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
104.0	104.0	104.0	0.063	0.54	0.70	0.42	2
180.0	180.0	180.0	0.15	0.89	1.3	1.1	2

Measured Temperature (°C)									
Calibration Point (°C)	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	104.243	103.732	103.760	103.742	103.863	103.743	104.311	103.689	103.815
180.0	180.101	180.481	179.401	179.692	179.980	179.943	180.127	179.915	179.709

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM829
Page.: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UM 400
Serial No. : b495.0899
ID No. : RYG_EN0006
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng,
Rayong 21140 Thailand
Location : Oven Room
Received Order : 5 May 2021
Calibration Date : 5 - 6 May 2021
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Khit Ruttanaprapachai
Approved by :
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 14 May 2021

REVIEW BY
APPROVED BY
NEXT CAL. DATE 3/1/22

The Uncertainties are for a confidence probability of approximately 95%

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a 1054286

A 0028096



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-1

Cert. No.: 21TM829
Page.: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	21LM3	26 Feb 2022

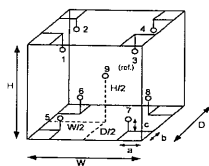
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :

Dimension of Chamber :	Value
a = 5.0 cm	D = 0.33 m
b = 5.0 cm	W = 0.40 m
c = 5.0 cm	H = 0.40 m
	Capacity = 0.053 m ³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	29	30
REL.Humid. (%)	56	58
AC Supply (Volt)	221	222

Position :	Ref. Std. ID No.:
1	21-17RTD-01
2	21-17RTD-02
3	17RTD-03
4	17RTD-04
5	17RTD-05
6	17RTD-06
7	17RTD-07
8	17RTD-08
9 (ref.)	17RTD-09

Mali

a 1054310

RYG_EN0061



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-1

Cert. No.: 21TM829
Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
70.0	70.0	70.0	0.21	1.8	2.0	0.55	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
70.0	1	2	3	4	5	6	7	8	9 (ref.)
	70.404	70.277	70.607	70.307	68.789	69.257	68.846	69.331	70.495

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

-o0o-

Mali

a 1054309



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
514/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM673
Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB22

Serial No. : L513.0648

ID No. : RYG_EN0061

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng,
Rayong 21140 Thailand
Wet Chemistry Lab

Location :

Received Order : 5 May 2021

Calibration Date : 5 May 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

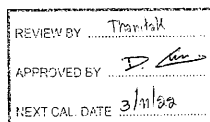
Calibrated by : Tawatchai Pama

Approved by :

Mali
Approved Signatory

() Pomthippa Tameyakul
() Malee Butkruea
() Suwit Imjai

Issue Date : 14 May 2021



The Uncertainties are for a confidence probability, of approximately 95%

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Approved on behalf of Corporate Services 3: Equipment Calibration and Testing Services



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2105-0005OC-3

Cert. No.: 21TM673
Page.: 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPT) .

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44060450	21LM4	06 Mar 2022

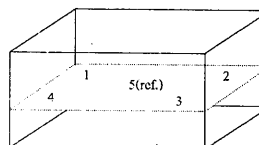
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	22	68	230
Finished of Calibration	20	64	231



Front

Position :	Ref. Std. S.N.:
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5(ref.)	4803988-005

Mali

a 1054289

a 0028098



Equipment: Water Bath
Condition As-Received: Used Item
Reference: 2105-0005OC-3
Result of Calibration: (*) Without Adjustment
Function of UUC: Temperature Source

Cert. No.: 21TM673
Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
85.0	85.0	85.0	84.891	84.893	84.880	84.892	84.917

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
85.0	0.089	0.052	0.22	2

Average*: The average of 30 values in each position.

Uniformity: The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Stability: One-half of the greatest maximum difference of measured temperature at any one probe.

UUC*: Unit Under Calibration

Note: The reported uncertainty of measurement was included stability and excluded uniformity.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %.

-o0o-

a 1054288



Cert. No.: 21T1200
Page.: 2 of 2

Result of Calibration: Without Adjustment
Function: Temperature measurement
Dimension of probe: Diameter 3 mm., Length 55 mm. Sheath material: Stainless Steel

Immersion Depth (mm.)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (± °C)
50	25.0029	24.9	-0.1029	0.12
50	30.0018	29.9	-0.1018	0.12
50	40.0035	40.0	-0.0035	0.12

UUC*: Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

-o0o-

a 1063351



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 21T1200
Page: 1 of 2

Equipment: Digital Thermometer With Sensor
Manufacturer: Testo
Model: 106
Serial No.: 31281494/504
ID No.: RYG_FS0467
Condition As-Received: Used Item
Received Date: 02 July 2021
Calibration Date: 07 July 2021
Reference: 2107-0089DSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch

616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong
21140, Thailand

Procedure used: Calibration were conducted using in-house calibration procedure CP-T01 according to comparison with Platinum Resistance Thermometer (PRT) into liquid bath temperature controller.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Thermometer	1529-R	B19520	211680	26 Jun 2022
2) Platinum Resistance Thermometer	935-14-95	261589/1	211680	26 Jun 2022

2. The certificate is valid only to the item calibrated on date and place of calibration.
3. This Certification is traceable to the International System of Unit maintained at:-
-National Institute of Metrology Thailand (NIMT)

REVIEW BY	Tanwasi
APPROVED BY	Sut/S
NEXT CAL. DATE	7/9/22

Calibrated by: Yossapon Poljom
Issue Date: 09 July 2021

Approved Signatory:

☐ Phalinee Prabpalai
☐ Chatchawan Khunpluek
☒ Wanlop Larpkum

B 0265214

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Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-6
Organization Name: ALS Laboratory Group(Thailand) Co., Ltd.
Organization Location: 104 Patthanakarn 40, Patthanakarn Rd., Kwang Suan Luang< Khet Suan Luang, Bangkok 10250
Date: November 25, 2021 5:20:10 PM
EQP Name: AgilentRecommended, AgilentRecommended
EQP Revision: GC.02.52, GCMS.02.51
Overall Qualification Status: Pass

CDS Logon Verification - GC

Logon: Nanihwadee.Somboon

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890

Front SSL

Setpoint Status: Pass

Setpoint Actual
Inlet Pressure: 25.0 psi 25.1 psi

Accuracy: 0.1 psi

Agilent Recommended: <= 1.2

Date: November 25, 2021 5:20:10 PM
System ID: GM-6

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Overall Inlet Pressure Accuracy Test Status

Pass

Headspace Leak

Name: 7697A with Tray
Sampler 1

Setpoint Status: Pass

Overall Headspace Leak Test Status

Pass

Headspace Heated Zones Temperature Accuracy

Name: 7697A with Tray
Sampler 1

Setpoint Status: Pass

Zone: Transferline

Temperature:

Setpoint 115.0 °C

Actual 114.9

Accuracy: -0.1 °C

Agilent Recommended: >= -1.8 % setpoint (-2.1 °C)

<= 5.2 % setpoint (6.0 °C)

Setpoint Status: Pass

Zone: Sample Loop

Temperature:

Setpoint 110.0 °C

Actual 109.8

Accuracy: -0.2 °C

Agilent Recommended: >= -4.0 % setpoint (-4.8 °C)

<= 4.0 % setpoint (4.4 °C)

Date: November 25, 2021 5:20:10 PM
System ID: GM-6

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Setpoint Status:

Pass

Zone:

Oven

Temperature:

Setpoint 100.0 °C

Actual 99.9

Accuracy:

-0.1 °C

Agilent Recommended:

>= -4.0 % setpoint in K (-4.0 °C)

<= 4.0 % setpoint in K (4.0 °C)

Overall Headspace Heated Zones Temperature Accuracy Test

Pass

GC Oven Temperature Accuracy

Name:

7890

Setpoint Status:

Pass

Zone:

Oven

Temperature:

Setpoint/Actual 230.0 229.8 °C

Accuracy:

-0.2 °C

Agilent Recommended:

>= -1.0 % setpoint in K (-5.0 °C)

<= 1.0 % setpoint in K (5.0 °C)

Setpoint Status:

Pass

Zone:

Oven

Temperature:

Setpoint/Actual 100.0 99.8 °C

Accuracy:

-0.2 °C

Agilent Recommended:

>= -1.0 % setpoint in K (-3.7 °C)

<= 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name:

7890

Date: November 25, 2021 5:20:10 PM
System ID: GM-6

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Setpoint Status:

Pass

Temperature:

Setpoint/Average 100.0 99.8 °C

Stability:

0.2 °C

Agilent Recommended:

<= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1

Front SSL / External SQ

Name: 5875C Inert XL with TAD

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1

Front SSL / External SQ

Name: 5875C Inert XL with TAD

Setpoint Status: Pass

Amu: 1050 m/z

Drift After Five Minutes:

18 mV

RFPA Voltage:

519 mV

Agilent Recommended: >= -100 and <= 100

<= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1

Front SSL / External SQ

Name: 5875C Inert XL with TAD

Setpoint Status: Pass

Filament:

1

Date: November 25, 2021 5:20:10 PM
System ID: GM-6

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Setpoint Status:

Pass

Filament:

2

This test's 0 comment(s) and 1 deviation(s) are available in the Attachments section.

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1

Front SSL / External SQ

Name: 7697A with Tray

Source: EI - Inert

Setpoint Status: Completed

Injection Volume on Column:

1000 uL

Overall Scouting Run Status

Completed

Injection Precision

Tested Combination1

Front SSL / External SQ

Name: 7697A with Tray

Source: EI - Inert

Setpoint Status: Pass

Injection Volume on Column:

1000 uL

Area RSD:

1.61 %

Retention Time RSD:

0.01 %

Agilent Recommended:

<= 5.00

<= 1.00

Overall Injection Precision Test Status

Pass

Mass Ratio Precision

Date: November 25, 2021 5:20:10 PM
System ID: GM-6

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Tested Combination1	Front	SSL	/ External	SQ
Name:	7697A with Tray			
Source:	EI - Inert			
Setpoint Status:	Pass			
Injection Volume on Column:	1000 µL			
RSD:	Area Mass 1		Mass Ratio	
Abundance's	1.61 %		0.25 %	
Agilent Recommended:	<= 5.00		<= 5.00	
	Pass		Pass	

Overall Mass Ratio Precision Test Status

Pass

Injection Carry Over

Tested Combination1	Front	SSL	/ External	SQ
Name:	7697A with Tray			
Source:	EI - Inert			
Setpoint Status:	Pass			
Injection Volume on Column:	1000 µL			
Area Carry Over:	0.00 %			
Agilent Recommended:	<= 1.00			

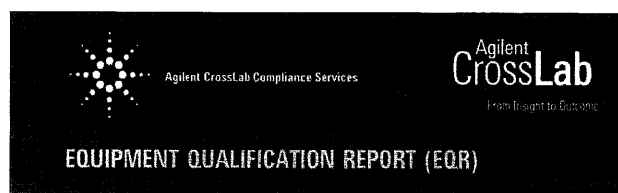
This test's 0 comment(s) and 2 deviation(s) are available in the Attachments section.

Overall Injection Carry Over Test Status

Pass

Date: November 25, 2021 5:20:10 PM
System ID: GM-6

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Agilent CrossLab Compliance

Qualification Type: ICPMS-OQ
System ID: JP15471169
EQP Name: AgilentRecommended
EQP Revision: ICPMS.02.50
EQP Publish Date: March 2020
Date: September 30, 2021 4:07:18 PM
Report Type: Report
Org. Name: ALS Laboratory Group (Thailand) Co., Ltd.
Org. Location: 104 Phattanakarn 40, Suan Luang, Bangkok 10250.

REVIEW BY *Saphan H.*
APPROVED BY *Saphan H.*
NEXT CAL. DATE 29 March 2023

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Test Summary

Purpose

This section includes a status for each scheduled test and the overall qualification. For each test that is run, (1) the status is automatically determined based on pre-defined limits, and (2) the total number of times the test was run is displayed. For detailed results and specifications for a test, refer to the test results in this EQR.

Details	Status	Runs
Test		
Autosampler Check : SPS4	Pass	1
Integrated Sample Introduction System (ISIS) Check : ISIS3	Pass	1
Autotune : G8403A	Pass	1
Background (No Gas Mode) : G8403A	Pass	1
Background (Gas Modes) : G8403A	Pass	1
20-Minute Stability (No Gas Mode) : G8403A	Pass	1

Overall Qualification Status

Pass

Date: September 30, 2021 4:07:18 PM
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Service Details

Purpose

This section includes local contact and delivery details for this service.

General Details	
Service Order No./Request:	6004837154
EQP Name:	AgilentRecommended
EQP Revision:	ICPMS.02.50
Report Type:	Report
Organization Details	
Name:	ALS Laboratory Group (Thailand) Co.,Ltd.
Location:	104 Phattanakarn 40, Suan Luang, Bangkok 10250.
Local Contact Details	
Name:	Chatcharnai Komarakul.
Job Title:	Manager
Qualification Location:	Laboratory
Operator Details	
Name:	Panthep Kurasathain
Job Title:	Field Service Emgineer.
Data Acquisition Details	
Acquisition Software Name:	MassHunter
Acquisition Software Revision:	C.01.04
Customer Data System (CDS):	IcpMs: MessHunter

Instrument Details

Purpose

This section describes the as found system configuration.

Details	
ICP-MS 1	
Manufacturer	Agilent Technologies
Name	7800
Model Number	G8403A
Installed Options	#100H: Standard Package with Hydrogen option
Detector Type	SQ
Nebulizer	Mira Mist (G3161)
Spray Chamber	Quartz
Torch	Quartz
Sampling Cone	Ni
Skimmer Cone	Ni
Serial Number	JP15471169
Firmware Revision	C.01.04
ISIS 1	
Manufacturer	Agilent Technologies
Name	ISIS3
Model Number	G8411A
Type	Peristaltic pump system
Serial Number	JP15510227
Autosampler 1	
Manufacturer	Agilent Technologies
Name	SPS4
Model Number	G8410A
Serial Number	AU15430722

Chiller 1	
Manufacturer	Agilent Technologies
Name	Chiller
Model Number	G3292A
Serial Number	3U1610713

Calculation Formulas

Purpose

This section includes calculation formulas for all available tests. Depending upon which tests are scheduled, all or some apply to your qualification.

For a description of calculations for ICP-MS tests performed by the MassHunter software, refer to the MassHunter application and documentation.

Protocol Details

Purpose

This section lists the revisions for all test units used in this report. For complete test-specific and high-level change details, refer to the Revision History document.

Test Revision	Test
ICPMS.02.50	20-Minute Stability (No Gas Mode)
ICPMS.02.50	Autosampler Check
ICPMS.02.50	Autotune
ICPMS.02.50	Background (Gas Modes)
ICPMS.02.50	Background (No Gas Mode)
ICPMS.02.50	Integrated Sample Introduction System (ISIS) Check

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Autosampler Check

Purpose

This test demonstrates that the autosampler module is correctly installed and connected. It does not test module performance.

Setpoint			
Results	Criteria	Observed Result	Expected Result Status
After the self test, is probe in the home position?		Yes	Yes Pass
As commanded, is the probe positioned at vial 2?		Yes	Yes Pass
Setpoint Status:	Pass		Runs: 1
Overall Autosampler Check Test Status			
Pass			

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Integrated Sample Introduction System (ISIS) Check

Purpose

This test demonstrates that the ISIS module is correctly installed and connected. It does not test module performance.

Setpoint			
Results	Criteria	Observed Result	Expected Result Status
As commanded, does the pump rotate?		Yes	Yes Pass
As commanded, do the valves load and inject?		Yes	Yes Pass
Setpoint Status:	Pass		Runs: 1
Overall Integrated Sample Introduction System (ISIS) Check Test Status			
Pass			

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Autotune

Purpose

This test uses traceable checkout standards to run a software-executed autotune in all modes. The tune report provides values for peak width, mass axis, sensitivity, oxide species, and doubly-charged species tests.

Setpoint			
Results	Criteria	Observed Result	Expected Result Status
Peakwidth Mass 7		0.719	AMU
Agilent Recommended:		>= 0.65	
		<= 0.80	
Status:		Pass	
Peakwidth Mass 89		0.750	AMU
Agilent Recommended:		>= 0.65	
		<= 0.80	
Status:		Pass	
Peakwidth Mass 205		0.713	AMU
Agilent Recommended:		>= 0.65	
		<= 0.80	
Status:		Pass	
Mass Axis 7		7.05	AMU
Agilent Recommended:		>= 6.9	
		<= 7.1	
Status:		Pass	
Mass Axis 89		88.95	AMU
Agilent Recommended:		>= 88.9	
		<= 89.1	
Status:		Pass	
Mass Axis 205		205.00	AMU
Agilent Recommended:		>= 204.9	
		<= 205.1	
Status:		Pass	

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Mass 7 Sensitivity No Gas

Agilent Recommended:

Status:

	94.28	Mcps/ppm
>=	25.5	
Pass		

Mass 89 Sensitivity No Gas

Agilent Recommended:

Status:

	307.15	Mcps/ppm
>=	127.5	
Pass		

Mass 205 Sensitivity No Gas

Agilent Recommended:

Status:

	203.77	Mcps/ppm
>=	76.5	
Pass		

Mass 59 Sensitivity He

Agilent Recommended:

Status:

	28.38	Mcps/ppm
>=	23.8	
Pass		

Mass 89 Sensitivity H2

Agilent Recommended:

Status:

	129.27	Mcps/ppm
>=	68	
Pass		

Oxide Ratio 158/140

Agilent Recommended:

Status:

	1.047	%
<=	1.38	
Pass		

Doubly Charged Species Ratio 70/140

Agilent Recommended:

Status:

	1.482	%
<=	2.3	
Pass		

Setpoint Status:

Pass

Runs: 1

Overall Autotune Test Status

Pass

Date: September 30, 2021 4:07:18 PM
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Background (No Gas Mode)

Purpose

This test examines the background of the ICP-MS in no gas mode by monitoring ions during a blank run.

