ภาคผนวก ค

ผลการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม

ภาคผนวก ค-1

คุณภาพอากาศจากแหล่งกำเนิด

Analysis / Test Report

LABORATORY ACCREDITATION
BLA-DSS
TESTING
No.0042

Lot ID: 2227217
Date Received : Mar 21, 2022
Date Reported : Mar 29, 2022
Report Number: 2246013-1

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Sample Number	2227217-1
Sampled Date	Mar 21, 2022
Sample Description	Emission from Stationary Source
Location	Heater A (47P 0733732, 1404276)
Date Analysis Commenced	Mar 22, 2022
Condition of Sample	Extracted into two 2-L collection flasks, one 10-L air sampling bag, one filter paper placed in plastic petri dish, one plastic bottle and one amber plastic bottle, refrigerated

Stack Description

Ambient Pressure	758	mmHg	Diameter	0.60	m	Oxygen	8.4	%
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	7.1	%
Type of Process	Combustion		Stack Temperature	180	°C	Gas Velocity	4.3	m/s
Type of Fuel	Natural Gas		Moisture	10.84	%	Flow Rate (Actual O2)	2548	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result at 7 %O_2	Result at 8.4 % O_2	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing										
Carbon Monoxide *	03:20 PM - 03:30 PM	ppm	-	1.0	1.3	1.2	690	-	US EPA, Method 10	Rayong
Oxides of Nitrogen *	03:05 PM - 03:15 PM	ppm	-	1.06	54.1	48.7	200	149	US EPA, Method 7	Rayong
Sulfur dioxide *	03:00 PM - 03:30 PM	ppm	-	2.0	<2.0	<2.0	60	-	US EPA, Method 6	Rayong
Total Suspended Particulate	03:00 PM - 03:56 PM	mg/m3	-	0.5	<0.5	<0.5	320	68	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 PS-SPCL Plant, Approval Letter No. Tor Sor 1009.9/11032 dated Nov 6, B.E.2555.

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)
ทะเบียนเลขที่ ว-323-จ-9447

Approved by

Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-9442

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ADDRESS 616/10 Moo 5 T. Maenam Khu A. Pluakdaeng Rayong 21140 Thailand | PHONE +66 0 3304 8555 | FAX +66 0 3304 8556
ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

LABORATORY ACCREDITATION BLA-DSS

TESTING No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227217
Date Received : Mar 21, 2022
Date Reported : Mar 29, 2022
Report Number: 2246013-1

Sample Number	2227217-1
Sampled Date	Mar 21, 2022
Sample Description	Emission from Stationary Source
Location	Heater A (47P 0733732, 1404276)
Date Analysis Commenced	Mar 22, 2022
Condition of Sample	Extracted into two 2-L collection flasks, one 10-L air sampling bag, one filter paper placed in plastic petri dish, one plastic bottle and one amber plastic bottle, refrigerated

Stack Description

Ambient Pressure	758	mmHg	Diameter	0.60	m	Oxygen	8.4	%
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	7.1	%
Type of Process	Combustion		Stack Temperature	180	°C	Gas Velocity	4.3	m/s
Type of Fuel	Natural Gas		Moisture	10.84	%	Flow Rate (Actual O2)	2548	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Carbon Monoxide *	03:20 PM - 03:30 PM	g/s	-	-	0.001	-	-	Calculated	Rayong
Oxides of Nitrogen *	03:05 PM - 03:15 PM	g/s	-	-	0.065	-	0.37	Calculated	Rayong
Sulfur dioxide *	03:00 PM - 03:30 PM	g/s	-	-	<0.004	-	-	Calculated	Rayong
Total Suspended Particulate *	03:00 PM - 03:56 PM	g/s	-	-	<0.0004	-	0.09	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 PS-SPCL Plant, Approval Letter No. Tor Sor 1009.9/11032 dated Nov 6, B.E.2555.

Sampled By : Surasak Sachin

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 ว-323-จ-9447

Approved by D. Changchon
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-9442

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ADDRESS 616/10 Moo 5 T. Maenam Khu A. Pluakdaeng Rayong 21140 Thailand | PHONE +66 0 3304 8555 | FAX +66 0 3304 8556
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ภาคผนวก ค-2

คุณภาพอากาศในบรรยากาศ

Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand
21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227202
Date Received : Mar 28, 2022
Date Reported : Apr 01, 2022
Report Number: 2276673-1

Sample Description Air Quality
Location รีมรั้วด้านทิศตะวันตกของบริษัท ปุ๋ยเอ็นเอฟซี จำกัด (มหาชน) (GPS 47P 0731964, 1403752)
Parameter Nitrogen dioxide (ppm)
Measurement Date Mar 21, 2022 - Mar 28, 2022
Measurement by Adisak Talesoon

Time	2227202-1 Mar 21, 2022	2227202-2 Mar 22, 2022	2227202-3 Mar 23, 2022	2227202-4 Mar 24, 2022	2227202-5 Mar 25, 2022	2227202-6 Mar 26, 2022	2227202-7 Mar 27, 2022
12:00 PM - 01:00 PM	0.002	0.003	0.004	0.008	0.004	0.002	0.002
01:00 PM - 02:00 PM	0.001	0.003	0.004	0.006	0.003	0.001	0.003
02:00 PM - 03:00 PM	0.002	0.004	0.006	0.005	0.004	0.001	0.002
03:00 PM - 04:00 PM	0.003	0.003	0.006	0.004	0.004	0.002	0.004
04:00 PM - 05:00 PM	0.002	0.004	0.003	0.003	0.004	0.002	0.005
05:00 PM - 06:00 PM	0.002	0.004	0.003	0.004	0.006	0.002	0.002
06:00 PM - 07:00 PM	0.002	0.004	0.002	0.004	0.005	0.001	0.002
07:00 PM - 08:00 PM	0.002	0.003	0.002	0.003	0.003	0.001	0.001
08:00 PM - 09:00 PM	0.002	0.003	0.002	0.003	0.005	0.002	0.001
09:00 PM - 10:00 PM	0.002	0.002	0.002	0.002	0.006	0.003	0.001
10:00 PM - 11:00 PM	0.001	0.001	0.001	0.003	0.006	0.003	0.002
11:00 PM - 12:00 AM	0.001	<0.001	0.001	0.003	0.004	0.002	0.004
12:00 AM - 01:00 AM	<0.001	<0.001	0.002	0.002	0.001	0.002	0.003
01:00 AM - 02:00 AM	<0.001	0.001	0.002	0.002	<0.001	0.004	0.003
02:00 AM - 03:00 AM	<0.001	<0.001	0.004	0.001	<0.001	0.002	0.003
03:00 AM - 04:00 AM	0.001	<0.001	0.005	0.001	0.002	0.001	0.003
04:00 AM - 05:00 AM	0.001	<0.001	0.003	0.002	0.002	<0.001	0.002
05:00 AM - 06:00 AM	0.002	<0.001	0.002	0.002	<0.001	<0.001	0.002
06:00 AM - 07:00 AM	0.002	0.001	0.003	0.004	<0.001	<0.001	0.002
07:00 AM - 08:00 AM	0.002	0.003	0.003	0.003	0.002	<0.001	0.003
08:00 AM - 09:00 AM	0.002	0.003	0.004	0.003	0.002	0.001	0.002
09:00 AM - 10:00 AM	0.002	0.003	0.004	0.004	0.002	0.002	0.003
10:00 AM - 11:00 AM	0.003	0.003	0.005	0.005	0.002	0.002	0.005
11:00 AM - 12:00 PM	0.003	0.003	0.007	0.004	0.002	0.002	0.003
Average	0.002	0.002	0.003	0.003	0.003	0.002	0.003
1hr - Maximum	0.003	0.004	0.007	0.008	0.006	0.004	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
Sararat Mongkonjirawut
Scientist (4)