Setpoint

Conditions

Masses:

7	AMU
89	AMU
205	AMU

Measurements and Results

Masses (AMU):

Measured Value:

Agilent Recommended:

Status:

	7		89		205	
	3.200		3.300		9.900	cps
<=	6.9	<=	4.6	<=	11.5	
Pass		Pass		Pass		

Setpoint Status:

Pass

Runs: 1

Overall Background (No Gas Mode) Test Status

Pass

Date: September 30, 2021 4:07:18 PM
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Background (Gas Mode)

Purpose

This test examines the background of the ICP-MS in the various gas modes by monitoring ions during a blank run.

Setpoint Gas Mode: Helium

Conditions

Mass:

78

AMU

Integration Time:

1.0

sec

Cycles:

20

Measurements and Results

Mass (AMU):

Measured Value:

Agilent Recommended:

Status:

	78	
	42.8500	cps
<=	115	
Pass		

Setpoint Status:

Pass

Runs: 1

Setpoint Gas Mode: Hydrogen

Conditions

Mass:

78

AMU

Integration Time:

1.0

sec

Cycles:

20

Measurements and Results

Mass (AMU):

Measured Value:

Agilent Recommended:

Status:

	78	
	2.1500	cps
<=	4.6	
Pass		

Setpoint Status:

Pass

Runs: 1

Overall Background (Gas Mode) Test Status

Pass

Date: September 30, 2021 4:07:18 PM
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20-Minute Stability (No Gas Mode)

Purpose

This test monitors the abundance of ions present in the checkout standard over a 20-minute period to verify that the signal is stable. The %RSD of the abundance of given ions is calculated internally by the software and compared to the limit.

Setpoint

Conditions

Mode:

Spectrum

Masses:

7, 9, 59, 89, 140, 205

Integration Time:

9.99

sec

Peak Pattern:

3

points/peak

Repetitions:

20

Sweeps/Replicates:

100

Measurements and Results

Masses (AMU):

Stability RSD:

Agilent Recommended:

Status:

	7		89		205	
	0.96400		0.51495		0.73011	%
<=	2.3	<=	2.3	<=	2.3	
Pass		Pass		Pass		

Setpoint Status:

Pass

Runs: 1

Overall 20-Minute Stability (No Gas Mode) Test Status

Pass

Date: September 30, 2021 4:07:18 PM
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Declaration of Change Control

This document is under change control. Revision history is maintained and printed on each document. Access to the master documents is limited to process owners. Documents receive periodic review and cannot be assigned an evergreen status. The qualification performed according to this document refers only to the hardware/software configuration in place at the time of the qualification. Agilent Technologies recommends that instrument configuration change management procedures be in place in order to maintain the validation process. Any changes to the analytical or computer hardware or software must be clearly specified. A change management system provides a means for determining the degree of requalification required according to the extent of the changes made. All details of the changes must be thoroughly recorded and documented, together with details of completed tests and their results. Note: Hardware/software configuration management is the customer's responsibility.

Attachments

Training requirements note: The delivery engineer attaches an ACE technique-specific training certificate to the Equipment Qualification Report (EQR). Obtaining ACE technique-specific certification includes pre-requisite trainings for Data Integrity, General Compliance topics (GMP, GLP, ALCOA, etc.), instrument hardware and software components, and the ACE technique itself. The one certificate encompasses all pre-requisite trainings as documented in the Agilent Learning Management System called Success Factors.

Location	Category	Document Name	Page
EQR	General	Certificate of System Qualification	16
EQR	General	Operator's training certificate and qualifications	19
EQR	General	Certificate of Qualification for ACE	20
EQR	General	Certificate of Qualification for ACE	21
EQR	General	Tune reports	22
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EQR	General	Test Report	27
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General

Document Name: Certificate of System Qualification

 **Agilent Technologies**

Agilent Compliance Engine Self Qualification

Date: September 14, 2021 4:59:16 PM
Drive Serial #: ACA225C9 Platform Revision: ACE 3.11

Individual self-qualification reports for each specific technique installed are also available upon request. They provide additional details on the general report from the concise summary and are structured by the actual algorithms challenged during the process. There is not a one-to-one relationship between algorithms and OQ program tests because some algorithms are used by several tests and across multiple similar hardware components of the qualified systems.

Technique Type	Tests Completed	Result
Atomic Absorption	7	Conforms
Capillary Electrophoresis	10	Conforms
Dissolution	6	Conforms
Emission Spectroscopy	3	Conforms
Gas Chromatography - GC/MS	17	Conforms
Gas Chromatography	29	Conforms
Gel Permeation Chromatography	9	Conforms
ICP-MS	6	Conforms
Infrared Spectroscopy	7	Conforms
Liquid Chromatography	17	Conforms
Liquid Chromatography - LC/MS	8	Conforms
Microfluidics	18	Conforms
Sample Preparation - Gas Chromatography	9	Conforms
Sample Preparation - Liquid Chromatography	8	Conforms
Supercritical Fluid Chromatography	15	Conforms
Software	6	Conforms
UV-Vis Spectrophotometer	13	Conforms

Overall Qualification Status
Conforms

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name: Operator's training certificate and qualifications

 **Agilent Technologies**

Certificate of Completion

Learner Name: Panchap Kurusathain

Title Of Course: AN-CB-ICPMS-2-038-A:Agilent 7900 ICPMS FSE update training

Completion Date: June 7, 2014

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific limitations.
A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent-authorized service provider, through which the service employee has ongoing access to Agilent's Safety Alerts, Service Notes, internal technical updates, system training, current documentation, technical support, current parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name:

Certificate of Qualification for ACE



Certificate of Completion

Learner Name: Parthap Kurusethain

Title Of Course: AN-CE-SS-II-030-A: ACE 3.X User Update Training

Completion Date: July 7, 2020

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific limitations.

A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent-authorized service provider, through which the service employee has ongoing access to Agilent's Safety Alerts, Service Notes, internal technical updates, update training, current documentation, technical support, current parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name:

Certificate of Qualification for ACE



Certificate of Completion

Learner Name: Parthap Kurusethain

Title Of Course: AN-CE-ICPMS-2-035-B: CrossLab Compliance Hardware Specific Delivery for Agilent ICP-MS Systems

Completion Date: October 31, 2020

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific limitations.

A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent-authorized service provider, through which the service employee has ongoing access to Agilent's Safety Alerts, Service Notes, internal technical updates, update training, current documentation, technical support, current parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name:

Tune reports

Tune Report

Operator Name: Supathin Mak

Acq/Date Batch: C:\Agilent\CPM\H11\user\Tune_7960.b

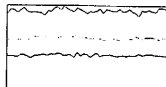
Acq Date/Time: 2021-09-30 14:44:38

Report Generated: 02:30 Sep 2021

Instrument Name: G4333A.JP15471169

[No Gas]

Stability



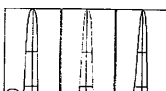
Mass	Range	Count	RS2%	Background
7	10000	8428	2.620	1.228
88	20000	30718	2.825	1.300
205	20000	20377	3.315	5.900

Sampling Period (sec): 0.311
Integration Time (sec): 0.1

Oxidize/Double Charged Ratio

Oxidize: 156 / 140: 1.047 %
Double Charged: 70 / 140: 1.432 %

Resolution/Auto



Mass	Peak Height	Abs	W-50%	W-10%
7	8479.80	7.06	0.83	0.719
88	30718.3	18.95	0.88	0.792
205	20346.12	205.05	0.52	0.712

Integration Time (sec): 0.1
Acquisition Time (sec): 22.34
Y Axis: Linear

Tune Parameters

Plasma Parameters
Plasma Mode: ---
RF Power: 1500 W
RF Matching: 1.15 V
Sample Depth: 9.0 mm

Nebulizer Gas: 1.00 L/min
Option Gas: ---
Nebulizer Pump: 0.10 rpm
S/C Temp: 2 °C

Makeup Gas: 0.10 L/min
Auxiliary Gas: 0.80 L/min
Plasma Gas: 15.0 L/min

Lens Parameters
Extract 1: 6.0 V
Extract 2: -205.0 V
Omega Bias: -40 V

Optics Lens: 9.1 V
Cell Entrance: -30 V
Cell Exit: -30 V

Deflect: 13.8 V
Plate Bias: -30 V

Cell Parameters
Use Gas: No
He Flow: 0.0 mL/min

Set Gas Flow: ---
OCP Bias: -8.0 V

Energy Discrimination: 5.0 V

1 of 3

2021-09-30 2:44 PM

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Document Name:

Tune reports

Tune Report

He Flow: 0.0 mL/min
OCP RF: 900 V

CP Parameters
Mass Gain: 124
Mass Offset: 125

Axis Gain: 0.9990
Axis Offset: 0.01

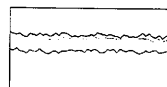
OP Bias: -3.0 V

Hardware Settings
Torch: Torch H: -6.3 mm
Torch V: 0.1 mm

EM
Discriminator: 4.0 mV
Analog HV: 2247 V
Pulse HV: 1318 V

[No Gas]

Stability



Mass	Range	Count	RS2%	Background
88	20000	2453	3.423	0.400
88	20000	12507	2.822	0.260
205	20000	13650	2.445	0.701

Sampling Period (sec): 0.31
Integration Time (sec): 0.1

Oxidize/Double Charged Ratio

Oxidize: 156 / 140: 0.854 %
Double Charged: 70 / 140: 1.020 %

Tune Parameters

Plasma Parameters
Plasma Mode: ---
RF Power: 1500 W
RF Matching: 1.15 V
Sample Depth: 9.0 mm

Nebulizer Gas: 1.00 L/min
Option Gas: ---
Nebulizer Pump: 0.10 rpm
S/C Temp: 2 °C

Makeup Gas: 0.10 L/min
Auxiliary Gas: 0.80 L/min
Plasma Gas: 15.0 L/min

Lens Parameters
Extract 1: 6.0 V
Extract 2: -210.0 V
Omega Bias: -105 V

Optics Lens: 9.1 V
Cell Entrance: -30 V
Cell Exit: -40 V

Deflect: 6.0 V
Plate Bias: -100 V

Cell Parameters
Use Gas: Yes
He Flow: 0.0 mL/min
He Flow: 0.0 mL/min

3rd Gas Flow: ---
OCP Bias: -22.0 V
OCP RF: 200 V

Energy Discrimination: 3.5 V

CP Parameters
Mass Gain: 124
Mass Offset: 125

Axis Gain: 0.9990
Axis Offset: 0.01

OP Bias: -18.5 V

Hardware Settings
Torch: Torch H: -6.3 mm
Torch V: 0.1 mm

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2021-09-30 2:44 PM

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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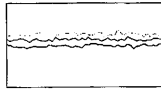
Document Name:

Tune reports

Tune Report

EM Discriminator 4.0 mV Analog HV 2247 V Pulse HV 1318 V

Scintillator



Mass	Range	Count	ASD	Background
50	5000	1038	0.992	0.000
50	5000	1049	0.985	0.000
100	10000	1837	2.885	0.001

Stripping Period [sec] 0.31
Integration Time [sec] 0.1

Choke/Choke Charged Ratio
Choke 156 / 140 0.435 %
Choke Charged 70 / 140 0.788 %

Tune Parameters

Plasma Parameters

Plasma Mode	—	Helium Gas	1.00 L/min	Makeup Gas	0.10 L/min
RF Power	15.50 W	Optim Gas	—	Auxiliary Gas	0.80 L/min
RF Matching	1.30 V	Helium Pump	0.10 rpm	Plasma Gas	15.0 L/min
Sample Depth	9.0 mm	SC Temp	2°C		

Lens Parameters

Extract 1	0.0 V	Orifice Lens	9.2 V	Deflect	12.4 V
Extract 2	-253.0 V	Orifice Extract	-30 V	Plate Bias	-100 V
Orifice Bias	-100 V	Orifice Exit	-50 V		

Cell Parameters

Use Gas	Yes	3rd Gas Flow	—	Energy Discrimination	3.5 V
He Flow	3.8 mL/min	Orifice Bias	-8.0 V		
H2 Flow	0.0 mL/min	Orifice RF	200 V		

CP Parameters

Mass Gain	124	Auto Gain	0.9990	CP Bias	-4.5 V
Mass Offset	125	Auto Offset	0.01		

Hardware Settings

Torch					
Torch H	-0.3 mm	Torch V	0.1 mm		

EM Discriminator 4.0 mV Analog HV 2247 V Pulse HV 1318 V

3 of 3 2021-09-30 2:44 PM

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name:

Test Report

Batch Summary Report

Batch Folder: C:\Batch\2021\BG He-3
Analysis File: BG He-3 batch.bln
Tune Step: #1 He

Run	Acq. Date/Time	Data File	Sample Name	Type	Level	Dilution
1	2021-09-30 14:21:47	BG He-3.d	BG He-3	Sample		1.0000

Page 1 / 2 2021-09-30 14:23:39

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Document Name:

Test Report

Batch Summary Report

Analyte Table

Run	Sample Name	File
1	BG He-3	42.8300

Page 2 / 2 2021-09-30 14:23:40

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name:

Test Report

Batch Summary Report

Batch Folder: D:\Agilent\Software\DO 30 Sep 2021\BG H2 new\B
Analysis File: BG H2 new batch.bln
Tune Step: #1 H2

Run	Acq. Date/Time	Data File	Sample Name	Type	Level	Dilution
1	2021-09-30 15:08:38	BG H2.d	BG H2	Sample		1.0000

Page 1 / 2 2021-09-30 15:10:31

Date: September 30, 2021 4:07:18 PM
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Document Name:

Test Report

Batch Summary Report

Analyte Table	
Sample Name	7% 1.421
1. 80.152	2.1500

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2021-09-30 15:10:31

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name:

Test Report

Batch Summary Report

Batch Folder: D:\Agilent Service\002 30 Sep 2021\027 Minib
Analyte File: 20 Minibatch\bin
Tune Step: #1 No Gas

Ret	Acq. Date/Time	Data File	Sample Name	Type	Level	Division
1	2021-09-30 15:12:44	20 Minib	20 Minib	Sample		1.0000

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2021-09-30 15:46:42

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Document Name:

Test Report

Batch Summary Report

Analyte Table	
Sample Name	7% 1.421
1. 20.152	2.1500

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2021-09-30 15:46:43

Date: September 30, 2021 4:07:18 PM
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Electronic Signature

Purpose

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Reason for Signature: Executed protocol and published this original version of document

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Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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User Name: panthop_kurathain Hostname: ASBKKW315			System Id: JP15471169 Print Date: September 30, 2021 4:07:22 PM	
ALS QHWW 7500 30Sep21 Transaction log :				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 30, 2021 3:50:07 PM	Audit	SessionCreated	Session	None
September 30, 2021 3:50:07 PM	Start	Configuration	Session	None
September 30, 2021 3:50:07 PM	Audit	Endlement	Licensing	User is FieldEngineer and does not require an unlock code
September 30, 2021 3:52:52 PM	Audit	EcpLoaded	Session	EQP details for primary technique (topMe) - File path: (ProtocolPacks\topMe\Config\urathain\02_50topMe.02.50.e cp). ECP File Name: (topMe.02.50.eap), ECP Name: (AgilentRecommended)
September 30, 2021 3:52:54 PM	End	Configuration	Session	None
September 30, 2021 3:52:57 PM	Start	Qualification	Session	OQ
September 30, 2021 3:52:57 PM	Start	Execution	Autosampler Check : SPS4: Autosampler Check	None
September 30, 2021 3:53:03 PM	End	Execution	Autosampler Check : SPS4: Autosampler Check	Run Count : 1
September 30, 2021 3:53:04 PM	Start	Execution	Integrated Sample Introduction System (SIS) Check : SIS3: Integrated Sample Introduction System (SIS) Check	None
September 30, 2021 3:53:08 PM	End	Execution	Integrated Sample Introduction System (SIS) Check : SIS3: Integrated Sample Introduction System (SIS) Check	Run Count : 1

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User Name: panthop_kurathain