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 : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand
21150
P/O : 4700033695
Project Name :
Project Location :

Lot ID: 2227918
Date Received : Mar 28, 2022
Date Reported : Apr 06, 2022
Report Number: 2276703-1C8

Sample Description Air Quality
Location บ้านอ่าวประดู่ (โรงพยาบาลส่งเสริมสุขภาพตำบลตากวน) (GPS 47P 0735531, 1402769)
Parameter Nitrogen dioxide (ppm)
Measurement Date Mar 21, 2022 - Mar 28, 2022
Measurement by Adisak Talesoon

Time	2227918-1 Mar 21, 2022	2227918-2 Mar 22, 2022	2227918-3 Mar 23, 2022	2227918-4 Mar 24, 2022	2227918-5 Mar 25, 2022	2227918-6 Mar 26, 2022	2227918-7 Mar 27, 2022
11:00 AM - 12:00 PM	0.004	0.005	0.007	0.003	0.005	0.004	0.006
12:00 PM - 01:00 PM	0.002	0.004	0.005	0.004	0.003	0.004	0.005
01:00 PM - 02:00 PM	0.002	0.003	0.006	0.005	0.003	0.004	0.006
02:00 PM - 03:00 PM	0.003	0.004	0.008	0.006	0.003	0.005	0.009
03:00 PM - 04:00 PM	0.003	0.003	0.007	0.006	0.003	0.004	0.005
04:00 PM - 05:00 PM	0.004	0.004	0.006	0.005	0.004	0.007	0.006
05:00 PM - 06:00 PM	0.005	0.003	0.010	0.005	0.006	0.006	0.006
06:00 PM - 07:00 PM	0.007	0.004	0.008	0.007	0.007	0.007	0.007
07:00 PM - 08:00 PM	0.008	0.010	0.012	0.008	0.010	0.011	0.006
08:00 PM - 09:00 PM	0.006	0.010	0.011	0.008	0.010	0.009	0.007
09:00 PM - 10:00 PM	0.004	0.006	0.009	0.008	0.008	0.007	0.006
10:00 PM - 11:00 PM	0.004	0.005	0.007	0.006	0.004	0.005	0.005
11:00 PM - 12:00 AM	0.003	0.005	0.004	0.008	0.004	0.004	0.005
12:00 AM - 01:00 AM	0.002	0.004	0.006	0.004	0.004	0.003	0.009
01:00 AM - 02:00 AM	0.002	0.003	0.007	0.004	0.004	0.003	0.008
02:00 AM - 03:00 AM	0.004	0.005	0.006	0.003	0.004	0.003	0.004
03:00 AM - 04:00 AM	0.003	0.005	0.005	0.004	0.003	0.003	0.004
04:00 AM - 05:00 AM	0.002	0.004	0.005	0.006	0.004	0.003	0.003
05:00 AM - 06:00 AM	0.003	0.005	0.005	0.005	0.003	0.004	0.004
06:00 AM - 07:00 AM	0.005	0.005	0.006	0.005	0.005	0.008	0.005
07:00 AM - 08:00 AM	0.010	0.009	0.006	0.005	0.010	0.009	0.005
08:00 AM - 09:00 AM	0.007	0.014	0.008	0.008	0.010	0.011	0.007
09:00 AM - 10:00 AM	0.004	0.006	0.006	0.005	0.005	0.010	0.005
10:00 AM - 11:00 AM	0.004	0.007	0.004	0.004	0.005	0.011	0.004
Average	0.004	0.006	0.007	0.006	0.005	0.006	0.006
1hr - Maximum	0.010	0.014	0.012	0.008	0.010	0.011	0.009
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
Sararat Mongkonjirawut
Scientist (4)

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 : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4700033695
Project Name :
Project Location :

Lot ID: 2227924
Date Received : Mar 28, 2022
Date Reported : Apr 06, 2022
Report Number: 2276710-1C8

Sample Description Air Quality
Location บ้านมาบตาพุด (GPS 47P 0735346, 1406705)
Parameter Nitrogen dioxide (ppm)
Measurement Date Mar 21, 2022 - Mar 28, 2022
Measurement by Adisak Talesoon

Time	2227924-1 Mar 21, 2022	2227924-2 Mar 22, 2022	2227924-3 Mar 23, 2022	2227924-4 Mar 24, 2022	2227924-5 Mar 25, 2022	2227924-6 Mar 26, 2022	2227924-7 Mar 27, 2022
09:00 AM - 10:00 AM	0.005	0.002	0.004	0.010	0.012	0.002	0.004
10:00 AM - 11:00 AM	0.006	0.001	0.002	0.010	0.006	0.002	0.003
11:00 AM - 12:00 PM	0.006	0.002	0.007	0.014	0.004	0.002	0.002
12:00 PM - 01:00 PM	0.003	0.002	0.005	0.024	0.003	0.002	0.002
01:00 PM - 02:00 PM	0.002	0.002	0.003	0.002	0.004	0.003	0.002
02:00 PM - 03:00 PM	0.001	0.003	0.003	0.006	0.004	0.007	0.002
03:00 PM - 04:00 PM	0.003	0.002	0.004	0.016	0.004	0.002	0.001
04:00 PM - 05:00 PM	0.001	0.002	0.002	0.003	0.013	0.003	0.005
05:00 PM - 06:00 PM	0.001	0.002	0.002	0.003	0.006	0.003	0.004
06:00 PM - 07:00 PM	0.001	0.004	0.002	0.002	0.005	0.002	0.002
07:00 PM - 08:00 PM	0.001	0.002	0.013	0.003	0.008	0.002	0.001
08:00 PM - 09:00 PM	0.001	0.002	0.001	0.006	0.005	0.002	0.001
09:00 PM - 10:00 PM	0.001	0.002	0.003	0.002	0.005	0.002	0.002
10:00 PM - 11:00 PM	0.001	0.002	0.005	0.002	0.004	0.002	0.004
11:00 PM - 12:00 AM	0.001	0.002	0.004	0.001	0.005	0.002	0.005
12:00 AM - 01:00 AM	0.002	0.002	0.006	<0.001	0.006	0.002	0.004
01:00 AM - 02:00 AM	0.002	0.003	0.007	<0.001	0.006	0.002	0.006
02:00 AM - 03:00 AM	0.003	0.004	0.007	0.002	0.009	0.003	0.005
03:00 AM - 04:00 AM	0.004	0.005	0.010	0.002	0.014	0.002	0.002
04:00 AM - 05:00 AM	0.002	0.009	0.004	0.003	0.009	0.003	0.002
05:00 AM - 06:00 AM	0.007	0.011	0.005	0.005	0.012	0.006	0.002
06:00 AM - 07:00 AM	0.004	0.005	0.005	0.011	0.005	0.006	0.003
07:00 AM - 08:00 AM	0.002	0.004	0.005	0.005	0.002	0.004	0.002
08:00 AM - 09:00 AM	0.003	0.004	0.006	0.002	0.003	0.004	0.003
Average	0.003	0.003	0.005	0.006	0.006	0.003	0.003
1hr - Maximum	0.007	0.011	0.013	0.024	0.014	0.007	0.006
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
Sararat Mongkonjirawut
Scientist (4)

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

LABORATORY ACCREDITATION BLA-DSS
TESTING No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227205
Date Received : Mar 28, 2022
Date Reported : Mar 31, 2022
Report Number: 2245992-1