Hostname: ASBKKW315

System Id: JP15471169

Print Date: September 30, 2021 4:07:22 PM

ALS QHWW 7500 30Sep21 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 30, 2021 3:53:10 PM	Start	Execution	Autotune : GB403A: Autotune 1	None
September 30, 2021 3:55:08 PM	End	Execution	Autotune : GB403A: Autotune 1	Run Count : 1
September 30, 2021 3:55:12 PM	Start	Execution	Background (No Gas Mode): GB403A: No Gas Mode Background 1	None
September 30, 2021 3:55:40 PM	End	Execution	Background (No Gas Mode): GB403A: No Gas Mode Background 1	Run Count : 1
September 30, 2021 3:55:43 PM	Start	Execution	Background (Gas Modes): GB403A: Gas Mode Background 1-Helium	None
September 30, 2021 3:56:17 PM	End	Execution	Background (Gas Modes): GB403A: Gas Mode Background 1-Helium	Run Count : 1
September 30, 2021 3:56:18 PM	Start	Execution	Background (Gas Modes): GB403A: Gas Mode Background 1-Hydrogen	None
September 30, 2021 3:56:28 PM	End	Execution	Background (Gas Modes): GB403A: Gas Mode Background 1-Hydrogen	Run Count : 1
September 30, 2021 3:56:41 PM	Start	Execution	20-Minute Stability (No Gas Mode): GB403A: 20-Minute Stability (No Gas Mode) 1	None
September 30, 2021 3:57:22 PM	End	Execution	20-Minute Stability (No Gas Mode): GB403A: 20-Minute Stability (No Gas Mode) 1	Run Count : 1
September 30, 2021 3:57:24 PM	End	Qualification	Session	OQ
September 30, 2021 3:57:24 PM	Start	Reporting	Session	None

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Date: September 30, 2021 4:07:16 PM
System ID: JP15471169

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Date: September 30, 2021 4:07:16 PM
System ID: JP15471169

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User Name: panthop_kurathain Hostname: ASBKKW315		System Id: JP15471169 Print Date: September 30, 2021 4:07:22 PM		
ALS QGMW 7500 30Sep21 Transaction log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 30, 2021 4:03:07 PM	Audit	Reporting	Session	Report Generated : Certificate
September 30, 2021 4:03:17 PM	Audit	Reporting	Session	Report Generated : Report
September 30, 2021 4:03:59 PM	Start	Qualification	Session	OQ
September 30, 2021 4:04:08 PM	End	Qualification	Session	OQ
September 30, 2021 4:04:09 PM	Start	Reporting	Session	None
September 30, 2021 4:04:28 PM	Audit	Reporting	Session	Report Generated : Certificate
September 30, 2021 4:04:36 PM	Audit	Reporting	Session	Report Generated : Report

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Date: September 30, 2021 4:07:16 PM
System ID: JP15471169

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Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoei, Saraburi 18110

Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T220730

Page 1 of 6

Certificate of Calibration

Equipment : HEATING BLOCK

Manufacturer : Environmental Express

Model : SC 196

Serial No. : 6974CECW3285

Customer Code : BKK_EL0054

ID No. : T5306A3

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250

Customer Location : Acid Digestion Lab

Date of Receipt : 30 March 2022

Calibrated By : Watcharapon Sangtong (Technician)

Approved By : / Sujjar Nakhakred (Site Calibration Manager)

Date of Issue : 12 APR 2022

REVIEW BY	Watcharapon C.
APPROVED BY	Sangtong
NEXT CAL DATE	7/10/23

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

Certificate No. T220730

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Calibration Report

Equipment : HEATING BLOCK
 Date of Calibration : 7 April 2022
 Environment : Temperature : 21.8-23.1 °C
 Line Voltage : 221.6-226.3 V
 Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20.

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN221-TN230	T210008	08 June 2022
TC	TYPE T	TN231-TN240	T210008	08 June 2022
DATA LOGGER	34970A	T149	T210008	08 June 2022

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Time Constant 2 Hour 25 Minute At 95 °C
 Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

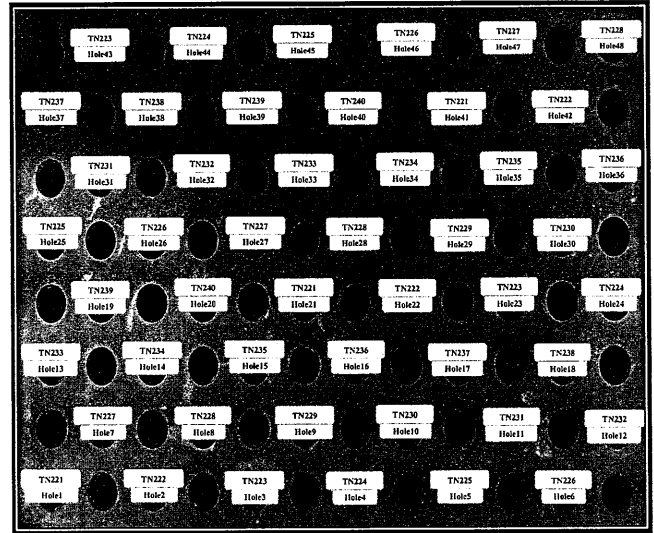
() without adjustment (X) after adjustment

Approved By.

Certificate No. T220730

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Calibration Report



FRONT CONTROL

Approved By.

FM-L13 108/30-05-57

FM-L13 108/30-05-57

Certificate No. T220730

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Calibration Report

Measurement Results

Calibration Point		Average Standard Reading at each position (°C)					
R1 Hole1-Hole6		TN221	TN222	TN223	TN224	TN225	TN226
CAL POINT	Max	93.60	93.82	94.05	94.20	94.36	94.26
	Min	93.07	93.26	93.51	93.66	93.82	93.71
	Average	93.33	93.54	93.78	93.93	94.09	93.98
R2 Hole7-Hole12		TN227	TN228	TN229	TN230	TN231	TN232
Max	94.59	94.79	94.63	94.55	94.82	95.00	
	Min	94.05	94.25	94.08	93.97	94.26	94.44
	Average	94.32	94.52	94.36	94.26	94.54	94.72
R3 Hole13-Hole18		TN233	TN234	TN235	TN236	TN237	TN238
Max	95.03	94.54	94.78	94.84	95.06	94.73	
	Min	94.46	93.98	94.20	94.28	94.49	94.18
	Average	94.74	94.26	94.49	94.56	94.78	94.45
R4 Hole19-Hole24		TN239	TN240	TN221	TN222	TN223	TN224
Max	94.89	94.82	95.73	95.85	95.73	96.10	
	Min	94.33	94.26	95.51	95.62	95.51	95.85
	Average	94.61	94.54	95.62	95.73	95.62	95.97
R5 Hole25-Hole30		TN225	TN226	TN227	TN228	TN229	TN230
Max	96.28	96.39	96.37	96.54	96.19	96.04	
	Min	96.01	96.10	96.02	96.20	95.89	95.71
	Average	96.15	96.24	96.20	96.37	96.04	95.88
R6 Hole31-Hole36		TN231	TN232	TN233	TN234	TN235	TN236
Max	96.84	96.97	97.03	96.48	96.33	95.76	
	Min	96.53	96.65	96.71	96.08	95.98	95.43
	Average	96.68	96.81	96.87	96.28	96.16	95.60
R7 Hole37-Hole42		TN237	TN238	TN239	TN240	TN221	TN222
Max	96.46	96.15	96.19	96.06	96.95	97.09	
	Min	96.13	95.84	95.85	95.72	96.64	96.78
	Average	96.30	95.99	96.02	95.89	96.80	96.93
R8 Hole43-Hole48		TN223	TN224	TN225	TN226	TN227	TN228
Max	96.91	96.58	96.13	96.19	96.34	96.19	
	Min	96.55	96.21	95.80	95.87	96.03	95.88
	Average	96.73	96.40	95.96	96.03	96.18	96.03

Approved By.

FM-L13 108/30-05-57

Certificate No. T220730

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Calibration Report

Measurement Results

Calibration Point		Average Standard Reading at each position (°C)					
R1 Hole1-Hole6		TN221	TN222	TN223	TN224	TN225	TN226
CAL POINT	Max	104.47	104.65	104.79	105.31	105.47	105.46
	Min	104.15	104.27	104.45	104.98	105.14	105.20
	Average	104.31	104.46	104.62	105.15	105.31	105.33
R2 Hole7-Hole12		TN227	TN228	TN229	TN230	TN231	TN232
Max	105.55	105.73	105.65	105.84	105.97	106.07	
	Min	105.28	105.43	105.35	105.52	105.68	105.83
	Average	105.42	105.58	105.50	105.68	105.82	105.95
R3 Hole13-Hole18		TN233	TN234	TN235	TN236	TN237	TN238
Max	106.14	106.06	105.81	106.05	105.81	105.87	
	Min	105.85	105.81	105.55	105.80	105.53	105.64
	Average	106.00	105.94	105.68	105.92	105.67	105.75
R4 Hole19-Hole24		TN239	TN240	TN221	TN222	TN223	TN224
Max	105.86	105.60	104.44	104.51	104.28	104.78	
	Min	105.61	105.37	104.27	104.35	104.12	104.61
	Average	105.74	105.48	104.35	104.43	104.20	104.69
R5 Hole25-Hole30		TN225	TN226	TN227	TN228	TN229	TN230
Max	104.94	104.93	104.97	105.08	104.68	104.69	
	Min	104.77	104.75	104.76	104.90	104.51	104.49
	Average	104.85	104.84	104.86	104.99	104.60	104.59
R6 Hole31-Hole36		TN231	TN232	TN233	TN234	TN235	TN236
Max	105.44	105.45	105.61	104.95	104.84	104.42	
	Min	105.27	105.27	105.44	104.76	104.66	104.25
	Average	105.36	105.36	105.53	104.86	104.75	104.33
R7 Hole37-Hole42		TN237	TN238	TN239	TN240	TN221	TN222
Max	105.17	104.70	104.59	104.51	105.22	105.53	
	Min	105.00	104.53	104.41	104.35	105.04	105.37
	Average	105.08	104.62	104.50	104.43	105.13	105.45
R8 Hole43-Hole48		TN223	TN224	TN225	TN226	TN227	TN228
Max	105.61	105.45	105.10	104.77	104.87	105.02	
	Min	105.44	105.28	104.92	104.60	104.70	104.85
	Average	105.53	105.37	105.01	104.69	104.79	104.93

Approved By.

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110

Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T220730

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Calibration Report

Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (±°C)	Uncertainty (±°C)
	Min, Max	Average		
100.0	100.0, 100.4	100.1	0.29	0.83
105.0	105.0, 105.4	105.1	0.20	0.79

* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By:

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T211009

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Calibration Report

Equipment : Chamber (Cold Room)
 Date of Calibration : 18 May 2021
 Environment : Temperature : 23.4-24.9 °C
 Line Voltage : 221.4-230.2 V
 Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Recapproved 2001) and AS2853-1986).

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T210009	8 January 2022
TC	TYPE T	TN171-TN180	T210009	8 January 2022
DATA LOGGER	34970A	T149	T210009	8 January 2022

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244).

4. Condition of calibrated item : good

Equipment Description :

Time Constant 1 Hour Minute At 3 °C
 Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment () after adjustment

Approved By:

FM-L15 117/15-05-63



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851 , +669 8247 2360

Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T211009

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cold Room)

Manufacturer : KOLDTECH

Model : KM 320

Serial No. : TBN-1012061/05

Customer Code : BKK_EN0167

ID No. : T2463A3

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250

Customer Location : Laboratory

Date of Receipt : 6 May 2021

Calibrated By : Watcharapon Songthong (Technician)

Approved By : / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 20 MAY 2021

REVIEW BY	
APPROVED BY	
NEXT CAL DATE	16/11/22

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-L14 117/01-02-64



Metrological Center

SCI ECO Services Company Limited

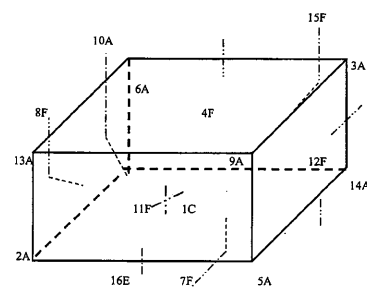
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T211009

Page 3 of 4

Calibration Report



C = Centre, F = Centre of Face, A = Corner, E = Centre of Edge

1C = TN161	12F = TN172
2A = TN162	13A = TN173
3A = TN163	14A = TN174
4F = TN164	15F = TN175
5A = TN165	16E = TN176
6A = TN166	
7F = TN167	
8F = TN168	
9A = TN169	
10A = TN170	
11F = TN171	

Approved By:

FM-L15 117/15-05-63

Certificate No. T211009

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170
3	3.23	3.38	3.23	3.41	3.36	3.52	3.51	3.11	3.29	3.50
	TN171	TN172	TN173	TN174	TN175	TN176				
	3.36	3.18	3.52	3.22	3.28	3.31				

Chamber (Cold Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
	Min	Max					
3.0	2.7, 3.4	3.0	3.34	1.00	1.10	1.46	2.00

* The Annotated uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By

FM-L15 117/15-05-63

analytikjena
An Endress+Hauser CompanySerial-No.: R190A0143 Customer-No.: 004-002
Date: 6/06/2022 Carried out by: Mr. Srichan Pawan.Maintenance with following Operational Qualification (OQ)
(requires a separate OQ protocol) ☐

Company	บริษัท 10102105 110057002 จำกัด (มหาชน) บมจ.
User	บริษัท 10102105
Department	Lab
Street	101 ถนนสุขุมวิท 40 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร
Zip Code, City	10110 กรุงเทพมหานคร 10250
Country	ประเทศไทย
Phone	
Fax	
E-mail	

REVIEW BY: Sudmat N.
APPROVED BY: Sudmat N.
NEXT CAL. DATE: 5/06/2023

Maintenance Protocol

Atomic Fluorescence Spectrometer
mercur DUO /
mercur DUO plus

Maintenance works basic unit

tightness visual check inside the Mercur ☒
visual check if gold-traps are broken ☒
visual check if spectrometer is contaminated ☒
visual check of the fluorescence cell ☒
visual check of the absorption cell, incl. window ☒
reactor cleaning ☒
check pump-hose, if necessary change it ☒
check swivel drive (SEV) ☒
check drying-hose, output gas-liquid-separator ☒
test Bubble-Sensor ☒
check gas flows ☒
check volume flows, reagents ☒
recording stray light values ☒
measurement with 30 ng/l ☒

Maintenance works Autosampler

Serial No.: 52 1102 250

lubricate the dosing-winding (Teflon-grease-spray) ☒
clean the dosing cylinder, if necessary exchange it ☒
lubricate the winding system of the height drive with some drops of oil ☒
check the toothed belt ☒
check the position of the mechanical stopper (height: 13mm) ☒
check the pump rate of mixing pump (<14s AS52, typ.7s/<20s AS52S, typ.10s) ☒
check the pump rate of washing cup ☒
check the electrical hose connections for good contact ☒
check the connectors of the magnetic valves ☒
check the dosing hose for buckling, if necessary exchange it ☒

Device parameter	nominal value	actual value
visual check general tightness inside the Mercur	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
visual check Goldtraps (Goldtraps 2 / NG)	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
visual check spectrometer		
Fluorescence cell	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
Absorption cell, incl. window	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
lens	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
Swivel drive (SEV)	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
check pump hoses	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
check hoses and hose connectors	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
check and clean reactor	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
check drying hose output Gas-liquid-separator	o.k.: <input checked="" type="checkbox"/>	changed: <input type="checkbox"/>
check bubble-sensor	o.k.: <input checked="" type="checkbox"/>	not o.k.: <input type="checkbox"/>
Check gasflow		
Argon pressure valve 4	1.2 - 1.5 bar	1.5 bar
Valve 1	10 Nl/h or 0.166 NL/min	0.166
Valve 2	50 Nl/h or 0.833 NL/min	0.833
Valve 3	5 Nl/h or 0.083 NL/min	0.083
Valve 4	10 Nl/h or 0.166 NL/min	0.167
Check liquidflow		
Acid	2.5ml/min ± 1 ml	2.5 ml/min
Red.-agent	2.5ml/min ± 1 ml	2.5 ml/min
Sample	10ml/min ± 2 ml	10 ml/min
Adventitious light - values (V)	from file	
100	0	0
200	0	0
300	0	0
350	0	1
400	1	3
450	4	7
500	9	17
550	19	36
575	26	51
600	36	71

Maintenance Protocol mercur DUO/ mercur DUO plus | update 27.06.2016 Version 2.1 Kees
Analytik Jena AG | Konrad-Zuse-Str. 1 | 07745 Jena, Germany

4/5

Device parameter	nominal value	actual value
Analytical parameters Fluorescence cell		
Conditions.: max.conc.: 10µg/L PMT-voltage: 369 V		
Blank-solution without enrichment / FBR 30 ng/L	Int > 0.0015 RSD < 3 %	Int.: 0.0003 Int.: 0.0053 RSD: 1.02 %
Conditions.: max.conc.: 1.7µg/L PMT-voltage: 352 V		
Blank-solution with enrichment / FBR 30 ng/L	Int > 0.008 RSD < 3 %	Int.: 0.0040 Int.: 0.0249 RSD: 0.87 %
Fok.-factor (Int ₂ / Int ₁)	> 3.5	4.206
Analytical parameters Absorption cell		
Blank-solution without enrichment / FBR 100 ng/L	Ext. > 0.0012 RSD < 5 %	Ext.: 0.0010 Ext.: 0.0049 RSD: 3.32 %
Comments		

Mr. Srichai Pak-on
Signature Technician

Bangkok, 6/06/2022
Place, Date (DD/MM/YYYY)

Samir Samir
Signature Customer

6/06/2022
Place, Date (DD/MM/YYYY)

Maintenance Protocol mercur DUO/ mercur DUO plus | update 27.06.2016 version 2.1 Kees
Analytik Jena AG | Konrad-Zuse-Str. 1 | 07745 Jena, Germany

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Agilent CrossLab Compliance Services

Certificate of System Qualification

GC-DQ

System ID: GC-6
Organization Name: ALS Laboratory Groups (Thailand)
Organization Location: 104 Phatthanakan 40, Phatthanakan Rd., Suan Luang, Bangkok 10250
Date: April 28, 2020 8:57:51 AM
EQP Name: Agilent Recommended
EQP Revision: GC.01.94
Overall Qualification Status: Pass

REVIEW BY: [Signature]
APPROVED BY: [Signature]
NEXT CAL DATE: 28/10/21

System Inspection and Basic Safety and Operation

Name: 7890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 7890
Front SSL

Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: 0.1 psi /5 minutes
Agilent Recommended: >= -2.0 and <= 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL

Date: April 28, 2020 8:57:51 AM
System ID: GC-6

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Agilent CrossLab Compliance Services

Setpoint Status: Pass

Setpoint: 25.0 psi Actual: 25.2 psi
Accuracy: 0.2 psi
Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 7890
Back SSL

Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: 0.1 psi /5 minutes
Agilent Recommended: >= -2.0 and <= 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back SSL

Setpoint Status: Pass
Setpoint: 25.0 psi Actual: 25.1 psi
Accuracy: 0.1 psi
Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Date: April 28, 2020 8:57:51 AM
System ID: GC-6

Name: 7890

Front FID

Setpoint Status: Pass

Flow Type: Fuel

Setpoint: 30.0 ml/min Measured Flow: 30.5 ml/min

Accuracy: 0.5 ml/min

Agilent Recommended: ≤ 10.0 % of setpoint (3.0 ml/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer

Setpoint: 400.0 ml/min Measured Flow: 401.5 ml/min

Accuracy: 1.5 ml/min

Agilent Recommended: ≤ 10.0 % of setpoint (40.0 ml/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup

Setpoint: 25.0 ml/min Measured Flow: 25.4 ml/min

Accuracy: 0.4 ml/min

Agilent Recommended: ≤ 10.0 % of setpoint (2.5 ml/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890

Back FID

Date: April 29, 2020 8:57:51 AM
System ID: GC-6

Page 3 / 12

Setpoint Status: Pass

Flow Type: Fuel

Setpoint: 30.0 ml/min Measured Flow: 29.6 ml/min

Accuracy: 0.4 ml/min

Agilent Recommended: ≤ 10.0 % of setpoint (3.0 ml/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer

Setpoint: 400.0 ml/min Measured Flow: 399.3 ml/min

Accuracy: 0.7 ml/min

Agilent Recommended: ≤ 10.0 % of setpoint (40.0 ml/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup

Setpoint: 25.0 ml/min Measured Flow: 25.0 ml/min

Accuracy: 0.0 ml/min

Agilent Recommended: ≤ 10.0 % of setpoint (2.5 ml/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: April 29, 2020 8:57:51 AM
System ID: GC-6

Page 4 / 12

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 231.8 °C

Accuracy: 1.8 °C

Agilent Recommended: ≥ -1.0 % of setpoint in K (-5.0 °C)

≤ 1.0 % of setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 100.0 100.3 °C

Accuracy: 0.3 °C

Agilent Recommended: ≥ -1.0 % of setpoint in K (-3.7 °C)

≤ 1.0 % of setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average

Temperature: 100.0 100.1833 °C

Stability: 0.2 °C

Agilent Recommended: ≤ 0.5 °C

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1 Front SSL / Front FID

Name: 7693A

Date: April 29, 2020 8:57:51 AM
System ID: GC-6

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Setpoint Status: Completed

Injection Volume on Column: 1.0 ul

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1 Front SSL / Front FID

Name: 7890

Setpoint Status: Pass

Base Signal: 15.8 pA

ASTM Noise pA Drift pA/hr

0.06 0.04

Agilent Recommended: ≤ 0.10 ≤ 2.50

Status: Pass Pass

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7693A

Setpoint Status: Pass

Injection Volume on Column: 1.0 ul

Area RSD: 0.28 % Retention Time 0.14 %

Agilent Recommended: ≤ 3.00 RSD: ≤ 1.00

Overall Injection Precision Test Status

Pass

Date: April 29, 2020 8:57:51 AM
System ID: GC-6

Page 6 / 12

Signal to Noise

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7890

Setpoint Status:

Pass

Signal to Noise:

553420

Agilent Recommended:

>=

300000

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2 Back SSL / Back FID

Injection Tower

Name: 7893A

Setpoint Status:

Completed

Injection Volume on Column:

1.0

ul

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2 Back SSL / Back FID

Name: 7890

Setpoint Status:

Pass

Base Signal:

21.0

pA

ASTM Noise

pA

0.07

<=

0.10

Drift

pA/Hr

0.55

<=

2.50

Agilent Recommended:

Status:

Pass

Pass

Date: April 29, 2020 8:57:51 AM
System ID: GC-6

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Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2 Back SSL / Back FID

Injection Tower

Name: 7893A

Setpoint Status:

Pass

Injection Volume on Column:

1.0

ul

Area RSD:

0.32

%

Retention Time

0.15

%

Agilent Recommended:

<=

3.00

RSD:

<=

1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2 Back SSL / Back FID

Injection Tower

Name: 7890

Setpoint Status:

Pass

Signal to Noise:

576934

Agilent Recommended:

>=

300000

Overall Signal to Noise Test Status

Pass

Date: April 29, 2020 8:57:51 AM
System ID: GC-6

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Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID GC-6
Manufacturer Agilent Technologies

Tested Combination1

Injection Technique Injection Tower
Sampler Identifier Sampler 1
Inlet Front
Detector Front
LTM Included? No

Tested Combination2

Injection Technique Injection Tower
Sampler Identifier Sampler 2
Inlet Back
Detector Back
LTM Included? No

Sampler 1

Manufacturer Agilent Technologies
Type Injection Tower
Name 7893A
Model Number G4513A
Serial Number CN18280128
Firmware Revision A.10.09
Usage Sample Injection
Location Front
Syringe Volume (ul) 10Date: April 29, 2020 8:57:51 AM
System ID: GC-6

Page 9 / 12

Sampler 2

Manufacturer Agilent Technologies
Type Injection Tower
Name 7893A
Model Number G4513A
Serial Number CN10340103
Firmware Revision A.10.09
Usage Sample Injection
Location Back
Syringe Volume (ul) 10

Sampler 3

Manufacturer Agilent Technologies
Type Tray
Name 7893A
Model Number G4514A
Serial Number CN15380030
Firmware Revision A.11.01
Vial Heater Not installed

Mainframe 1

Manufacturer Agilent Technologies
Name 7890
Model Number G3440A
Serial Number CN11481056
Firmware Revision A.01.16

Inlet 1

Manufacturer Agilent Technologies
Name 7890
Type SSL
Location Front
Carrier Gas Helium
Control Type Electronic Pressure Control (EPC)
Purged Inlet YesDate: April 29, 2020 8:57:51 AM
System ID: GC-6

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Inlet 2

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

Electronic Signature

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Signature Creation Date:	April 29, 2020
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Date: April 29, 2020 8:57:51 AM
System ID: GC-6

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Date: April 29, 2020 8:57:51 AM
System ID: GC-6

Page 12 / 12

BKK_EL0026

Certificate of System Qualification

ICPMS-OQ

System ID: JP12091612
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Phatthanakan 40, Suan Luang, Bangkok 10250 Thailand.

Date: November 26, 2020 2:02:37 PM
EQP Name: Agilent Recommended
EQP Revision: ICPMS.02.50
Overall Qualification Status: Pass

Autosampler Check

Overall Autosampler Check Test Status

Pass

Integrated Sample Introduction System (ISIS) Check

Overall Integrated Sample Introduction System (ISIS) Check Test Status

Pass

Autotune

Peakwidth Mass 7	Pass
Peakwidth Mass 89	Pass
Peakwidth Mass 205	Pass
Mass Axis 7	Pass
Mass Axis 89	Pass
Mass Axis 205	Pass
Mass 7 Sensitivity No Gas	Pass
Mass 89 Sensitivity No Gas	Pass
Mass 205 Sensitivity No Gas	Pass
Mass 59 Sensitivity He	Pass
Oxide Ratio 156/140	Pass
Doubly Charged Species Ratio 70/140	Pass

Overall Autotune Test Status

Pass

Date: November 26, 2020 2:02:37 PM
System ID: JP12091612

Page 1 / 7

Background (No Gas Mode)

Setpoint Status:

Pass

Masses (AMU):

Measured Value:

Agilent Recommended:

Status:

7	89	205
2,500	2,700	5,000
cps		
<= 10	<= 10	<= 30
Pass	Pass	Pass

Overall Background (No Gas Mode) Test Status

Pass

Background (Gas Mode)

Gas Mode: Helium

Setpoint Status:

Pass

Mass (AMU):

Measured Value:

Agilent Recommended:

Status:

78	
80,1000	cps
<= 1460	
Pass	

Overall Background (Gas Mode) Test Status

Pass

20-Minute Stability (No Gas Mode)

Masses (AMU):

Stability RSD:

Agilent Recommended:

Status:

7	89	205
0.78059	1.31334	1.69158
%		
<= 3.45	<= 3.45	<= 3.45
Pass	Pass	Pass

Overall 20-Minute Stability (No Gas Mode) Test Status

Pass

Date: November 26, 2020 2:02:37 PM
System ID: JP12091612

Page 2 / 7

Instrument Details

Purpose

This section describes the as found system configuration.

Details

ICP-MS 1

Manufacturer	Agilent Technologies
Name	7700x
Model Number	G3281A
Detector Type	SQ
Nebulizer	Mira Mist (G3161)
Spray Chamber	Quartz
Torch	Quartz
Sampling Cone	Ni
Skimmer Cone	Ni
Serial Number	JP12091612
Firmware Revision	B.01.03

ISIS 1

Manufacturer	Agilent Technologies
Name	ISIS2
Model Number	G4911A
Installed Options	#003: 2 pumps, 1 valve, auto dilution and discrete sampling
Type	Peristaltic pump system

Autosampler 1

Manufacturer	Agilent Technologies
Name	ASX-520
Model Number	G3286A
Serial Number	US021293A520

Chiller 1

Manufacturer	Agilent Technologies
Name	Chiller
Model Number	G3292A
Serial Number	4N1220700

Date: November 26, 2020 2:02:37 PM
System ID: JP12091612

Page 3 / 7

Electronic Signature

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Details

Full Name of Signer: Panthep Kurasathain
Logged On User Name: panthep_kurasathain@agilent.com
Signature Creation Date: November 26, 2020
Reason for Signature: Executed protocol and published this original version of document

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Date: November 26, 2020 2:02:37 PM
System ID: JP12091612

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User Name: panthep_kurasathain HostName: ASBKKW7009		System ID: JP12091612 Print Date: November 26, 2020 2:02:38 PM		
ALS OQ HW 261120 Transaction log :				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 26, 2020 1:38:34 PM	Audit	SessionCreated	Session	None
November 26, 2020 1:38:35 PM	Start	Configuration	Session	None
November 26, 2020 1:38:35 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
November 26, 2020 1:45:03 PM	Audit	EqpLoaded	Session	EQP details for primary technique [topMa] - File path: [ProtocolPacks\topMa\Config\units\02.50\topMa.02.50.aqp], EQP File Name: [topMa.02.50.aqp], EQP Name: [AgilentRecommended]
November 26, 2020 1:48:14 PM	End	Configuration	Session	None
November 26, 2020 1:49:17 PM	Start	Qualification	Session	OQ
November 26, 2020 1:48:17 PM	Start	Execution	Autosampler Check : ASX-620:	None
November 26, 2020 1:48:24 PM	End	Execution	Autosampler Check : ASX-620:	Run Count : 1
November 26, 2020 1:49:31 PM	Start	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS2:	None
November 26, 2020 1:49:37 PM	End	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS2:	Run Count : 1

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Page 1 / 3

User Name: panthep_kurasathain

Host Name: ASBKKW7009

System ID: JP12091612

Print Date: November 26, 2020 2:02:38 PM

ALS OQ HW 261120 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 26, 2020 1:48:41 PM	Start	Execution	Autotune : G3281A: Autotune 1	None
November 26, 2020 1:53:13 PM	Start	Execution	Background (No Gas Mode): G3281A: No Gas Mode Background 1	None
November 26, 2020 1:53:16 PM	Start	Execution	Autotune : G3281A: Autotune 1	None
November 26, 2020 1:54:39 PM	End	Execution	Autotune : G3281A: Autotune 1	Run Count: 1
November 26, 2020 1:54:41 PM	Start	Execution	Background (No Gas Mode): G3281A: No Gas Mode Background 1	None
November 26, 2020 1:55:07 PM	End	Execution	Background (No Gas Mode): G3281A: No Gas Mode Background 1	Run Count: 1
November 26, 2020 1:55:08 PM	Start	Execution	Background (Gas Modes): G3281A: Gas Mode Background 1Helium	None
November 26, 2020 1:55:49 PM	End	Execution	Background (Gas Modes): G3281A: Gas Mode Background 1Helium	Run Count: 1
November 26, 2020 1:55:51 PM	Start	Execution	20-Minute Stability (No Gas Mode): G3281A: 20-Minute Stability (No Gas Mode) 1	None
November 26, 2020 1:56:40 PM	End	Execution	20-Minute Stability (No Gas Mode): G3281A: 20-Minute Stability (No Gas Mode) 1	Run Count: 1
November 26, 2020 1:56:42 PM	End	Qualification	Session	OQ
November 26, 2020 1:56:42 PM	Start	Reporting	Session	None

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System ID: JP12091612

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Date: November 26, 2020 2:02:37 PM
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User Name: panthep_kurassathain
 Hostname: ASBKHW7009
 System ID: JP12091612
 Print Date: November 26, 2020 2:02:38 PM

ALS OQ HW 261120 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 26, 2020 2:00:12 PM	Audit	Reporting	Session	Report Generated: Certificate
November 26, 2020 2:00:19 PM	Audit	Reporting	Session	Report Generated: Report
November 26, 2020 2:02:17 PM	Audit	Reporting	Session	Report Signed: Report PDF Name: ALS OQ HW 261120_20201126_OQ Report_1.pdf User Name: panthep_kurassathain@agilent.com Full Name of Signer: Panthep Kurassathain Reason for signature: Executed protocol and published this original version of document

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Date: November 26, 2020 2:02:37 PM
 System ID: JP12091612

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Agilent CrossLab Compliance Services

Agilent
CrossLab
From Laboratory to Data

EQUIPMENT QUALIFICATION REPORT (EQR)

Agilent CrossLab Compliance

Qualification Type: ICPMS-OQ
 System ID: JP12091612
 EQP Name: AgilentRecommended
 EQP Details: Agilent Technologies System
 EQP Revision: ICPMS.02.50
 EQP Release Date: March 2020
 Date: November 26, 2020 2:02:09 PM
 Report Type: Report
 Org. Name: ALS Laboratory Group (Thailand) Co., Ltd.
 Org. Location: 104 Phatthanakan 40, Suan Luang, Bangkok 10250 Thailand.

Date: November 26, 2020 2:02:09 PM
 System ID: JP12091612

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Date: November 26, 2020 2:02:09 PM
 System ID: JP12091612

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Test Summary

Purpose

This section includes a status for each scheduled test and the overall qualification. For each test that is run, (1) the status is automatically determined based on pre-defined limits, and (2) the total number of times the test was run is displayed. For detailed results and specifications for a test, refer to the test results in this EQR.

Details

Test	Status	Runs
Autosampler Check : ASX-520	Pass	1
Integrated Sample Introduction System (ISIS) Check : ISIS2	Pass	1
Autotune : G3281A	Pass	1
Background (No Gas Mode) : G3281A	Pass	1
Background (Gas Modes) : G3281A	Pass	1
20-Minute Stability (No Gas Mode) : G3281A	Pass	1

Overall Qualification Status

Pass

Date: November 26, 2020 2:02:09 PM
 System ID: JP12091612

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Service Details

Purpose

This section includes local contact and delivery details for this service.

General Details

Service Order No./Request: 6004267565
EQP Name: AgilentRecommended
EQP Revision: ICPMS.02.50
Report Type: Report

Organization Details

Name: ALS Laboratory Group (Thailand) Co.,Ltd.
Location: 104 Phatthanakan 40, Suan Luang, Bangkok 10250 Thailand.