Sample Description Air Quality
Location ริมรั้วด้านทิศตะวันตกของบริษัท ปุ๋ยเอ็นเอฟซี จำกัด (มหาชน) (GPS 47P 0731964, 1403752)
Date Analysis Commenced Mar 29, 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)
2227205-1	Mar 21 - Mar 22, 2022	0.036	758	31
2227205-2	Mar 22 - Mar 23, 2022	0.027	758	30
2227205-3	Mar 23 - Mar 24, 2022	0.033	758	31
2227205-4	Mar 24 - Mar 25, 2022	0.035	758	31
2227205-5	Mar 25 - Mar 26, 2022	0.036	758	32
2227205-6	Mar 26 - Mar 27, 2022	0.017	758	32
2227205-7	Mar 27 - Mar 28, 2022	0.027	758	32
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 : Adisak Talesoon

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Approved by
Thanita Kulsuriwong
Scientist (4)

ADDRESS 616/10 Moo 5 T. Maenam Khu A. Pluakdaeng Rayong 21140 Thailand | PHONE +66 0 3304 8555 | FAX +66 0 3304 8556
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Analysis / Test Report

TESTING
No.0042

Lot ID: 2229814

Date Received : Mar 28, 2022
Date Reported : Apr 06, 2022
Report Number : 2251787-1C8

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4700033695
Project Name :
Project Location :

Sample Description Air Quality
Location บ้านอ่าวประดู่ (โรงพยาบาลส่งเสริมสุขภาพตำบลตากวน) (GPS 47P 0735531, 1402769)
Date Analysis Commenced Mar 29, 2022
Condition of Sample Drawn into one glass filter paper (8x10 inch) placed in plastic bag and one quartz filter paper (8x10 inch) placed in plastic bag

Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
2229814-1	Mar 21 - Mar 22, 2022	0.022	758	31
2229814-2	Mar 22 - Mar 23, 2022	0.022	758	30
2229814-3	Mar 23 - Mar 24, 2022	0.041	758	31
2229814-4	Mar 24 - Mar 25, 2022	0.028	758	31
2229814-5	Mar 25 - Mar 26, 2022	0.022	758	32
2229814-6	Mar 26 - Mar 27, 2022	0.028	758	32
2229814-7	Mar 27 - Mar 28, 2022	0.024	758	32
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 : Adisak Talesoon

Approved by ThanitaK.
Thanita Kulsuriwong
Scientist (4)

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Analysis / Test Report

TESTING
No.0042

Lot ID: 2229816

Date Received : Mar 28, 2022
Date Reported : Apr 06, 2022
Report Number : 2251828-1C8

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4700033695
Project Name :
Project Location :

Sample Description Air Quality
Location บ้านมาบตาพุด (GPS 47P 0735346, 1406705)
Date Analysis Commenced Mar 29, 2022
Condition of Sample Drawn into one glass filter paper (8x10 inch) placed in plastic bag and one quartz filter paper (8x10 inch) placed in plastic bag

Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
2229816-1	Mar 21 - Mar 22, 2022	0.023	758	31
2229816-2	Mar 22 - Mar 23, 2022	0.017	758	30
2229816-3	Mar 23 - Mar 24, 2022	0.034	758	31
2229816-4	Mar 24 - Mar 25, 2022	0.029	758	31
2229816-5	Mar 25 - Mar 26, 2022	0.020	758	32
2229816-6	Mar 26 - Mar 27, 2022	0.020	758	32
2229816-7	Mar 27 - Mar 28, 2022	0.023	758	32
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 : Adisak Talesoon

Approved by ThanitaK.
Thanita Kulsuriwong
Scientist (4)

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID : 2227204
Date Received : Mar 28, 2022
Date Reported : Apr 04, 2022
Report Number : 2245987-1

Sample Number 2227204-1 to 7
Parameter Wind Speed / Wind Direction
Location ริมรั้วด้านทิศตะวันตกของบริษัท ปุ๋ยเอ็นเอฟซี จำกัด (มหาชน) (GPS 47P 0731964, 1403752)
Sampling Date Mar 21 - Mar 28, 2022
Sampling by Adisak Talesoon

Time	Mar 21 - Mar 22, 2022			Mar 22 - Mar 23, 2022			Mar 23 - Mar 24, 2022			Mar 24 - Mar 25, 2022			Mar 25 - Mar 26, 2022			Mar 26 - Mar 27, 2022			Mar 27 - Mar 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)	
12:00 PM - 01:00 PM	1.4	235.0	SW	1.0	220.0	SW	2.4	358.0	N	1.3	65.0	ENE	0.5	177.0	S	2.2	269.0	W	1.3	154.0	SSE
01:00 PM - 02:00 PM	1.7	126.0	SE	1.4	249.0	WSW	1.2	151.0	SSE	1.4	275.0	W	1.3	188.0	S	2.2	211.0	SSW	3.4	169.0	S
02:00 PM - 03:00 PM	1.9	203.0	SSW	0.8	87.0	E	0.2	-	-	0.9	183.0	S	1.3	206.0	SSW	1.7	220.0	SW	3.0	165.0	SSE
03:00 PM - 04:00 PM	3.7	181.0	S	1.4	58.0	ENE	0.3	117.0	ESE	1.5	251.0	WSW	0.1	-	-	4.6	178.0	S	5.3	213.0	SSW
04:00 PM - 05:00 PM	0.7	220.0	SW	0.0	-	-	2.7	59.0	ENE	3.4	264.0	W	0.3	173.0	S	2.7	193.0	SSW	0.7	145.0	SE
05:00 PM - 06:00 PM	1.5	202.0	SSW	0.0	-	-	1.0	102.0	ESE	0.2	-	-	1.0	184.0	S	2.1	199.0	SSW	1.9	223.0	SW
06:00 PM - 07:00 PM	1.8	211.0	SSW	0.9	256.0	WSW	1.3	213.0	SSW	1.1	236.0	SW	0.5	220.0	SW	1.8	215.0	SW	1.7	207.0	SSW
07:00 PM - 08:00 PM	1.0	179.0	S	0.6	257.0	WSW	1.2	207.0	SSW	0.5	202.0	SSW	0.7	198.0	SSW	1.5	197.0	SSW	2.7	198.0	SSW
08:00 PM - 09:00 PM	0.3	218.0	SW	1.3	241.0	WSW	1.0	205.0	SSW	0.2	-	-	0.8	193.0	SSW	0.3	218.0	SW	1.7	187.0	S
09:00 PM - 10:00 PM	0.5	188.0	S	0.3	224.0	SW	2.2	203.0	SSW	0.1	-	-	1.1	184.0	S	0.3	186.0	S	1.3	194.0	SSW
10:00 PM - 11:00 PM	0.0	-	-	0.8	213.0	SSW	1.5	205.0	SSW	0.3	209.0	SSW	0.7	171.0	S	0.3	218.0	SW	0.2	-	-
11:00 PM - 12:00 AM	0.2	-	-	0.8	337.0	NNW	0.6	193.0	SSW	0.4	210.0	SSW	0.3	198.0	SSW	0.2	-	-	0.4	197.0	SSW
12:00 AM - 01:00 AM	0.3	115.0	ESE	1.0	359.0	N	0.1	-	-	0.2	-	-	0.3	197.0	SSW	0.1	-	-	0.3	194.0	SSW
01:00 AM - 02:00 AM	2.4	193.0	SSW	1.0	359.0	N	0.4	327.0	NNW	0.4	157.0	SSE	1.2	191.0	S	0.3	106.0	ESE	0.9	162.0	SSE
02:00 AM - 03:00 AM	2.9	340.0	NNW	0.6	225.0	SW	0.2	-	-	0.3	139.0	SE	0.7	155.0	SSE	0.6	123.0	ESE	0.4	188.0	S
03:00 AM - 04:00 AM	0.3	44.0	NE	0.1	-	-	0.3	234.0	SW	0.2	-	-	1.6	188.0	S	0.2	-	-	0.1	-	-
04:00 AM - 05:00 AM	0.2	-	-	1.1	246.0	WSW	0.5	315.0	NW	0.1	-	-	0.4	195.0	SSW	0.8	201.0	SSW	0.7	165.0	SSE
05:00 AM - 06:00 AM	0.1	-	-	0.9	234.0	SW	36.0	68.0	ENE	0.1	-	-	0.1	-	-	0.1	-	-	0.1	-	-
06:00 AM - 07:00 AM	0.5	323.0	NW	0.2	-	-	35.0	196.0	SSW	0.3	152.0	SSE	0.3	198.0	SSW	0.2	-	-	0.3	164.0	SSE
07:00 AM - 08:00 AM	0.6	266.0	W	0.3	168.0	SSE	0.3	345.0	NNW	0.2	-	-	0.5	200.0	SSW	0.5	207.0	SSW	0.1	-	-
08:00 AM - 09:00 AM	1.3	235.0	SW	0.6	62.0	ENE	0.9	80.0	E	0.5	95.0	E	0.7	245.0	WSW	0.6	224.0	SW	0.8	265.0	W
09:00 AM - 10:00 AM	2.0	284.0	WNW	0.7	261.0	W	0.4	66.0	ENE	0.2	-	-	0.8	274.0	W	1.3	233.0	SW	1.0	223.0	SW
10:00 AM - 11:00 AM	2.5	227.0	SW	1.9	226.0	SW	0.2	-	-	2.3	161.0	SSE	1.7	281.0	W	1.1	215.0	SW	2.5	278.0	W
11:00 AM - 12:00 PM	3.2	216.0	SW	2.7	257.0	WSW	0.7	67.0	ENE	0.3	208.0	SSW	1.6	206.0	SSW	0.4	197.0	SSW	2.0	159.0	SSE