Local Contact Details

Name: Chatchamai
Job Title: Lab Manager
Qualification Location: Spectro Room

Operator Details

Name: Panthep Kurasathain
Job Title: Field Service Engineer

Data Acquisition Details

Acquisition Software Name: MassHunter
Acquisition Software Revision: B.01.03

Customer Data System (CDS): IcpMs: MassHunter

Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

Instrument Details

Purpose

This section describes the as found system configuration.

Details

ICP-MS 1

Manufacturer: Agilent Technologies
Name: 7700x
Model Number: G3281A
Detector Type: SQ
Nebulizer: Mira Mist (G3161)
Spray Chamber: Quartz
Torch: Quartz
Sampling Cone: NI
Skimmer Cone: NI
Serial Number: JP12091612
Firmware Revision: B.01.03

ISIS 1

Manufacturer: Agilent Technologies
Name: ISIS2
Model Number: G4911A
Installed Options: #003: 2 pumps, 1 valve, auto dilution and discrete sampling
Type: Peristaltic pump system

Autosampler 1

Manufacturer: Agilent Technologies
Name: ASX-620
Model Number: G3296A
Serial Number: US021293A520

Chiller 1

Manufacturer: Agilent Technologies
Name: Chiller
Model Number: G3292A
Serial Number: 4N1220700

Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

Calculation Formulas

Purpose

This section includes calculation formulas for all available tests. Depending upon which tests are scheduled, all or some apply to your qualification.

For a description of calculations for ICP-MS tests performed by the MassHunter software, refer to the MassHunter application and documentation.

Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

Protocol Details

Purpose

This section lists the revisions for all test units used in this report. For complete test-specific and high-level change details, refer to the Revision History document.

Test Revision	Test
ICPMS.02.50	20-Minute Stability (No Gas Mode)
ICPMS.02.50	Autosampler Check
ICPMS.02.50	Autotune
ICPMS.02.50	Background (Gas Modes)
ICPMS.02.50	Background (No Gas Mode)
ICPMS.02.50	Integrated Sample Introduction System (ISIS) Check

Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

Autosampler Check

Purpose

This test demonstrates that the autosampler module is correctly installed and connected. It does not test module performance.

Setpoint

Results

Criteria	Observed Result	Expected Result	Status
After the self test, is probe in the home position?	Yes	Yes	Pass
As commanded, is the probe positioned at vial 2?	Yes	Yes	Pass

Setpoint Status: Pass

Runs: 1

Overall Autosampler Check Test Status

Pass

Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

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Integrated Sample Introduction System (ISIS) Check

Purpose

This test demonstrates that the ISIS module is correctly installed and connected. It does not test module performance.

Setpoint

Results

Criteria	Observed Result	Expected Result	Status
As commanded, does the pump rotate?	Yes	Yes	Pass
As commanded, do the valves load and inject?	Yes	Yes	Pass

Setpoint Status: Pass

Runs: 1

Overall Integrated Sample Introduction System (ISIS) Check Test Status

Pass

Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

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Autotune

Purpose

This test uses traceable checkout standards to run a software-executed autotune in all modes. The tune report provides values for peak width, mass axis, sensitivity, oxide species, and doubly-charged species tests.

Setpoint

Results

Peakwidth Mass 7

Agilent Recommended:

	0.733	AMU
>=	0.65	
<=	0.80	
Status:	Pass	

Peakwidth Mass 89

Agilent Recommended:

	0.716	AMU
>=	0.65	
<=	0.80	
Status:	Pass	

Peakwidth Mass 205

Agilent Recommended:

	0.720	AMU
>=	0.65	
<=	0.80	
Status:	Pass	

Mass Axis 7

Agilent Recommended:

	7.05	AMU
>=	6.9	
<=	7.1	
Status:	Pass	

Mass Axis 89

Agilent Recommended:

	89.00	AMU
>=	88.9	
<=	89.1	
Status:	Pass	

Mass Axis 205

Agilent Recommended:

	205.00	AMU
>=	204.9	
<=	205.1	
Status:	Pass	

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Mass 7 Sensitivity No Gas

Agilent Recommended:

Status:

	17.62	Mcps/ppm
>=	25.5	
Status:	Pass	

Mass 89 Sensitivity No Gas

Agilent Recommended:

Status:

	161.21	Mcps/ppm
>=	85	
Status:	Pass	

Mass 205 Sensitivity No Gas

Agilent Recommended:

Status:

	120.27	Mcps/ppm
>=	51	
Status:	Pass	

Mass 69 Sensitivity He

Agilent Recommended:

Status:

	58.47	Mcps/ppm
>=	20.4	
Status:	Pass	

Oxide Ratio 156/140

Agilent Recommended:

Status:

	0.955	%
<=	1.38	
Status:	Pass	

Doubly Charged Species Ratio 70/140

Agilent Recommended:

Status:

	1.900	%
<=	2.3	
Status:	Pass	

Setpoint Status: Pass

Runs: 1

Overall Autotune Test Status

Pass

Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

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Background (No Gas Mode)

Purpose

This test examines the background of the ICP-MS in no gas mode by monitoring ions during a blank run.

Setpoint

Conditions

Masses: 7 AMU
89 AMU
205 AMU

Measurements and Results

Masses (AMU): 7, 89, 205
Measured Value: 2.500, 2.700, 5.000 cps
Agilent Recommended: <= 10, <= 10, <= 30
Status: Pass, Pass, Pass

Setpoint Status: Pass Runs: 1

Overall Background (No Gas Mode) Test Status

Pass

Background (Gas Mode)

Purpose

This test examines the background of the ICP-MS in the various gas modes by monitoring ions during a blank run.

Setpoint

Gas Mode: Helium

Conditions

Mass: 78 AMU
Integration Time: 1.0 sec
Cycles: 20

Measurements and Results

Mass (AMU): 78
Measured Value: 60.1000 cps
Agilent Recommended: <= 460
Status: Pass

Setpoint Status: Pass Runs: 1

Overall Background (Gas Mode) Test Status

Pass

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20-Minute Stability (No Gas Mode)

Purpose

This test monitors the abundance of ions present in the checkout standard over a 20-minute period to verify that the signal is stable. The %RSD of the abundance of given ions is calculated internally by the software and compared to the limit.

Setpoint

Conditions

Mode: Spectrum
Masses: 7, 9, 59, 89, 140, 205
Integration Time: 9.99 sec
Peak Pattern: 3 points/peak
Repetitions: 20
Sweeps/Replicates: 100

Measurements and Results

Masses (AMU): 7, 89, 205
Stability RSD: 0.78069, 1.31334, 1.69158 %
Agilent Recommended: <= 3.45, <= 3.45, <= 3.45
Status: Pass, Pass, Pass

Setpoint Status: Pass Runs: 1

Overall 20-Minute Stability (No Gas Mode) Test Status

Pass

Declaration of Change Control

This document is under change control. Revision history is maintained and printed on each document. Access to the master documents is limited to process owners. Documents receive periodic review and cannot be assigned an overgreen status. The qualification performed according to this document refers only to the hardware/software configuration in place at the time of the qualification. Agilent Technologies recommends that instrument configuration change management procedures be in place in order to maintain the validation process. Any changes to the analytical or computer hardware or software must be clearly specified. A change management system provides a means for determining the degree of requalification required according to the extent of the changes made. All details of the changes must be thoroughly recorded and documented, together with details of completed tests and their results. Note: Hardware/software configuration management is the customer's responsibility.

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Attachments

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EQR	General	Operator's training certificate and qualifications	1
EQR	General	Certificate of Qualification for ACE	1
EQR	General	Certificate of Qualification for ACE	1
EQR	General	Tune reports	3
EQR	General	Test BG	2
EQR	General	Test Stability	2

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General

Document Name: Certificate of System Qualification

Agilent Technologies

Agilent Compliance Engine Self Qualification

Date: October 14, 2020 10:27:55 AM
Drive Serial #: ACA25C9 Platform Revision: A.03.01

Individual self-qualification reports for each specific technique installed are also available upon request. They provide additional details on the general report from the concise summary and are structured by the actual algorithms challenged during the process. There is not a one-to-one relationship between algorithms and OQ program tests because some algorithms are used by several tests and across multiple similar hardware components of the qualified systems.

Technique Type	Tests Completed	Result
Atomic Absorption	7	Conforms
Capillary Electrophoresis	10	Conforms
Dissolution	8	Conforms
Emission Spectroscopy	3	Conforms
Gas Chromatography - GCMS	17	Conforms
Gas Chromatography	29	Conforms
Gel Permeation Chromatography	9	Conforms
ICP-MS	8	Conforms
Infrared Spectroscopy	7	Conforms
Liquid Chromatography	17	Conforms
Liquid Chromatography - LCMS	8	Conforms
Microfluidics	18	Conforms
Sample Preparation - Gas Chromatography	9	Conforms
Sample Preparation - Liquid Chromatography	8	Conforms
Supercritical Fluid Chromatography	15	Conforms
Software	5	Conforms
UV-Vis Spectrophotometer	13	Conforms

Overall Qualification Status
Conforms

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General

Document Name: Operator's training certificate and qualifications

Agilent Technologies

Certificate of Completion

Learner Name: Panthop Kurasthain

Title Of Course: AN-CB-ICPMS-2-017-B:7700x/7700s ICP-MS Intro. -Oper.H/W.S/W & OQ/PV

Completion Date: November 22, 2012

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific limitations.

A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent-authorized service provider, through which the service employee has ongoing access to Agilent's Safety Alerts, Service Notes, internal technical updates, update training, current documentation, technical support, course parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

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General

Document Name: Certificate of Qualification for ACE

Agilent Technologies

Certificate of Completion

Learner Name: Panthop Kurasthain

Title Of Course: AN-CB-SS-II-030-A: ACE 3.X User Update Training

Completion Date: July 7, 2020

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific limitations.

A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent-authorized service provider, through which the service employee has ongoing access to Agilent's Safety Alerts, Service Notes, internal technical updates, update training, current documentation, technical support, course parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

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General

Document Name: Certificate of Qualification for ACE



Certificate of Completion

Learner Name: Penkep Kurusubala

Title Of Course: AN-CE-ICPMS-2-035-B: CrossLab Compliance Hardware Specific Delivery for Agilent ICP-MS Systems

Completion Date: October 31, 2020

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific limitations:

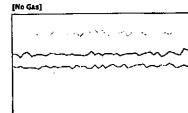
A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent-authorized service provider, through which the service employee has ongoing access to Agilent's Safety Alerts, Service Notes, internal technical updates, update training, current documentation, technical support, current parts, and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

General

Document Name: Tune reports

Tune Report

Batch Folder: C:\Agilent\ICPMS\UseTuneLab
 Acq. Date-Time: 11/26/2020 12:31
 Report Comment: 02 16 Nov 2020
 Batchment Name: 0231A JP12091612



Mass	Range	Count	RSD%	Background
7	10000	4763	2.594	2.500
89	20000	16121	1.976	2.700
205	20000	13037	2.531	3.000

Ratio: 156/140: 0.555 % Ratio: 70/140: 1.090 %

Integration Time [sec]: 0.1 Sampling Period [sec]: 0.111



Mass	Peak Height	Area	W-50%	W-80%
7	4821.36	7.26	0.66	0.733
89	16252.60	89.00	0.54	0.716
205	12833.99	185.00	0.47	0.730

Integration Time [sec]: 0.1 Acquisition Time [sec]: 22.34 Y Axis: Linear

Tune Parameters

Plasma Parameters

RF Power: 1550 W Nebulizer Pump: 0.10 rpm
 RF Matching: 1.80 V S/C Temp: 2 °C
 Spray Depth: 8.0 mm Gas Switch: Makeup Gas: 0.10 L/min
 Carrier Gas: 0.50 L/min
 Oxidant Gas: 0.0 %

Lens Parameters

Extract 1: 0.0 V Cell Entrance: -30 V
 Extract 2: -125.0 V Cell Exit: -50 V



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Document Name: Tune reports

Tune Report

Omega Bias: -65 V Defect: 13.4 V
 Omega Lens: 8.0 V Plate Bias: -40 V

Cell Parameters

Use Gas: Inert OCP Bias: -8.0 V
 He Flow: 0.0 mL/min OCP RF: 180 V
 H2 Flow: 0.0 mL/min Energy Distribution: 5.0 V
 3rd Gas Flow: 0 %

Mass	Range	Count	RSD%	Background
59	10000	2847	2.091	2.000
89	10000	6330	2.067	2.900
205	20000	13551	2.192	3.400

Ratio: 156/140: 0.561 % Ratio: 70/140: 1.741 %

Integration Time [sec]: 0.1 Sampling Period [sec]: 0.11

Tune Parameters

Plasma Parameters

RF Power: 1550 W Nebulizer Pump: 0.10 rpm
 RF Matching: 1.80 V S/C Temp: 2 °C
 Spray Depth: 8.0 mm Gas Switch: Makeup Gas: 0.10 L/min
 Carrier Gas: 0.50 L/min
 Oxidant Gas: 0.0 %

Lens Parameters

Extract 1: 0.0 V Cell Entrance: -90 V
 Extract 2: -125.0 V Cell Exit: -70 V
 Omega Bias: -65 V Defect: -70.0 V
 Omega Lens: 8.0 V Plate Bias: -115 V

Cell Parameters

Use Gas: Inert OCP Bias: -100.0 V
 He Flow: 4.5 mL/min OCP RF: 200 V
 H2 Flow: 0.0 mL/min Energy Distribution: 3.0 V
 3rd Gas Flow: 0 %

Mass	Range	Count	RSD%	Background
59	5000	2893	3.156	0.900
89	10000	4919	2.599	0.700
205	10000	2845	2.727	1.400

Ratio: 156/140: 0.610 % Ratio: 70/140: 1.326 %

Integration Time [sec]: 0.1 Sampling Period [sec]: 0.11

Tune Parameters

Plasma Parameters

RF Power: 1550 W Nebulizer Pump: 0.10 rpm
 RF Matching: 1.80 V S/C Temp: 2 °C
 Spray Depth: 8.0 mm Gas Switch: Makeup Gas: 0.10 L/min
 Carrier Gas: 0.50 L/min
 Oxidant Gas: 0.0 %

Lens Parameters

Extract 1: 0.0 V Cell Entrance: -90 V
 Extract 2: -125.0 V Cell Exit: -70 V
 Omega Bias: -65 V Defect: -70.0 V
 Omega Lens: 8.0 V Plate Bias: -115 V

Cell Parameters

Use Gas: Inert OCP Bias: -100.0 V
 He Flow: 4.5 mL/min OCP RF: 200 V
 H2 Flow: 0.0 mL/min Energy Distribution: 3.0 V
 3rd Gas Flow: 0 %



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Document Name: Tune reports

Tune Report

RF Power: 1550 W Nebulizer Pump: 0.10 rpm
 RF Matching: 1.80 V S/C Temp: 2 °C
 Spray Depth: 8.0 mm Gas Switch: Makeup Gas: 0.10 L/min
 Carrier Gas: 0.50 L/min
 Oxidant Gas: 0.0 %

Cell Parameters

Extract 1: 0.0 V Cell Entrance: -120 V
 Extract 2: -185.0 V Cell Exit: -190 V
 Omega Bias: -60 V Defect: -70.0 V
 Omega Lens: 5.3 V Plate Bias: -130 V

Plasma Parameters

Use Gas: Inert OCP Bias: -100.0 V
 He Flow: 9.0 mL/min OCP RF: 200 V
 H2 Flow: 0.0 mL/min Energy Distribution: 5.0 V
 3rd Gas Flow: 0 %

Ratio: 156/140: 0.561 % Ratio: 70/140: 1.741 %

Integration Time [sec]: 0.1 Sampling Period [sec]: 0.11

Tune Parameters

Plasma Parameters

RF Power: 1550 W Nebulizer Pump: 0.10 rpm
 RF Matching: 1.80 V S/C Temp: 2 °C
 Spray Depth: 8.0 mm Gas Switch: Makeup Gas: 0.10 L/min
 Carrier Gas: 0.50 L/min
 Oxidant Gas: 0.0 %

Lens Parameters

Extract 1: 0.0 V Cell Entrance: -90 V
 Extract 2: -125.0 V Cell Exit: -70 V
 Omega Bias: -65 V Defect: -70.0 V
 Omega Lens: 8.0 V Plate Bias: -115 V

Cell Parameters

Use Gas: Inert OCP Bias: -100.0 V
 He Flow: 4.5 mL/min OCP RF: 200 V
 H2 Flow: 0.0 mL/min Energy Distribution: 3.0 V
 3rd Gas Flow: 0 %

Mass	Range	Count	RSD%	Background
59	5000	2893	3.156	0.900
89	10000	4919	2.599	0.700
205	10000	2845	2.727	1.400

Ratio: 156/140: 0.610 % Ratio: 70/140: 1.326 %

Integration Time [sec]: 0.1 Sampling Period [sec]: 0.11

Tune Parameters

Plasma Parameters

RF Power: 1550 W Nebulizer Pump: 0.10 rpm
 RF Matching: 1.80 V S/C Temp: 2 °C
 Spray Depth: 8.0 mm Gas Switch: Makeup Gas: 0.10 L/min
 Carrier Gas: 0.50 L/min
 Oxidant Gas: 0.0 %

Lens Parameters

Extract 1: 0.0 V Cell Entrance: -90 V
 Extract 2: -125.0 V Cell Exit: -70 V
 Omega Bias: -65 V Defect: -70.0 V
 Omega Lens: 8.0 V Plate Bias: -115 V

Cell Parameters

Use Gas: Inert OCP Bias: -100.0 V
 He Flow: 4.5 mL/min OCP RF: 200 V
 H2 Flow: 0.0 mL/min Energy Distribution: 3.0 V
 3rd Gas Flow: 0 %



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General

Document Name: Test BG

Batch Summary Report							
Batch Folder:	D:\Agilent\OQ 26 Nov 2020\BG Pch3						
Analysis File:	30 Hz BGch2bin						
Time Step:	45 Hz						
Run	Acq. Date/Time	Data File	Sample Name	Time	Level	Division	
1	11/26/2020 5:53:33 AM	00194Pch.d	30 Hz	Sample			1.0000

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Date: November 26, 2020 2:02:09 PM
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Document Name: Test BG

Batch Summary Report		
Analysis Table		
Sample Name	CPS	78 Sec / Run 1
1 30 Hz	50.1000	

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Date: November 26, 2020 2:02:09 PM
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General

Document Name: Test Stability

Batch Summary Report							
Batch Folder:	D:\Agilent\OQ 26 Nov 2020\20 min.b3						
Analysis File:	20 min.b3ch2bin						
Time Step:	45 Hz Gas						
Run	Acq. Date/Time	Data File	Sample Name	Time	Level	Division	
1	11/26/2020 9:35:52 AM	20150Pch.d	20 min	Sample			1.0000

Page 1 / 2 11/26/2020 9:44:01 AM

Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

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Document Name: Test Stability

Batch Summary Report											
Analysis Table											
7 Hz / No Gas 1		5 Hz / No Gas 1		20 Hz / No Gas 1		10 Hz / No Gas 1		140 Hz / No Gas 1		140 Hz / No Gas 1	
Sample Name	CPS	CPS 850	CPS	CPS 850	CPS	CPS 850	CPS	CPS 850	CPS	CPS 850	CPS 850
1 10 Min	66450.2565	0.73609	37.8580	1.85802	121373.7738	0.631247	122139.2483	0.95096	202423.4511	1.31134	
20 Hz / No Gas 1											
Sample Name	CPS	CPS 850									
1 20 Min	144593.4148	1.48118									

Page 2 / 2 11/26/2020 9:44:01 AM

Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

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Electronic Signature

Purpose

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Details

Full Name of Signer: Panthep Kurasathain
Logged On User Name: panthep_kurasathain@agilent.com
Signature Creation Date: November 26, 2020
Reason for Signature: Executed protocol and published this original version of document

Regulatory Disclaimer

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

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User Name: panthep_kurasathain
Host Name: ASBKKW7009
System ID: JP12091612
Print Date: November 26, 2020 2:02:13 PM

ALS OQ HW 261120 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 26, 2020 1:36:34 PM	Audit	Session Created	Session	None
November 26, 2020 1:36:35 PM	Start	Configuration	Session	None
November 26, 2020 1:36:35 PM	Audit	Enrollment	Licensing	User is Field Engineer and does not require an unlock code
November 26, 2020 1:48:03 PM	Audit	Eqp Loaded	Session	EQP details for primary technology [ipM4] - File path: [ProtocolPack\acpM4\Configurations\02.50VcpM4.02.50.es], EQP File Name: [ipM4.02.50.es], EQP Name: [AgilentRecommended]
November 26, 2020 1:48:14 PM	End	Configuration	Session	None
November 26, 2020 1:48:17 PM	Start	Qualification	Session	OQ
November 26, 2020 1:48:17 PM	Start	Execution	Autosampler Check : ASX-520: Autosampler Check	None
November 26, 2020 1:48:24 PM	End	Execution	Autosampler Check : ASX-520: Autosampler Check	Run Count : 1
November 26, 2020 1:48:31 PM	Start	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS2: Integrated Sample Introduction System (ISIS) Check	None
November 26, 2020 1:48:37 PM	End	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS2: Integrated Sample Introduction System (ISIS) Check	Run Count : 1

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Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

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User Name: panthep_kurasathain
Host Name: ASBKKW7009
System ID: JP12091612
Print Date: November 26, 2020 2:02:13 PM

ALS OQ HW 261120 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 26, 2020 1:48:41 PM	Start	Execution	Autotune : G3281A: Autotune 1	None
November 26, 2020 1:53:13 PM	Start	Execution	Background (No Gas Mode) : G3281A: No Gas Mode Background 1	None
November 26, 2020 1:53:16 PM	Start	Execution	Autotune : G3281A: Autotune 1	None
November 26, 2020 1:54:29 PM	End	Execution	Autotune : G3281A: Autotune 1	Run Count : 1
November 26, 2020 1:54:41 PM	Start	Execution	Background (No Gas Mode) : G3281A: No Gas Mode Background 1	None
November 26, 2020 1:55:07 PM	End	Execution	Background (No Gas Mode) : G3281A: No Gas Mode Background 1	Run Count : 1
November 26, 2020 1:55:08 PM	Start	Execution	Background (Gas Modes) : G3281A: Gas Mode Background Helium	None
November 26, 2020 1:55:49 PM	End	Execution	Background (Gas Modes) : G3281A: Gas Mode Background Helium	Run Count : 1
November 26, 2020 1:55:51 PM	Start	Execution	20-Minute Stability (No Gas Mode) : G3281A: 20-Minute Stability (No Gas Mode) 1	None
November 26, 2020 1:56:40 PM	End	Execution	20-Minute Stability (No Gas Mode) : G3281A: 20-Minute Stability (No Gas Mode) 1	Run Count : 1
November 26, 2020 1:56:42 PM	End	Qualification	Session	OQ
November 26, 2020 1:56:42 PM	Start	Reporting	Session	None

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User Name: panthep_kurasathain
Host Name: ASBKKW7009
System ID: JP12091612
Print Date: November 26, 2020 2:02:13 PM

ALS OQ HW 261120 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 26, 2020 2:00:12 PM	Audit	Reporting	Session	Report Generated : Certificate
November 26, 2020 2:00:16 PM	Audit	Reporting	Session	Report Generated : Report

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Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

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Date: November 26, 2020 2:02:09 PM
System ID: JP12091612

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Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110

Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110

Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

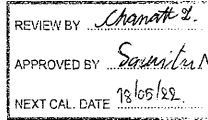
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T202398

Page 1 of 6

Certificate of Calibration

Equipment : Hot Block
 Manufacturer : Environmental Express
 Model : SC 196
 Serial No. : 6974CECW3285
 Customer Code : BKK_EL0054
 ID No. : T5306A3
 Customer : ALS Laboratory Group (Thailand) Co., Ltd.
 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
 Khet Suan Luang, Bangkok 10250
 Customer Location : Acid Digestion Lab
 Date of Receipt : 12 November 2020
 Calibrated By : Watcharapon Songthong (Technician)
 Approved By : Boonchai Suriyawong (Site Calibration Manager)
 Date of Issue : 27 NOV 2020



The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-L13 108/30-05-57

Certificate No. T202398

Page 2 of 6

Calibration Report

Equipment : Hot Block
 Date of Calibration : 17 November 2020
 Environment : Temperature 20.0-20.3 °C
 Line Voltage 224.2-227.8 V

Condition of this results of test :

1. This instrument was calibrated by insert 20 standard thermocouples type T into its chamber and test according to WI-T20. All data show below were final values and the initial data may be obtained upon request.

The temperature scale used was based on ITS - 90.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN21-TN30	T202319	30 October 2021
TC	TYPE T	TN31-TN40	T202319	30 October 2021
DATA LOGGER	34970A	T151	T202319	30 October 2021

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

UUC Description :

Time Constant 1 Hour 30 Minute At 95 °C
 Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Result of test :

(X) without adjustment () after adjustment

Approved By: Boonchai



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110

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Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



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SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110

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Certificate No. T202398

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Calibration Report

37	38	39	40	41	42	43	44	45	46	47	48
25	26	27	28	29	30	31	32	33	34	35	36
13	14	15	16	17	18	19	20	21	22	23	24
1	2	3	4	5	6	7	8	9	10	11	12

○ STANDARD THERMOCOUPLE TYPE T

No.1 = TN21	No.13 = TN33	No.25 = TN25	No.37 = TN37
No.2 = TN22	No.14 = TN34	No.26 = TN26	No.38 = TN38
No.3 = TN23	No.15 = TN35	No.27 = TN27	No.39 = TN39
No.4 = TN24	No.16 = TN36	No.28 = TN28	No.40 = TN40
No.5 = TN25	No.17 = TN37	No.29 = TN29	No.41 = TN21
No.6 = TN26	No.18 = TN38	No.30 = TN30	No.42 = TN22
No.7 = TN27	No.19 = TN39	No.31 = TN31	No.43 = TN23
No.8 = TN28	No.20 = TN40	No.32 = TN32	No.44 = TN24
No.9 = TN29	No.21 = TN21	No.33 = TN33	No.45 = TN25
No.10 = TN30	No.22 = TN22	No.34 = TN34	No.46 = TN26
No.11 = TN31	No.23 = TN23	No.35 = TN35	No.47 = TN27
No.12 = TN32	No.24 = TN24	No.36 = TN36	No.48 = TN28

Approved By: Boonchai

FM-L13 108/30-05-57

Certificate No. T202398

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Calibration Report

Measurement Results

		Average Standard Reading at each position (°C)									
Calibration Point		TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30
95	Max	95.30	95.46	96.02	96.07	96.19	95.57	95.82	95.79	96.10	95.84
	Min	95.10	95.24	95.78	95.82	96.02	95.42	95.66	95.64	95.93	95.66
	Average	95.20	95.35	95.90	95.94	96.10	95.50	95.74	95.71	96.02	95.75
		TN31	TN32	TN33	TN34	TN35	TN36	TN37	TN38	TN39	TN40
	Max	95.66	95.57	95.73	96.04	96.14	95.91	95.88	95.71	95.54	95.16
	Min	95.50	95.40	95.60	95.88	95.97	95.69	95.70	95.53	95.36	95.03
	Average	95.58	95.49	95.67	95.96	96.06	95.80	95.79	95.62	95.45	95.10
		TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30
	Max	95.30	94.97	95.35	95.24	96.11	95.86	95.92	96.00	95.82	95.67
	Min	94.91	94.61	94.99	94.84	95.75	95.51	95.55	95.64	95.47	95.34
	Average	95.10	94.79	95.17	95.04	95.93	95.68	95.73	95.82	95.65	95.51
		TN31	TN32	TN33	TN34	TN35	TN36	TN37	TN38	TN39	TN40
	Max	95.83	96.10	96.06	95.66	95.44	95.00	95.18	95.56	95.13	94.90
	Min	95.44	95.75	95.73	95.33	95.12	94.69	94.83	95.17	94.76	94.57
	Average	95.63	95.92	95.89	95.50	95.28	94.85	95.01	95.36	94.95	94.74
		TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28		
	Max	95.82	95.67	95.83	96.10	96.06	95.66	95.44	95.00		
	Min	95.47	95.34	95.44	95.75	95.73	95.33	95.12	94.69		
	Average	95.65	95.51	95.63	95.92	95.89	95.50	95.28	94.85		

Approved By: Boonchai

FM-L13 108/30-05-57

Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

General Preparation

- ☒ Discuss any specific questions or issues with the customer prior to starting.
- ☒ Review the instrument logbook.
- ☒ Perform general external inspection of system for cleanliness.
- ☒ Check for proper installation of safety-related parts, assemblies, sensors etc.
- ☒ Check for required firmware/software updates and verify with customers if they would like it installed.
- ☒ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it. N/A
- ☒ Run Instrument Performance test and record results in Instrument Performance Test Results Table - Pre PM.

Inspect and clean the system

- ☒ Look for any obvious external damage or problems.
- ☒ Inspect water cooling hoses, gas lines and power cord for excessive wear or damage.
- ☒ Perform a general internal inspection of the system for excessive dust accumulation, clean if necessary.
- ☒ Inspect sample introduction components and record any required maintenance in the Service Engineer Comments and notify the customer as the required actions required.
- ☒ Record the instrument operating conditions in the ICP-OES Status Results Table.
- ☒ Replace the polychromator purge filter.
- ☒ Replace the radial pre-optics window
- ☒ Replace the axial pre-optics window for SVDV and VDV instruments.
- ☒ Check exhaust flow for the correct positive extraction at the exhaust duct to insure they meet minimum specifications.
- ☒ Replace air inlet dust filter.
- ☒ Replace high capacity air inlet dust filter element if installed. N/A
- ☒ Remove and clean instrument water inlet filter.

G8481A Cooling water system

- ☐ Section NOT Applicable
- ☒ Drain cooling fluid and remove any particles from the chiller reservoir
- ☒ Remove, clean and reinstall water inlet metal mesh filter.
- ☒ Re fill with Polyclear cooling fluid.
- ☒ Clean the cooling system Air filter and the condenser by compressed air or vacuum cleaner.

Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

SPS 3 Auto Sampler

- ☒ Section NOT Applicable
- ☐ Power cycle the autosampler and verify successful initialization.
- ☐ Inspect X and Z axis belts for wear. Replace is necessary.
- ☐ Clean X and Z axis slide shafts.
- ☐ Using customer's racks and the Agilent software move the sample probe to the 4 outermost corners and rinse port, ensure that the probe is approximately centered in the vial.

SPS 4 Auto Sampler

- ☐ Section NOT Applicable
- ☒ Clean the spill tray, rack location mat, end frames and chassis with a damp soft cloth and diluted mild detergent.
- ☒ Clean the auto sampler cover panels, if cover kit is installed, with domestic window cleaner
- ☒ Check the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☒ Check the X-axis, Theta-axis and Z-axis FPC cables for cracks, incorrect positioning, damaged edges or damaged connectors.
- ☒ Pump Tubing Replacement. Replace peristaltic pump tubing. Replace all tubing that goes from the rinse station to the pump and from the pump to the waste/rinse bottles

AVS 4, 6, 7 (ANS 2)

- ☐ Section NOT Applicable
- ☒ Replace valve rotor seal cleaned into seal
- ☒ Check fittings for signs of leaks
- ☒ Check tubing including autosampler tubing for kinks or excessive wear
- ☒ Check high flow pump for signs of leaks

Instrument Adjustment

- ☒ Check position of Zn peak, adjust if required.
- ☒ Check Argon Ratio, adjust to specified value if required.
- ☒ Perform Detector Calibration.
- ☒ Perform Instrument Calibration.
- ☒ Run Instrument Performance Test and record results in Instrument Performance Test Results Table - Post PM.
- ☒ For systems using ICP Expert version 7.3 and above run the following Instrument tests and record the result in the Instrument Test Results Table
 - ☒ Subsystem Communications Test
 - ☒ Air Flow

Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

- ☒ Water Flow
- ☒ Gas Flows
- ☒ RF Generator
- ☒ Camera Test
- ☒ Optics Test
- ☒ Nebulizer Test

Instrument Performance Test Results Table

Note: These measurements do not form part of any specification and are for reference only.

	Pre PM Sensitivity Check		Post PM Sensitivity Check	
	Radial	Axial *	Radial	Axial *
Zn 213.857 nm SRBR	3493.3	7519.6	4638.5	9248.3
Mn 257.610 nm SRBR	10543.1	22751.3	15474.9	26056.4
Al 396.152 nm SBR	7.2	14.2	14.5	18.0
K 766.491 nm SBR	3.8	30.8	6.6	35.6

* Axial result is not applicable for G8016AA, G8012AA Radial View instruments.

Instrument Test Results Table

Note: The Instrument Test results are for systems using ICP Expert version 7.3 and above only.

Instrument Test	Result
Subsystem Communications Test	Pass
Air Flow	Pass
Water Flow	Pass
Gas Flows	Pass
RF Generator	Pass
Camera Test	Pass
Optics Test	Pass
Nebulizer test	Pass

Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

ICP-OES Status Results Table

Note: These measurements do not form part of any specification and are for reference only.