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by

Sarayuth Jittranont
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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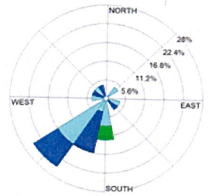
Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID : 2227204
Date Received : Mar 28, 2022
Date Reported : Apr 04, 2022
Report Number : 2245987-1

Wind Rose



Date : Mar 21-22, 2022

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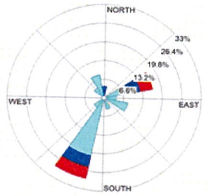
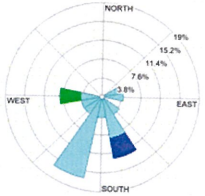
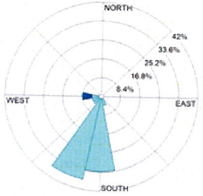


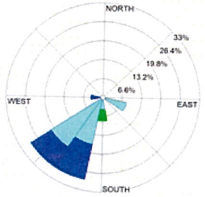
Date : Mar 23-24, 2022



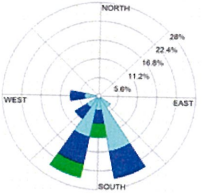
Date : Mar 24-25, 2022



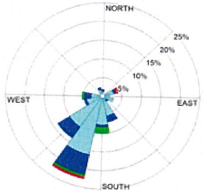
Date : Mar 25-26, 2022



Date : Mar 26-27, 2022



Date : Mar 27-28, 2022



Date : Mar 21-28, 2022

	WS(m/s)	%
	≥ 10.0	1.19
	8.0-10.0	0.00
	5.5-8.0	0.00
	3.3-5.5	2.97
	1.7-3.3	16.67
	0.3-1.7	60.12
	Calms	19.05

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Sarayuth Jittranont
Assistant General Manager

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID : 2229813
Date Received : Mar 28, 2022
Date Reported : Apr 01, 2022
Report Number : 2251777-1 C8

Sample Number 2229813-1 to 7
Parameter Wind Speed / Wind Direction
Location บ้านอ่าวประดู่ (โรงพยาบาลส่งเสริมสุขภาพตำบลตากวน) (GPS 47P 0735531, 1402769)
Sampling Date Mar 21 - Mar 28, 2022
Sampling by Adisak Talesoon

Time	Mar 21 - Mar 22, 2022			Mar 22 - Mar 23, 2022			Mar 23 - Mar 24, 2022			Mar 24 - Mar 25, 2022			Mar 25 - Mar 26, 2022			Mar 26 - Mar 27, 2022			Mar 27 - Mar 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)	
11:00 AM - 12:00 PM	1.3	196.0	SSW	0.7	194.0	SSW	0.5	97.0	E	0.0	-	-	0.4	150.0	SSE	0.6	131.0	SE	1.5	145.0	SE
12:00 PM - 01:00 PM	1.3	225.0	SW	1.8	215.0	SW	1.1	112.0	ESE	3.3	183.0	S	0.9	177.0	S	1.8	229.0	SW	0.9	225.0	SW
01:00 PM - 02:00 PM	0.3	234.0	SW	0.5	259.0	W	1.0	129.0	SE	0.4	158.0	SSE	2.0	159.0	SSE	0.9	252.0	WSW	1.2	141.0	SE
02:00 PM - 03:00 PM	0.4	282.0	WNW	0.3	274.0	W	0.9	172.0	S	1.2	177.0	S	1.2	165.0	SSE	2.1	235.0	SW	0.9	196.0	SSW
03:00 PM - 04:00 PM	1.0	229.0	SW	0.9	301.0	WNW	1.6	225.0	SW	1.6	118.0	ESE	0.7	87.0	E	1.0	165.0	SSE	1.4	192.0	SSW
04:00 PM - 05:00 PM	0.5	291.0	WNW	0.7	245.0	WSW	0.0	-	-	0.3	239.0	WSW	1.3	164.0	SSE	1.8	203.0	SSW	1.2	223.0	SW
05:00 PM - 06:00 PM	2.3	254.0	WSW	0.3	221.0	SW	0.0	-	-	0.6	221.0	SW	0.3	203.0	SSW	0.4	213.0	SSW	0.3	191.0	S
06:00 PM - 07:00 PM	0.4	294.0	WNW	0.2	-	-	0.5	220.0	SW	0.6	212.0	SSW	0.0	-	-	0.3	211.0	SSW	0.5	144.0	SE
07:00 PM - 08:00 PM	2.2	187.0	S	0.2	-	-	0.3	211.0	SSW	0.5	193.0	SSW	2.0	163.0	SSE	1.1	190.0	S	0.4	219.0	SW
08:00 PM - 09:00 PM	0.0	-	-	1.0	275.0	W	0.2	-	-	0.3	184.0	S	2.3	139.0	SE	1.0	206.0	SSW	0.1	-	-
09:00 PM - 10:00 PM	0.1	-	-	0.2	-	-	0.5	195.0	SSW	0.3	188.0	S	0.6	183.0	S	0.2	-	-	1.0	173.0	S
10:00 PM - 11:00 PM	0.7	142.0	SE	0.4	325.0	NW	0.3	133.0	SE	0.2	-	-	1.1	200.0	SSW	0.1	-	-	0.4	159.0	SSE
11:00 PM - 12:00 AM	0.3	203.0	SSW	0.3	261.0	W	0.6	210.0	SSW	0.2	-	-	1.3	257.0	WSW	0.1	-	-	0.1	-	-
12:00 AM - 01:00 AM	0.7	215.0	SW	0.6	254.0	WSW	0.6	210.0	SSW	0.4	228.0	SW	1.2	222.0	SW	0.5	235.0	SW	1.0	203.0	SSW
01:00 AM - 02:00 AM	0.4	220.0	SW	0.5	282.0	WNW	1.1	235.0	SW	1.2	204.0	SSW	0.4	175.0	S	2.7	254.0	WSW	1.4	229.0	SW
02:00 AM - 03:00 AM	0.6	295.0	WNW	0.9	214.0	SW	2.4	213.0	SSW	1.3	226.0	SW	0.0	-	-	0.6	212.0	SSW	0.0	-	-
03:00 AM - 04:00 AM	0.7	255.0	WSW	0.8	212.0	SSW	3.2	264.0	W	1.5	224.0	SW	1.2	231.0	SW	0.2	-	-	0.6	242.0	WSW
04:00 AM - 05:00 AM	0.2	-	-	0.0	-	-	2.6	100.0	E	2.4	224.0	SW	0.8	233.0	SW	0.6	197.0	SSW	0.0	-	-
05:00 AM - 06:00 AM	0.0	-	-	1.2	30.0	NNE	0.3	100.0	E	0.3	288.0	WNW	0.0	-	-	0.0	-	-	0.2	-	-
06:00 AM - 07:00 AM	0.0	-	-	0.0	-	-	0.3	236.0	SW	0.1	-	-	0.4	240.0	WSW	0.7	138.0	SE	0.4	63.0	ENE
07:00 AM - 08:00 AM	1.5	249.0	WSW	0.3	253.0	WSW	0.6	143.0	SE	0.1	-	-	0.7	195.0	SSW	1.5	201.0	SSW	0.0	-	-
08:00 AM - 09:00 AM	0.4	287.0	WNW	0.8	256.0	WSW	0.5	158.0	SSE	0.3	208.0	SSW	0.9	217.0	SW	2.1	196.0	SSW	0.3	224.0	SW
09:00 AM - 10:00 AM	1.7	266.0	W	0.0	-	-	1.2	142.0	SE	0.9	118.0	ESE	0.5	233.0	SW	2.5	225.0	SW	0.6	245.0	WSW
10:00 AM - 11:00 AM	0.4	228.0	SW	0.0	-	-	1.3	159.0	SSE	0.5	175.0	S	0.8	184.0	S	0.1	-	-	0.5	215.0	SW