Measurement	Standby Mode		Plasma On	
Mains Voltage	213.5	VAC	213.5	VAC
Mains Current	0.00	A	0.114	A
Instrument Temperature	25.0	°C	25.0	°C
RF Air Flow (sensor speed)	9.0	Hz	17.0	Hz
Plasma Exhaust Temperature	No measurement		71.2	°C
Water Flow Oscillator	No measurement		1.37	L/min
Water Flow Detector	1.31	L/min	1.28	L/min
Water Inlet Temperature	18.8	°C	18.8	°C
Polychromator Temperature	35.0	°C	35.0	°C
CCD Temperature	-33.9	°C	-33.9	°C
Thermal Stabilizer	35.0	°C	35.0	°C
Argon Supply Pressure	630.51	kPa	584.30	kPa
Purge Gas Supply Pressure*1	670.70	kPa	615.13	kPa
Option Gas Supply Pressure*1	8.23	kPa	8.22	kPa
Nebulizer Flow	No measurement		0.65	L/min
Nebulizer Back Pressure	No measurement		273	kPa
Plasma Gas Flow	No measurement		11.93	L/min
Auxiliary Gas Flow	No measurement		1.00	L/min
RF Power	No measurement		1237	W
RF Supply Current	No measurement		8.43	A
RF Supply Voltage	No measurement		204	V

*1 If option installed

**Agilent 5110 and 5100 ICP-OES
Preventive Maintenance Checklist**
ICP-OES Parts List Table

Part description	Part Number	Product /Model # where used	Quantity Consumed
Axial Pre-Optic Window	G8010-68014	G8010A, G8011A, G8014A/G8016A	1
Radial Pre-Optic Window	G8010-68015	All	1
Polyclear Cooling Fluid	G8292-80010	G8481A	
Purge Gas Filter	G8010-60186	All	1
Air inlet filter	G8000-68002	All	1
High Capacity Air Filter	G8010-60189	Optional	
Rotor seal for 6-7 port valve for AVS6/7	G8494-60002	G8494A/G8496	
Rotor seal for 4 port valve for AVS4	G8493-60002	G8493A	
Rinse solution to rinse station 2.5mm id x 1m	G8410-80123	SPS 4	
Barb connector 2.5mm-1.5mm ID	G8410-80124	SPS 4	
PVC waste tubing, 8mm od x 5mm id, 2m	G8410-80122	SPS 4	
Additional Parts may be required from engineers stock:			
X axis drive belt	5410047600	SPS 3	
Z axis drive belt	5410047400	SPS 3	
Peristaltic pump tubing, PVC SolvaFlex, 3 bridged,	8710049000	SPS 4	

Restore system

For HF applications, ask the customer to reinstall their sample introduction system.

Leave system in an idle state: on and purging.

Guidance: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Service Review

- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section below if there are additional comments.

Issued: 3 February 2017, Revision: 1.1

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Agilent Technologies

**Agilent 5110 and 5100 ICP-OES
Preventive Maintenance Checklist**

- ☐ Review the service and any test results with the customer.
- ☒ If the Instrument firmware was updated, record the details of the change in the Service Engineer's Comments box below or if necessary, in the customer's IQ records.

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write in this box.

Other Important Customer Web Links

How to get information on your product:

- ☒ Literature Library - <http://www.agilent.com/en-us/products/icp-oes/icp-oes-systems/5110-icp-oes#literature>
- ☒ Need to know more? - <http://www.agilent.com/crosslab/university/>
- ☒ Need technical support, FAQs? - <http://www.agilent.com/en-us/support/landing/icp-oes>
- ☒ Need supplies? - www.agilent.com/chem/supplies

Service Completion

Service request number 6004944003 Date service completed 3 MAR 2021

Agilent signature Wenjit T. Customer signature Theresa B.

Document part number: G8014-90075

Issued: 3 February 2017, Revision: 1.1

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Agilent Technologies

Report Summary

Instrument Model Agilent 5100/5110 SVDV ICP-OES
Instrument ID G8010A/G8014A
Instrument Serial Number MY16010005
Software Version 7.3.0.8799
Firmware Version 3354
Tested By Khunphol Test
Test Completed On 2/26/2020 1:54:10 PM

Result Summary

Subsystem Communications Test Pass
Air Flow Test Pass
Water Flow Test Pass
Gas Flows Test Pass
RF Generator Test Pass
Camera Test Pass
Optics Test Pass
Advanced Valve System Test Skipped
Resolution Test Pass
Sensitivity Test Pass
Precision Test Pass

Subsystem Communications Test

Pass

Air Flow Test

Pass

30% Air Flow (relative speed)	75% Air Flow (relative speed)
12.00	17.00

Water Flow Test

Pass

RF Water Flow (L/min)	Camera Water Flow (L/min)	Water Inlet Temperature (°C)
1.37	1.23	16.56

Gas Flows Test

Pass

Nebulizer Target Flow	Actual Flow	Back Pressure	Auxiliary Target Flow	Actual Flow	Back Pressure
0.70	0.71	268.83	2.00	1.99	129.22

Makeup Target Flow	Actual Flow	Back Pressure	Plasma Target Flow	Actual Flow	Back Pressure
2.00	1.99	129.75	18.00	17.89	25.93

RF Generator Test

Pass

RF Power Supply Test	Passed
RF Power Supply (V)	147.047

RF Oscillator Test	Passed
RF Oscillator Frequency (MHz)	25.739
Work Coil Current (A)	45.707
RF Power Supply Current (A)	2.000

Camera Test

Pass

	Integration Time (ms)	Standard Deviation	Status
Electronic Offset Test	1000	6.828	Passed
Dark Current Test	6000	0.907	Passed
Array Test	5	0.021	Passed
Linearity Test		0.019	Passed

Optics Test

Pass

	Radial	Axial	SVDV
Intensity	2511179	3116480	2761652
Wavelength	737.212	737.212	737.212

Resolution Test

Pass

Element Wavelength	Specification	Width
N (174.213 nm)	≤ 9.40	7.81
As (188.980 nm)	≤ 8.20	8.43
C (193.027 nm)	≤ 11.50	8.89
Mo (202.032 nm)	≤ 8.20	6.57
Cr (206.158 nm)	≤ 13.40	10.30
Zn (213.857 nm)	≤ 8.70	7.30
Pb (220.353 nm)	≤ 9.50	7.46
Co (228.615 nm)	≤ 17.20	12.45
Ba (230.424 nm)	≤ 9.40	7.80
Mn (257.610 nm)	≤ 13.30	9.84
Mn (260.568 nm)	≤ 20.30	14.96
Cr (267.716 nm)	≤ 11.00	8.59
Cu (324.754 nm)	≤ 25.00	18.91
Cu (327.395 nm)	≤ 14.20	11.71
Sr (338.071 nm)	≤ 33.50	24.92
Ba (455.403 nm)	≤ 44.00	33.50
Sr (460.733 nm)	≤ 36.00	22.33
Ba (493.408 nm)	≤ 36.00	25.84
Ba (814.171 nm)	≤ 42.00	28.46
Ar (675.283 nm)	≤ 74.00	62.25
K (766.491 nm)	≤ 80.00	62.92

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Sensitivity Test

Pass

Radial

Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 46.0	SRBR	140.3	1345.0	81.1
Se (196.026 nm)	≥ 41.0	SRBR	93.8	1002.9	94.0
Zn (213.857 nm)	≥ 1421.0	SRBR	3088.3	41780.0	181.3
Pb (220.353 nm)	≥ 46.0	SRBR	152.2	1912.7	138.2
Mn (257.610 nm)	≥ 3518.0	SRBR	9845.4	176791.9	321.3
Al (396.152 nm)	≥ 3.4	SBR	11.8	28224.8	2241.9
Ba (493.408 nm)	≥ 34.0	SBR	174.8	1519375.4	8640.4
K (766.491 nm)	≥ 1.8	SBR	5.5	77052.1	11908.3

Axial

Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 208.0	SRBR	414.4	7602.5	309.7
Se (196.026 nm)	≥ 159.0	SRBR	293.9	5929.0	359.1
Zn (206.200 nm)	≥ 234.0	SRBR	1170.3	17869.8	227.3
Zn (213.857 nm)	≥ 1743.0	SRBR	6593.5	185102.7	781.5
Cd (214.439 nm)	≥ 4227.0	SRBR	5666.0	118953.0	433.1
Pb (220.353 nm)	≥ 320.0	SRBR	406.7	10163.0	557.9
Mn (257.610 nm)	≥ 10825.0	SRBR	21673.9	776712.2	1280.0
Cr (267.716 nm)	≥ 1048.0	SRBR	4387.7	186495.1	1772.4
Cu (324.754 nm)	≥ 19.0	SBR	44.6	208221.0	4563.9
Al (396.152 nm)	≥ 6.0	SBR	18.2	161098.6	8401.5
Ba (493.408 nm)	≥ 60.0	SBR	216.7	7047159.1	32366.9
K (766.491 nm)	≥ 24.0	SBR	43.4	1586217.0	35725.8

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Precision Test

Pass

Radial

Element Wavelength	Specification	Measured Value % RSD
As (188.980 nm)	≤ 2.60	0.67
Se (196.026 nm)	≤ 2.60	0.82
Zn (213.857 nm)	≤ 1.50	0.45
Pb (220.353 nm)	≤ 2.60	0.76
Mn (257.610 nm)	≤ 1.50	0.49
Al (396.152 nm)	≤ 1.50	0.38
Ba (493.408 nm)	≤ 1.50	0.68
K (766.491 nm)	≤ 1.50	0.38

Axial

Element Wavelength	Specification	Measured Value % RSD
As (188.980 nm)	≤ 1.50	0.36
Se (196.026 nm)	≤ 1.50	0.53
Zn (206.200 nm)	≤ 1.50	0.30
Zn (213.857 nm)	≤ 1.50	0.55
Cd (214.439 nm)	≤ 1.50	0.54
Pb (220.353 nm)	≤ 1.50	0.53
Mn (257.610 nm)	≤ 1.50	0.83
Cr (267.716 nm)	≤ 1.50	0.59
Cu (324.754 nm)	≤ 1.50	0.52
Al (396.152 nm)	≤ 1.50	0.60
Ba (493.408 nm)	≤ 1.50	1.04
K (766.491 nm)	≤ 1.50	1.21

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ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการ

วิเคราะห์เอกชน



ที่อก ๐๓๑๐(๑)/ ๑๐๖๕

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ เขตราชเทวี
กรุงเทพมหานคร ๑๐๕๐๐

๒๘ มกราคม ๒๕๖๕

เรื่อง คออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓๐ กรกฎาคม ๒๕๖๓

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุ
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔-๕๖๐๑๑ สถานที่ตั้งเลขที่ ๑๐๔
ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร
ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย)
จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๖ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนไว้วิเคราะห์ในน้ำเสีย จำนวน ๕๔ รายการ น้ำใต้ดิน
จำนวน ๑๖๖ รายการ อากาศเสีย ๑๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๓๕ รายการ และดิน
จำนวน ๑๒๕ รายการ รวมทั้งสิ้นจำนวน ๓๖๓ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กันยายน ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอ
ต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายศิระ จันทร์เลิศ)

อธิบดีกรมโรงงานอุตสาหกรรม รักษาการแทน
ผู้อำนวยการกองขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
ปฏิบัติการทางเทคนิคโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๑๔๖ ๐ ๒๒๐๒ ๔๐๐๒

โทรสาร ๐ ๒๒๕๔ ๓๒๐๘ ๐ ๒๒๕๔ ๓๔๔๔

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ๖-๒๐๔

ที่อก ๐๓๑๐(๑)/

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

๑) นางสาวยุพพร จันทร์เปล่ง
๒) นางสาวชัชฌิยา โภมารกุล ณ นคร
๓) นายศรายุทธ จิตราพันธ์
๔) นางสาวกนกกร เอนก
๕) นายสุริยา สอนแก้ว
๖) นายวิชาญ ชุมพรี

ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๐
ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๑
ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๒
ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๓
ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๔
ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๕

(นายศิระ จันทร์เลิศ)

อธิบดีกรมโรงงานอุตสาหกรรม รักษาการแทน
ผู้อำนวยการกองขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
ปฏิบัติการทางเทคนิคโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ๖-๒๐๔

ที่อก ๐๓๑๐(๑)/ ๑๐๖๕

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๖ ราย

๑) นางสาวจินดา จุลอธรรม ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๔
๒) นางสาวสวริตรี น้อยเสถียร ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๕
๓) นางสาวชนัญญา จันทน์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๖
๔) นางสาวนันทพร สายเส่ง ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๗
๕) นางสาวนันทพร สมบูรณ์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๘
๖) นางสาวพรนิยา เกลิมอำรุง ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๑๙
๗) นางสาวสาริณี มงคลจิราวุฒิ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๒๐
๘) นางสาวสิริลักษณ์ พึ่งแพง ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๒๑
๙) นายณพกร จันทพันธ์ุ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๒๒
๑๐) นายณเรศบุรี โภมาลย์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๒๓
๑๑) นายธีรนา ธิราช ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๒๔
๑๒) นางสาวกมลรัตน์ แก้วมัน ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๒๕
๑๓) นางสาวสุวิมล ชัยเรืองวุฒิ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๒๖
๑๔) นางสาวสุชาดา ธรรมการ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๒๗
๑๕) นางสาวเปรมิกา ชัยเดชอนกุล ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๒๘
๑๖) นางสาวศศิธร พูลสวัสดิ์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๒๙
๑๗) นางสาวเสาวลักษณ์ ภูนาอำพร ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๓๐
๑๘) นายอภิสิทธิ์ สิงหา ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๓๑
๑๙) นายศักดิ์สิทธิ์ โพธิ์พิสุทธิ์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๓๒
๒๐) ว่าที่ร้อยตรีหญิง พรณิภา จำเริญ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๓๓
๒๑) นางจิตตา คำบุญแก้ว ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๓๔
๒๒) นางสาววรรณกร รักษ์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๓๕
๒๓) นางสาวนพรัตน์ แยมกรณิ์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๓๖
๒๔) นายจุลเดช วารินทร์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๓๗
๒๕) นางสาวดาญ์รัตน์ รุ่งคำ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๓๘
๒๖) นายกร สุขเจริญ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๓๙
๒๗) นายบุญชา นามเดช ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๔๐
๒๘) นายพรมณ์ ศรีปิตเนตร ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๔๑
๒๙) นายสุทิศ อุณิสม์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๔๒
๓๐) ว่าที่ร้อยตรี เกลิมเกียรติ อมศรีเสริม ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๔๓
๓๑) นางสาววิภา สร้างนา ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๔๔
๓๒) นายอนุพงศ์ รัตนศรีประเสริฐ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๔๕
๓๓) นางสาวจุฑารัตน์ โอนสินทะ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๔๖
๓๔) นางสาวจาวรรณ พิมพ์สุกัญญา ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๔๗

(นายศิระ จันทร์เลิศ)

อธิบดีกรมโรงงานอุตสาหกรรม รักษาการแทน
ผู้อำนวยการกองขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
ปฏิบัติการทางเทคนิคโรงงานอุตสาหกรรม

๓๕) นางสาวปรารถนา หิยา...

๓๕) นางสาวปรารถนา หิยา... ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๔๘
๓๖) นางสาวเดือนใจ ทางกลาง ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๔๙
๓๗) นางสาวจิราพร ศรีเว ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๕๐
๓๘) นายวรกร ลูกภัย ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๕๑
๓๙) นายทณ วิริยะสกิจ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๕๒
๔๐) นายชิต เจนบุ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๕๓
๔๑) นายณิศร จำเพทะ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๕๔
๔๒) นายอรรถพล นิยมวิทยาพันธ์ุ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๕๕
๔๓) นายภูวิช พรหมสะอาด ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๕๖
๔๔) นายณเดช โกวิทพัฒน์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๕๗
๔๕) นายชวฤทธิ์ วงษ์จันทร์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๕๘
๔๖) นายอาทิตย์ ศรีเสน ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๕๙
๔๗) นายเจษฎาภรณ์ คงศักดิ์ไทย ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๖๐
๔๘) นายจรัส บุญถึง ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๖๑
๔๙) นายณณัติ เอนก ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๖๒
๕๐) นายอภิวัฒน์ ทุมพู ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๖๓
๕๑) นางสาวสุภาภรณ์ มาก ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๖๔
๕๒) นางสาวกานทิรา สุวงศ์ตระกูล ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๖๕
๕๓) นางสาวอริยา บุญเพ็ง ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๖๖
๕๔) นางสาวกนกกร เอนก ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๖๗
๕๕) นางสาวพัชรียา หงษ์สมิตี ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๖๘
๕๖) นางสาวกานทิรา สุวงศ์ตระกูล ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๖๙
๕๗) นางสาวกานทิรา นามวัฒน์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๗๐
๕๘) นางสาวอุไรรัตน์ ที่สร้างเนบิ์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๗๑
๕๙) นายธีรวัฒน์ ปางสุข ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๗๒
๖๐) นายอิทธิพล ยะโส ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๗๓
๖๑) นายประพนธ์ วรรณสุขิ์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๗๔
๖๒) นายชยร พวงทิพย์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๗๕
๖๓) นางสาวกนกกรณณ จันทนาทะ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๗๖
๖๔) นางสาวกนกกร หลีกบุญ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๗๗
๖๕) นายสิทธิโชค ธงเงิน ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๗๘
๖๖) นางศิริวรรณ โจปัญ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๗๙
๖๗) นางสาวพรณิศา พุ่มคง ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๘๐
๖๘) นางสาวศรวิทย์ ยี่ดี ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๘๑
๖๙) นายณวัฒน์ ทองอ่อน ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๘๒
๗๐) นายวิญญู บุญตะเนิ์ ทะเบียนเลขที่ ๖-๒๐๔-๕๖๐๘๓

(นายศิระ จันทร์เลิศ)

อธิบดีกรมโรงงานอุตสาหกรรม รักษาการแทน
ผู้อำนวยการกองขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
ปฏิบัติการทางเทคนิคโรงงานอุตสาหกรรม

๓๖) นายสมบุญ...

๑๐๕) นายบงกชชัย...

๑๔๖) นางสาวชดาภรณ์...

เลขทะเบียน ๖-๒๐๔

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการรักษาราชการแทน
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ผู้ดำเนินการกลุ่มมาตรฐานวิชาการและวิชาชีพ
และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
20	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
33	Formaldehyde	Distillation, Colorimetric Method ⁽⁴⁾
34	Free Chlorine	1) DPD Ferrous Titrimetric Method ⁽⁴⁾ 2) Iodometric Method ⁽⁴⁾
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
36	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
37	Hexavalent Chromium	Filtration, Colorimetric Method ⁽⁴⁾
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method ⁽⁴⁾
39	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
40	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass spectrometric Method ⁽⁴⁾
42	Methiocarb	High-Performance Liquid Chromatographic Method ⁽⁴⁾
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾

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.....โรงเรียนปทุมธานี

44 Methomyl...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
44	Methomyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
45	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
47	Oxamyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
48	Propoxur	High-Performance Liquid Chromatographic Method ⁽⁴⁾
49	pH	Electrometric Method ⁽⁴⁾
50	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
51	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
52	Sulfide	Iodometric Method ⁽⁴⁾
53	Temperature	Laboratory and Field Methods ⁽⁴⁾
54	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ⁽⁴⁾
56	Total Suspended Solids	Dried at 103-105 °C ⁽⁴⁾
57	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
58	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
59	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁴⁾

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

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.....โรงเรียนปทุมธานี

3 Aldrin...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
8	Barium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
9	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
11	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
12	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
13	Benzoic Acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
14	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
15	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

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.....โรงเรียนปทุมธานี


18 Bis(2-ethylhexyl)phthalate...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
22	Butyl Benzyl Phthalate	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

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.....โรงเรียนปทุมธานี

34 Chromium (II)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
35	Chromium (VI)	Colorimetric Method ⁽⁴⁾
36	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
37	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
39	DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
40	DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
41	DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
42	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
43	Di-n-Butyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
47	3,3-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾


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 กรมควบคุมมลพิษ


51 cis-1,2-Dichloroethylene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
57	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
58	Diethyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
63	Di-n-Octyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
64	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
65	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
67	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾


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
68 Fluorene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
74	α-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
75	β-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
76	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
81	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
83	Mercury	1) Cold Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾


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 กรมควบคุมมลพิษ


84 Methanol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾ 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾


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97 Pentachlorophenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
100	Phenol	1) Distillation, Direct Photometric Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
103	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₉ -C ₉)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^{(1)(3,2)}
110	TPH (C ₉ -C ₁₆)	Solvent Extraction, Gas Chromatographic Method ^(9,21)
111	TPH (C ₁₆ -C ₃₅)	Solvent Extraction, Gas Chromatographic Method ^(9,21)
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾



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114 1,1,2-Trichloroethane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
120	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
121	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
122	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
123	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
124	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
126	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾


จากผลเสีย (ปล่องระบาย) จำนวน 16 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽³⁾
2	Arsenic	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽³⁾


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3 Carbon Monoxide...


ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Carbon Monoxide	1) Sampling Bag Non-Dispersive Infrared Method ⁽⁵⁾ 2) Non-Dispersive Infrared Method ⁽⁵⁾ 3) Instrumental Analyzer Method ⁽⁵⁾
4	Chlorine	1) Absorption Sampling, Ion Chromatographic Method ⁽⁵⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
5	Copper	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
6	Dioxins	Isokinetic Sampling, Analysis by ISO/IEC 17025 Accredited Laboratory or Analysis by Department of Industrial Works Registered Laboratory (Dioxins/Furans Analysis Approved) ⁽⁵⁾
7	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method ⁽⁵⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
8	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁽⁵⁾
9	Lead	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
10	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁵⁾ 2) Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
11	Opacity	Ringelmann's Method ⁽²⁾
12	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ⁽⁵⁾ 2) Chemiluminescence Method ⁽⁵⁾ 3) Instrumental Analyzer Method ⁽⁵⁾
13	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾ 2) UV Fluorescence Method ⁽⁵⁾ 3) Instrumental Analyzer Method ⁽⁵⁾
14	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾
15	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ⁽⁵⁾
16	Xylene	Absorption Sampling, Gas Chromatographic Method ⁽⁵⁾


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สิ่งปฏิกูล...


สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)


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
6 Cadmium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1.6.15,17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1.6.17) 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7.8,15,17) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7.8,16,17)
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(1.6.17) 2) Alkaline Digestion, Colorimetric Method ^(8.17)


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
11 Cobalt...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25)


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
2) Soxhlet...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1.6.18)


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2) Waste Extraction...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
23	Methoxychlor	2) Waste Extraction, Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1.6.19) 3) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1.6.20) 4) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁸⁾ 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁹⁾ 6) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁰⁾
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)


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
27 Polychlorinated...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,9,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(23,31)


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28 Pentachlorophenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(23,31)
29	pH	Electrometric Method ^(29,30)
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16)
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(23,31)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15)



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4) Digestion...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
35	Zinc	4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)

ดิน จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
4	Anthracene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)


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
9 Benz(a)anthracene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
9	Benz(a)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
11	Benzo(b)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
12	Benzo(k)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
13	Benzoic acid	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
14	Benzo(a)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
15	Benzo(g,h,i)perylene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
17	Bis(2-chloroethyl)ether	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
18	Bis(2-ethylhexyl)phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
21	Butanol	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(12,20)
22	Butyl Benzyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
24	Carbazole	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)


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
26 Carbon tetrachloride...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
28	p-Chloroaniline	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
32	2-Chlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,15,17) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,16,17)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,17)
36	Chrysene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(26,27,28)
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
39	DDD	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)


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
40 DDE...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	DDE	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22)
41	DDT	2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31) 1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22)
42	Dibenz(a,h)anthracene	2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
43	Di-n-Butyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
47	3,3-Dichlorobenzidine	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
53	2,4-Dichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)


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57 Dieldrin...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
58	Diethyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
59	2,4-Dimethylphenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
60	2,4-Dinitrophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
61	2,4-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
62	2,6-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
63	Di-n-Octyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
67	Fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
68	Fluorene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
70	Heptachlor Epoxide	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)


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71 Hexachlorobenzene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
74	α-HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
75	β-HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
76	γ-HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
77	Hexachlorocyclopentadiene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
78	Hexachloroethane	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
79	Indeno(1,2,3-cd)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
80	Isophorone	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
81	Lead	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁸⁾


 (นางวิภาดาญจน์ นัครสกุลวิไล)
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2) Thermal...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry ⁽¹⁹⁾
85	Methoxychlor	3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁰⁾ Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(12,24)
86	Methyl Bromide	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
88	2-methylphenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
89	2-Methylnaphthalene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
91	Naphthalene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
93	Nitrobenzene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
94	N-Nitrosodiphenylamine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
95	N-Nitrosodi-n-propylamine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^(23,32)

วิทย์
(นางวิภาญ์ นัตรสกุลวิไล)
ผู้อำนวยการศูนย์มาตรฐานวิชาการและทดสอบเคมี

- Aroclor 1242...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
	- Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3',3',4,6-Pentachlorobiphenyl - 2,2',3,4,5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,6-Nonachlorobiphenyl	
97	Pentachlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
98	Phenanthrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
99	Phenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
100	Pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)

วิทย์
(นางวิภาญ์ นัตรสกุลวิไล)
ผู้อำนวยการศูนย์มาตรฐานวิชาการและทดสอบเคมี

101 Selenium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
102	Silver	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
103	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
106	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
108	TPH (C ₈ -C ₁₀)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
109	TPH (C ₈ -C ₁₆)	1) Solvent Extraction, Gas Chromatographic Method ^(11,21) 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^(21,31)
110	TPH (C ₁₆ -C ₃₃)	1) Solvent Extraction, Gas Chromatographic Method ^(11,21) 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^(21,31)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
115	2,4,5-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)

วิทย์
(นางวิภาญ์ นัตรสกุลวิไล)
ผู้อำนวยการศูนย์มาตรฐานวิชาการและทดสอบเคมี

116 2,4,6-Trichlorophenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
116	2,4,6-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
121	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
122	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
123	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
125	Zinc	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)

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วิทย์
(นางวิภาญ์ นัตรสกุลวิไล)
ผู้อำนวยการศูนย์มาตรฐานวิชาการและทดสอบเคมี

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(นางริศกัญจน์ อัครกุลศิริโอ)
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลปฏิบัติการ
กรมโรงงานอุตสาหกรรม
กระทรวงอุตสาหกรรม

20. United States...



ที่ อภ ๐๓๑๐(๓)/ ๖๔๗๐

๒๔ มิถุนายน ๒๕๖๕

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

เรื่อง ขันทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอรับสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๔ เมษายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน พร้อมรายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ เจ้าหน้าที่ประจำ
ห้องปฏิบัติการวิเคราะห์ และรายการสารมลพิษที่จะทำการวิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอลเอส แลบริทอรี กรุ๊ป
(ประเทศไทย) จำกัด ขันทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน มีเลขทะเบียน ๖-๒๒๓ สถานที่ตั้งเลขที่
๖๓๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้ อำเภอบางบาล จังหวัดพระนครศรีอยุธยา โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

- | | |
|--------------------------|----------------------------|
| ๑) นายเดช ช่างชน | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๖๒ |
| ๒) นางวิลาวัลย์ บริรักษ์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๔๓ |
| ๓) นายสุพจน์ สลามเต๊ะ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๔๔ |

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

- | | |
|-------------------------------|----------------------------|
| ๑) นางสาวณัฐพร บรรจงกิจ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๔๕ |
| ๒) นางพจนา สีดา | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๔๖ |
| ๓) นางสาววันิดา กลุสสุวัณท์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๔๗ |
| ๔) นายพิทยา ทองแดง | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๔๘ |
| ๕) นางชลธิชา สูงภณ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๔๙ |
| ๖) ว่าที่ ร.ต.รณชัย ม่วงงาม | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๕๐ |
| ๗) นายวรวิทย์ หับพา | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๕๑ |
| ๘) นายศักดิ์รินทร์ จรัสกาย | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๕๒ |
| ๙) นายสุศักดิ์ สาชื่น | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๕๓ |
| ๑๐) นางสาวเพชรคุณ กวักตานนท์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๕๔ |
| ๑๑) นายสถาพร ถาแก้ว | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๕๕ |
| ๑๒) นายสุทธิดำรง โชคปิตินันท์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๕๖ |

๑๓) นายวัลลภ...

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(นางริศกัญจน์ อัครกุลศิริโอ)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลปฏิบัติการ
กรมโรงงานอุตสาหกรรม

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลปฏิบัติการ กองวิจัยและเตือนภัยมลพิษโรงงาน กรมโรงงานอุตสาหกรรม โทร. ๐ ๒๒๒๖ ๔๐๐๖, ๔๑๔๖

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| ๑๓) นายวัลลภ หันไชยเนาว์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๕๗ |
| ๑๔) นางสาววณิดา เจริญตระกูล | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๕๘ |
| ๑๕) นางสาววณิดา ผดุงจิตต์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๕๙ |
| ๑๖) นายธนะสิทธิ์ วงศ์ไชย | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๖๐ |
| ๑๗) นายชัยนุสรณ์ เลิศนันท์กุลชัย | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๖๑ |
| ๑๘) นายสังข์ เพ็ชรแสง | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๖๒ |
| ๑๙) นายกัมภกมล มณีสัมพันธ์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๖๓ |
| ๒๐) นางสาวจันทิพย์ โกมพะชนะ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๖๔ |
| ๒๑) นายธรรรินทร์ ออจินดา | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๖๕ |
| ๒๒) นายคุณชัย พิสมัยพันธ์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๖๖ |
| ๒๓) นายสุภาชัย วงศ์สุริยาชัย | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๖๗ |
| ๒๔) นายปฐมพงศ์ กรสรัตติ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๖๘ |
| ๒๕) นายไฉว ต้นโพธิ์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๖๙ |
| ๒๖) นางสาวกิตติยา สันญญาภิรมย์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๗๐ |
| ๒๗) นางสาวเกตุภาพร ศรีบุญเรือง | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๗๑ |
| ๒๘) นางสาวณัฐรินทร์ สิงห์เงา | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๗๒ |
| ๒๙) นางสาวธิดาจันทร์ ศรีมงคลโร | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๗๓ |
| ๓๐) นายพิพัฒน์ นิภัทร์เศรษฐ์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๗๔ |
| ๓๑) นายศิริวิทย์ เรืองสม | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๗๕ |
| ๓๒) นายปารเมศ สัตยาคุณ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๗๖ |
| ๓๓) นายณัฐนาถ ธรรมะโร | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๗๗ |
| ๓๔) นางสาวศุภรัตน์ โลจันท์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๗๘ |
| ๓๕) นายพชรกร อินทรเสนา | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๗๙ |
| ๓๖) นายทีวกร เชื้อมาก | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๘๐ |
| ๓๗) นายอนุวัชร ทองจรัสศักดิ์ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๘๑ |
| ๓๘) นายอภิชาติ วัลลภ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๘๒ |
| ๓๙) นายสุริยวัชร ศรีรักษา | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๘๓ |
| ๔๐) นายประสพณมิตร เชื้อนเพชร | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๘๔ |
| ๔๑) นายภาณุวัฒน์ วังบง | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๘๕ |
| ๔๒) นายฉัตรชัย ชัยชนะ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๘๖ |
| ๔๓) นายสิทธิชัย แก้วเกตุ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๘๗ |
| ๔๔) นายณัฏฐกร กลุสชาติ | ทะเบียนเลขที่ ๖-๒๒๓-๖-๔๔๘๘ |

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนไว้วิเคราะห์ในน้ำเสีย จำนวน ๑๔ รายการ
อากาศเสีย (ปล่องระบาย) จำนวน ๗ รายการ และน้ำใต้ดิน จำนวน ๓ รายการ รวมทั้งสิ้นจำนวน ๒๔ รายการ
ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้มีอายุ ๓ ปี นับจากวันที่กรมโรงงานอุตสาหกรรมออกหนังสือ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นสุดอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นางจินดา เคษะศรีจันทร์)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติการตามกม.ฉบับที่ ๒๕๖ ของกระทรวงอุตสาหกรรม

๒๕ มิ.ย. ๒๕๖๕

กองวิจัยและเตือนภัยมลพิษโรงงาน

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๘๐๕ ๗๖๖๑-๓

ไปรษณีย์อิเล็กทรอนิกส์ envw@diw.mail.go.th

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๓๒๓

ที่ อก ๐๓๑๐(๓)/ ๒๕๗๐

ลงวันที่ ๒๕ มิถุนายน ๒๕๖๕

ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ

น้ำเสีย จำนวน 14 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ^[2] 2) 5-Day BOD Test, Azide Modification Method ^[2]
2	Chemical Oxygen Demand	1) Open Reflux, Titrimetric Method ^[2] 2) Closed Reflux, Colorimetric Method ^[2] 3) Closed Reflux, Titrimetric Method ^[2]
3	Color	ADMI Weighted - Ordinate Spectrophotometric Method ^[2]
4	Cyanide	Distillation, Colorimetric Method ^[2]
5	Formaldehyde	Distillation, Colorimetric Method ^[1]
6	Free Chlorine	DPD-Ferrous Titrimetric Method ^[2]
7	Oil and Grease	Liquid-Liquid Partition-Gravimetric Method ^[2]
8	pH	Electrometric Method ^[2]
9	Phenols	1) Distillation, Chloroform Extraction Method ^[2] 2) Distillation, Direct Photometric Method ^[2]
10	Sulfide	ZnS Precipitation, Iodometric Method ^[2]
11	Temperature	Laboratory and Field Method ^[2]
12	Total Dissolved Solids	Dried at 180 °C ^[2]
13	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ^[2]
14	Total Suspended Solids	Dried at 103-105 °C ^[2]

อากาศเสีย (ปล่องระบาย) จำนวน 7 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method ^[3] 2) Instrumental Analyzer Method ^[8]
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
3	Opacity	Ringelmann's Method ^[3,4]
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[4] 2) Instrumental Analyzer Method ^[9]
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Instrumental Analyzer Method ^[10]

วิภา คิมกุล

(นางสาววิชุดา สัมฤทธิ์ผล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

Sulfuric Acid...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Sulfuric Acid	Isokinetic Sampling, Barium - Thorin Titrimetric Method ^[6]
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[7]

น้ำได้ดิน จำนวน 3 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Cyanide	Distillation, Colorimetric Method ^[2]
2	pH	Electrometric Method ^[2]
3	Phenols	Distillation, Direct Photometric Method ^[2]

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วิภา คิมกุล

(นางสาววิชุดา สัมฤทธิ์ผล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก



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