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by
Sarayuth Jittranont
Assistant General Manager

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

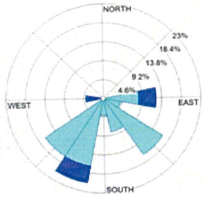
Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID : 2229813
Date Received : Mar 28, 2022
Date Reported : Apr 01, 2022
Report Number : 2251777-1 C8

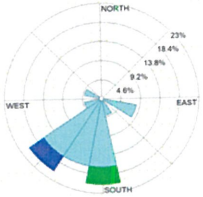
Wind Rose

Date : Mar 21-22, 2022

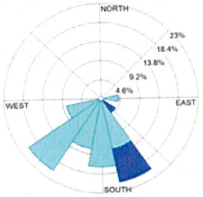
Date : Mar 22-23, 2022



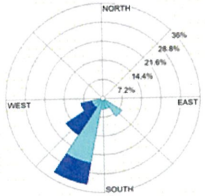
Date : Mar 23-24, 2022



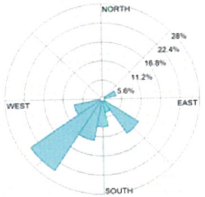
Date : Mar 24-25, 2022



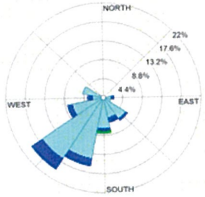
Date : Mar 25-26, 2022



Date : Mar 26-27, 2022



Date : Mar 27-28, 2022



Date : Mar 21-28, 2022

	WS(m/s)	%
	≥ 10.0	0.00
	8.0-10.0	0.00
	5.5-8.0	0.00
	3.3-5.5	0.60
	1.7-3.3	10.12
	0.3-1.7	68.45
	Calms	20.83

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Approved by
Sarayuth Jittranont
Assistant General Manager

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

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID : 2229815
Date Received : Mar 28, 2022
Date Reported : Apr 01, 2022
Report Number : 2251809-1 C8

Sample Number 2229815-1 to 7
Parameter Wind Speed / Wind Direction
Location บ้านมาบตาพุด (GPS 47P 0735346, 1406705)
Sampling Date Mar 21 - Mar 28, 2022
Sampling by Adisak Talesoon

Time	Mar 21 - Mar 22, 2022			Mar 22 - Mar 23, 2022			Mar 23 - Mar 24, 2022			Mar 24 - Mar 25, 2022			Mar 25 - Mar 26, 2022			Mar 26 - Mar 27, 2022			Mar 27 - Mar 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	325.0	NW	3.6	205.0	SSW	0.3	210.0	SSW	0.6	220.0	SW	0.2	-	-	0.5	232.0	SW	1.5	278.0	W
10:00 AM - 11:00 AM	0.5	289.0	WNW	4.7	207.0	SSW	0.2	-	-	1.6	145.0	SE	0.5	234.0	SW	0.7	233.0	SW	2.2	328.0	NNW
11:00 AM - 12:00 PM	1.3	282.0	WNW	1.8	205.0	SSW	2.3	195.0	SSW	0.3	164.0	SSE	0.1	-	-	0.2	-	-	1.6	314.0	NW
12:00 PM - 01:00 PM	0.0	-	-	3.1	204.0	SSW	0.6	147.0	SSE	0.8	217.0	SW	1.3	228.0	SW	0.4	239.0	WSW	3.3	310.0	NW
01:00 PM - 02:00 PM	0.0	-	-	1.8	204.0	SSW	1.4	113.0	ESE	0.9	227.0	SW	0.3	223.0	SW	0.5	236.0	SW	2.2	271.0	W
02:00 PM - 03:00 PM	2.6	111.0	ESE	2.2	224.0	SW	1.3	212.0	SSW	1.0	234.0	SW	0.2	-	-	0.7	234.0	SW	1.5	265.0	W
03:00 PM - 04:00 PM	1.5	120.0	ESE	0.9	211.0	SSW	1.8	211.0	SSW	0.2	-	-	0.4	223.0	SW	0.4	165.0	SSE	1.2	241.0	WSW
04:00 PM - 05:00 PM	2.2	110.0	ESE	0.8	155.0	SSE	0.6	212.0	SSW	1.6	145.0	SE	0.5	210.0	SSW	0.3	154.0	SSE	0.6	229.0	SW
05:00 PM - 06:00 PM	2.5	222.0	SW	0.0	-	-	0.0	-	-	1.5	144.0	SE	0.6	211.0	SSW	0.3	154.0	SSE	0.0	-	-
06:00 PM - 07:00 PM	2.7	216.0	SW	0.0	-	-	0.0	-	-	1.3	154.0	SSE	1.3	213.0	SSW	0.2	-	-	0.0	-	-
07:00 PM - 08:00 PM	2.2	212.0	SSW	0.2	-	-	0.6	165.0	SSE	0.2	-	-	0.6	207.0	SSW	1.3	209.0	SSW	0.0	-	-
08:00 PM - 09:00 PM	2.6	166.0	SSE	1.6	169.0	S	0.3	164.0	SSE	0.3	213.0	SSW	0.5	117.0	ESE	0.6	206.0	SSW	1.2	177.0	S
09:00 PM - 10:00 PM	1.6	149.0	SSE	1.3	107.0	ESE	0.3	209.0	SSW	0.7	210.0	SSW	1.3	98.0	E	1.1	188.0	S	1.9	187.0	S
10:00 PM - 11:00 PM	0.0	-	-	1.5	202.0	SSW	0.2	-	-	0.2	-	-	1.2	96.0	E	2.3	125.0	SE	1.6	156.0	SSE
11:00 PM - 12:00 AM	0.0	-	-	0.3	200.0	SSW	0.6	123.0	ESE	1.5	206.0	SSW	2.4	96.0	E	2.6	205.0	SSW	0.0	-	-
12:00 AM - 01:00 AM	2.0	197.0	SSW	1.9	203.0	SSW	0.3	123.0	ESE	0.7	195.0	SSW	2.2	96.0	E	0.6	208.0	SSW	2.5	213.0	SSW
01:00 AM - 02:00 AM	1.6	194.0	SSW	0.6	189.0	S	0.2	-	-	0.3	193.0	SSW	0.9	199.0	SSW	1.5	211.0	SSW	1.0	225.0	SW
02:00 AM - 03:00 AM	3.1	198.0	SSW	0.5	198.0	SSW	1.1	196.0	SSW	0.2	-	-	1.0	190.0	S	2.2	203.0	SSW	1.9	216.0	SW
03:00 AM - 04:00 AM	3.3	199.0	SSW	0.5	200.0	SSW	1.3	201.0	SSW	0.7	200.0	SSW	1.1	203.0	SSW	0.0	-	-	3.3	215.0	SW
04:00 AM - 05:00 AM	3.6	197.0	SSW	0.3	206.0	SSW	1.6	335.0	NNW	0.5	191.0	S	0.7	186.0	S	0.0	-	-	2.3	200.0	SSW
05:00 AM - 06:00 AM	2.8	144.0	SE	1.4	190.0	S	0.3	335.0	NNW	0.4	127.0	SE	0.9	197.0	SSW	0.0	-	-	0.0	-	-
06:00 AM - 07:00 AM	3.0	144.0	SE	0.4	187.0	S	0.5	208.0	SSW	0.1	-	-	1.1	197.0	SSW	2.0	173.0	S	0.3	148.0	SSE
07:00 AM - 08:00 AM	0.0	-	-	0.9	192.0	SSW	1.2	217.0	SW	0.4	237.0	WSW	0.5	216.0	SW	1.3	184.0	S	0.2	-	-
08:00 AM - 09:00 AM	0.0	-	-	0.3	196.0	SSW	1.8	217.0	SW	0.9	233.0	SW	0.3	235.0	SW	1.3	186.0	S	1.3	164.0	SSE

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by

Sarayuth Jittranont
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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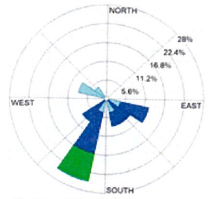
Analysis / Test Report

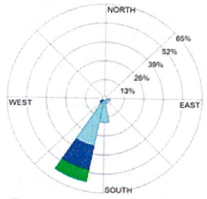
Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID : 2229815
Date Received : Mar 28, 2022
Date Reported : Apr 01, 2022
Report Number : 2251809-1 C8

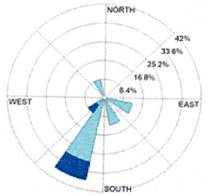
Wind Rose



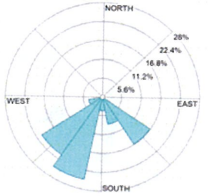
Date : Mar 21-22, 2022



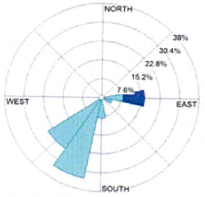
Date : Mar 22-23, 2022



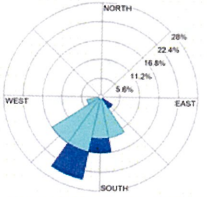
Date : Mar 23-24, 2022



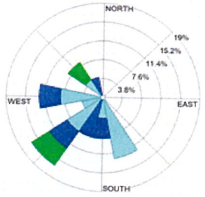
Date : Mar 24-25, 2022



Date : Mar 25-26, 2022



Date : Mar 26-27, 2022



Date : Mar 27-28, 2022

Date : Mar 21-28, 2022

	WS(m/s)	%
	≥ 10.0	0.00
	8.0-10.0	0.00
	5.5-8.0	0.00
	3.3-5.5	3.57
	1.7-3.3	17.86
	0.3-1.7	58.93
	Calms	19.64

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Approved by

Sarayuth Jittranont
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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ภาคผนวก ค-3

ระดับเสียงโดยทั่วไป

Analysis / Test Report

TESTING
No.0042

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262440-1

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Sample Number	2227211-1
Parameter	Noise (Leq 24 hrs.)
Location	ชุมชนวัดโสภณ (GPS 47P 0735038, 1405843)
Measurement Date	Mar 07 - Mar 08, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	56.6	78.8	51.3
01:00 PM - 02:00 PM	54.9	76.3	50.5
02:00 PM - 03:00 PM	52.5	68.0	50.5
03:00 PM - 04:00 PM	53.1	73.0	51.0
04:00 PM - 05:00 PM	61.5	71.3	59.5
05:00 PM - 06:00 PM	53.9	67.8	50.1
06:00 PM - 07:00 PM	51.1	67.6	49.5
07:00 PM - 08:00 PM	53.2	75.9	50.6
08:00 PM - 09:00 PM	58.0	67.3	55.8
09:00 PM - 10:00 PM	50.6	65.4	50.0
10:00 PM - 11:00 PM	62.0	71.8	59.3
11:00 PM - 12:00 AM	63.3	71.8	61.1
12:00 AM - 01:00 AM	58.5	65.1	57.5
01:00 AM - 02:00 AM	63.9	68.3	63.2
02:00 AM - 03:00 AM	53.1	66.0	52.3
03:00 AM - 04:00 AM	50.4	66.2	49.3
04:00 AM - 05:00 AM	59.5	70.2	54.9
05:00 AM - 06:00 AM	53.5	70.0	51.0
06:00 AM - 07:00 AM	54.7	72.0	50.5
07:00 AM - 08:00 AM	59.3	74.8	52.0
08:00 AM - 09:00 AM	57.0	71.8	51.5
09:00 AM - 10:00 AM	51.1	68.5	48.6
10:00 AM - 11:00 AM	51.0	67.4	48.0
11:00 AM - 12:00 PM	50.0	73.7	47.1
Leq Average 24 hrs. (dB(A))	57.7		
Lmax (dB(A))		78.8	
L90 (dB(A))			51.0
Ldn (dB(A))	65.8		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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ADDRESS 616/10 Moo 5 T. Maenam Khu A. Pluakdaeng Rayong 21140 Thailand | PHONE +66 0 3304 8555 | FAX +66 0 3304 8556
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Analysis / Test Report

TESTING
No.0042

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262441-1

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Sample Number	2227211-2
Parameter	Noise (Leq 24 hrs.)
Location	ชุมชนวัดโสภณ (GPS 47P 0735038, 1405843)
Measurement Date	Mar 08 - Mar 09, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	51.9	70.9	46.7
01:00 PM - 02:00 PM	52.4	72.6	48.4
02:00 PM - 03:00 PM	52.5	69.7	48.5
03:00 PM - 04:00 PM	53.1	77.2	48.7
04:00 PM - 05:00 PM	60.5	73.2	54.4
05:00 PM - 06:00 PM	50.0	68.2	46.9
06:00 PM - 07:00 PM	49.1	68.8	46.5
07:00 PM - 08:00 PM	52.8	75.5	46.4
08:00 PM - 09:00 PM	47.2	60.9	45.8
09:00 PM - 10:00 PM	47.2	67.9	45.0
10:00 PM - 11:00 PM	46.9	71.4	43.9
11:00 PM - 12:00 AM	46.6	63.7	45.4
12:00 AM - 01:00 AM	49.4	66.3	45.5
01:00 AM - 02:00 AM	46.2	64.0	44.7
02:00 AM - 03:00 AM	46.1	63.7	44.7
03:00 AM - 04:00 AM	48.9	60.5	47.8
04:00 AM - 05:00 AM	60.4	76.0	55.5
05:00 AM - 06:00 AM	52.1	66.1	49.9
06:00 AM - 07:00 AM	54.5	72.6	48.8
07:00 AM - 08:00 AM	58.1	76.5	50.5
08:00 AM - 09:00 AM	54.4	84.8	50.0
09:00 AM - 10:00 AM	51.2	71.0	48.4
10:00 AM - 11:00 AM	51.7	69.8	48.3
11:00 AM - 12:00 PM	52.3	76.3	48.0
Leq Average 24 hrs. (dB(A))	53.7		
Lmax (dB(A))		84.8	
L90 (dB(A))			47.8
Ldn (dB(A))	59.7		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Lot ID: 2227211

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262442-1

Sample Number	2227211-3
Parameter	Noise (Leq 24 hrs.)
Location	ชุมชนวัดโสภณ (GPS 47P 0735038, 1405843)
Measurement Date	Mar 09 - Mar 10, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial.No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	51.5	72.6	47.6
01:00 PM - 02:00 PM	52.4	70.8	48.1
02:00 PM - 03:00 PM	52.2	73.4	48.0
03:00 PM - 04:00 PM	52.8	75.8	48.8
04:00 PM - 05:00 PM	60.9	79.0	58.2
05:00 PM - 06:00 PM	54.6	74.9	49.7
06:00 PM - 07:00 PM	49.3	64.3	47.3
07:00 PM - 08:00 PM	53.3	77.1	46.9
08:00 PM - 09:00 PM	49.5	68.1	46.9
09:00 PM - 10:00 PM	48.7	60.8	47.7
10:00 PM - 11:00 PM	57.7	69.9	54.2
11:00 PM - 12:00 AM	46.2	64.0	44.4
12:00 AM - 01:00 AM	45.4	58.6	44.2
01:00 AM - 02:00 AM	45.6	62.7	44.3
02:00 AM - 03:00 AM	46.1	61.9	44.4
03:00 AM - 04:00 AM	47.2	68.0	45.3
04:00 AM - 05:00 AM	59.0	77.9	54.2
05:00 AM - 06:00 AM	52.9	69.7	49.7
06:00 AM - 07:00 AM	52.2	68.5	48.4
07:00 AM - 08:00 AM	52.7	73.6	48.1
08:00 AM - 09:00 AM	54.6	83.4	48.4
09:00 AM - 10:00 AM	56.3	78.9	48.7
10:00 AM - 11:00 AM	52.0	68.9	49.3
11:00 AM - 12:00 PM	54.7	75.5	50.1
Leq Average 24 hrs. (dB(A))	53.9		
Lmax (dB(A))		83.4	
L90 (dB(A))			48.1
Ldn (dB(A))	59.9		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supt S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Lot ID: 2227211

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262443-1

Sample Number	2227211-4
Parameter	Noise (Leq 24 hrs.)
Location	ชุมชนวัดโสภณ (GPS 47P 0735038, 1405843)
Measurement Date	Mar 10 - Mar 11, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	56.8	75.5	49.9
01:00 PM - 02:00 PM	59.2	75.3	50.4
02:00 PM - 03:00 PM	55.9	77.0	48.9
03:00 PM - 04:00 PM	54.3	77.8	49.7
04:00 PM - 05:00 PM	62.1	78.1	57.2
05:00 PM - 06:00 PM	58.5	70.4	53.6
06:00 PM - 07:00 PM	55.2	72.0	47.7
07:00 PM - 08:00 PM	49.3	70.4	46.4
08:00 PM - 09:00 PM	49.5	69.4	48.0
09:00 PM - 10:00 PM	46.3	68.2	44.2
10:00 PM - 11:00 PM	50.1	60.1	47.7
11:00 PM - 12:00 AM	45.4	64.6	42.9
12:00 AM - 01:00 AM	44.7	60.1	42.8
01:00 AM - 02:00 AM	54.5	69.8	51.3
02:00 AM - 03:00 AM	49.3	68.3	47.2
03:00 AM - 04:00 AM	47.0	58.5	44.9
04:00 AM - 05:00 AM	59.4	74.9	54.6
05:00 AM - 06:00 AM	52.8	69.5	49.7
06:00 AM - 07:00 AM	54.4	77.9	50.2
07:00 AM - 08:00 AM	54.1	74.7	52.0
08:00 AM - 09:00 AM	50.9	71.1	47.0
09:00 AM - 10:00 AM	53.1	69.8	50.9
10:00 AM - 11:00 AM	54.0	69.3	52.1
11:00 AM - 12:00 PM	52.8	73.7	50.7
Leq Average 24 hrs. (dB(A))	55.1		
Lmax (dB(A))		78.1	
L90 (dB(A))			49.7
Ldn (dB(A))	60.2		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supt S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262444-1

Sample Number	2227211-5
Parameter	Noise (Leq 24 hrs.)
Location	ชุมชนวัดโสภณ (GPS 47P 0735038, 1405843)
Measurement Date	Mar 11 - Mar 12, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	52.7	67.9	50.6
01:00 PM - 02:00 PM	53.3	72.6	51.3
02:00 PM - 03:00 PM	54.8	74.0	52.2
03:00 PM - 04:00 PM	54.8	67.1	53.2
04:00 PM - 05:00 PM	59.6	77.3	57.1
05:00 PM - 06:00 PM	57.9	76.1	55.5
06:00 PM - 07:00 PM	53.3	69.6	51.6
07:00 PM - 08:00 PM	52.1	66.3	50.8
08:00 PM - 09:00 PM	52.4	65.5	50.9
09:00 PM - 10:00 PM	52.2	68.4	50.0
10:00 PM - 11:00 PM	51.2	66.5	50.1
11:00 PM - 12:00 AM	50.9	59.0	49.8
12:00 AM - 01:00 AM	55.6	64.0	53.4
01:00 AM - 02:00 AM	50.5	59.9	49.4
02:00 AM - 03:00 AM	51.2	74.6	49.1
03:00 AM - 04:00 AM	50.8	59.6	49.7
04:00 AM - 05:00 AM	60.1	71.6	52.9
05:00 AM - 06:00 AM	53.6	68.2	51.4
06:00 AM - 07:00 AM	54.5	71.7	51.2
07:00 AM - 08:00 AM	53.8	72.1	51.0
08:00 AM - 09:00 AM	55.4	71.8	51.3
09:00 AM - 10:00 AM	55.0	71.5	51.0
10:00 AM - 11:00 AM	53.6	71.1	50.9
11:00 AM - 12:00 PM	57.4	71.6	51.4
Leq Average 24 hrs. (dB(A))	54.9		
Lmax (dB(A))		77.3	
L90 (dB(A))			51.0
Ldn (dB(A))	61.0		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
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Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262445-1

Sample Number	2227211-6
Parameter	Noise (Leq 24 hrs.)
Location	ชุมชนวัดโสภณ (GPS 47P 0735038, 1405843)
Measurement Date	Mar 12 - Mar 13, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	56.2	72.7	52.1
01:00 PM - 02:00 PM	53.5	70.6	50.9
02:00 PM - 03:00 PM	54.2	69.3	51.5
03:00 PM - 04:00 PM	53.9	73.6	52.0
04:00 PM - 05:00 PM	58.4	75.6	56.1
05:00 PM - 06:00 PM	56.9	72.6	54.3
06:00 PM - 07:00 PM	52.8	71.2	50.7
07:00 PM - 08:00 PM	51.7	69.5	49.7
08:00 PM - 09:00 PM	54.9	69.2	51.2
09:00 PM - 10:00 PM	51.3	73.5	49.1
10:00 PM - 11:00 PM	50.7	70.4	49.1
11:00 PM - 12:00 AM	52.8	76.6	49.6
12:00 AM - 01:00 AM	50.0	65.4	48.8
01:00 AM - 02:00 AM	51.4	72.7	48.8
02:00 AM - 03:00 AM	49.9	63.0	48.8
03:00 AM - 04:00 AM	50.6	70.7	49.3
04:00 AM - 05:00 AM	57.7	69.1	55.4
05:00 AM - 06:00 AM	54.5	81.4	50.8
06:00 AM - 07:00 AM	51.8	65.1	49.9
07:00 AM - 08:00 AM	52.1	69.9	50.0
08:00 AM - 09:00 AM	53.0	76.7	50.6
09:00 AM - 10:00 AM	51.9	65.9	50.0
10:00 AM - 11:00 AM	55.4	69.8	52.0
11:00 AM - 12:00 PM	52.3	67.0	50.3
Leq Average 24 hrs. (dB(A))	53.9		
Lmax (dB(A))		81.4	
L90 (dB(A))			50.3
Ldn (dB(A))	59.6		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262446-1

Sample Number	2227211-7
Parameter	Noise (Leq 24 hrs.)
Location	ชุมชนวัดโสภณ (GPS 47P 0735038, 1405843)
Measurement Date	Mar 13 - Mar 14, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	52.0	72.3	50.1
01:00 PM - 02:00 PM	53.2	71.1	50.9
02:00 PM - 03:00 PM	53.7	70.3	51.7
03:00 PM - 04:00 PM	54.0	69.4	51.5
04:00 PM - 05:00 PM	60.3	74.3	58.4
05:00 PM - 06:00 PM	55.0	64.9	53.5
06:00 PM - 07:00 PM	51.6	63.6	50.0
07:00 PM - 08:00 PM	51.3	68.9	49.6
08:00 PM - 09:00 PM	54.0	66.1	50.8
09:00 PM - 10:00 PM	51.5	72.5	49.6
10:00 PM - 11:00 PM	50.5	63.0	49.4
11:00 PM - 12:00 AM	58.0	67.4	55.0
12:00 AM - 01:00 AM	52.3	61.1	49.5
01:00 AM - 02:00 AM	54.2	66.3	49.8
02:00 AM - 03:00 AM	53.1	62.1	49.9
03:00 AM - 04:00 AM	51.3	67.3	49.8
04:00 AM - 05:00 AM	60.3	70.5	57.7
05:00 AM - 06:00 AM	53.9	77.5	51.6
06:00 AM - 07:00 AM	54.2	73.5	51.3
07:00 AM - 08:00 AM	53.4	72.2	50.3
08:00 AM - 09:00 AM	52.3	67.5	50.4
09:00 AM - 10:00 AM	52.4	69.7	50.4
10:00 AM - 11:00 AM	52.4	68.1	49.1
11:00 AM - 12:00 PM	51.7	68.3	48.2
Leq Average 24 hrs. (dB(A))	54.6		
Lmax (dB(A))		77.5	
L90 (dB(A))			50.3
Ldn (dB(A))	61.6		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supt S.
Supot Salamteh
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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262447-1

Sample Number	2227211-8
Parameter	Noise (Leq 24 hrs.)
Location	บ้านอ่าวประดู่ (ศูนย์บริการสาธารณสุขตากวน) (GPS 47P 0735531, 1402769)
Measurement Date	Mar 07 - Mar 08, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 233183

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
06:00 PM - 07:00 PM	59.4	89.0	54.6
07:00 PM - 08:00 PM	54.5	74.0	50.8
08:00 PM - 09:00 PM	54.1	79.9	49.1
09:00 PM - 10:00 PM	51.1	73.0	46.9
10:00 PM - 11:00 PM	53.1	74.8	45.4
11:00 PM - 12:00 AM	54.1	75.7	50.2
12:00 AM - 01:00 AM	53.7	74.2	50.4
01:00 AM - 02:00 AM	51.6	66.5	48.8
02:00 AM - 03:00 AM	53.6	65.1	52.0
03:00 AM - 04:00 AM	48.9	64.5	46.2
04:00 AM - 05:00 AM	48.6	65.5	41.2
05:00 AM - 06:00 AM	53.9	72.1	47.3
06:00 AM - 07:00 AM	57.2	75.8	53.7
07:00 AM - 08:00 AM	55.3	75.2	49.9
08:00 AM - 09:00 AM	54.9	73.1	52.7
09:00 AM - 10:00 AM	53.6	74.7	50.5
10:00 AM - 11:00 AM	52.8	66.6	50.1
11:00 AM - 12:00 PM	51.5	69.6	44.9
12:00 PM - 01:00 PM	53.1	73.2	48.4
01:00 PM - 02:00 PM	53.9	72.9	50.0
02:00 PM - 03:00 PM	53.7	68.3	47.8
03:00 PM - 04:00 PM	54.2	74.1	47.9
04:00 PM - 05:00 PM	55.5	77.9	50.5
05:00 PM - 06:00 PM	54.9	82.8	50.2
Leq Average 24 hrs. (dB(A))	54.2		
Lmax (dB(A))		89.0	
L90 (dB(A))			49.9
Ldn (dB(A))	60.0		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supt S.
Supot Salamteh
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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262448-1

Sample Number 2227211-9
Parameter Noise (Leq 24 hrs.)
Location บ้านอ่าวประดู่ (ศูนย์บริการสาธารณสุขตากวน) (GPS 47P 0735531, 1402769)
Measurement Date Mar 08 - Mar 09, 2022
Measurement by Satcha Phetsawaeng
Sound Level meter Serial No. 233183

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
06:00 PM - 07:00 PM	58.0	73.8	54.5
07:00 PM - 08:00 PM	55.0	73.8	51.3
08:00 PM - 09:00 PM	55.2	80.1	50.4
09:00 PM - 10:00 PM	51.4	72.2	47.6
10:00 PM - 11:00 PM	49.8	74.2	42.6
11:00 PM - 12:00 AM	49.2	74.1	43.2
12:00 AM - 01:00 AM	49.1	74.1	42.6
01:00 AM - 02:00 AM	47.1	70.4	41.6
02:00 AM - 03:00 AM	49.9	68.8	43.1
03:00 AM - 04:00 AM	53.9	68.0	49.8
04:00 AM - 05:00 AM	52.1	65.9	46.7
05:00 AM - 06:00 AM	58.6	70.7	56.0
06:00 AM - 07:00 AM	57.2	72.8	53.0
07:00 AM - 08:00 AM	55.1	79.2	51.6
08:00 AM - 09:00 AM	53.5	70.7	49.8
09:00 AM - 10:00 AM	52.7	74.3	46.4
10:00 AM - 11:00 AM	57.4	77.2	53.3
11:00 AM - 12:00 PM	57.6	71.9	52.6
12:00 PM - 01:00 PM	57.2	80.0	52.0
01:00 PM - 02:00 PM	51.6	70.1	46.6
02:00 PM - 03:00 PM	52.9	68.7	49.2
03:00 PM - 04:00 PM	56.1	74.5	52.2
04:00 PM - 05:00 PM	54.3	75.8	49.3
05:00 PM - 06:00 PM	56.0	80.8	51.0
Leq Average 24 hrs. (dB(A))	54.8		
Lmax (dB(A))		80.8	
L90 (dB(A))			49.8
Ldn (dB(A))	60.3		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
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Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262449-1

Sample Number 2227211-10
Parameter Noise (Leq 24 hrs.)
Location บ้านอ่าวประดู่ (ศูนย์บริการสาธารณสุขตากวน) (GPS 47P 0735531, 1402769)
Measurement Date Mar 09 - Mar 10, 2022
Measurement by Satcha Phetsawaeng
Sound Level meter Serial No. 233183

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
06:00 PM - 07:00 PM	60.9	79.4	58.4
07:00 PM - 08:00 PM	54.5	75.7	50.8
08:00 PM - 09:00 PM	54.4	77.8	50.3
09:00 PM - 10:00 PM	55.3	78.7	48.0
10:00 PM - 11:00 PM	51.5	76.7	46.1
11:00 PM - 12:00 AM	50.5	73.0	45.6
12:00 AM - 01:00 AM	54.0	73.1	49.8
01:00 AM - 02:00 AM	49.1	72.0	44.9
02:00 AM - 03:00 AM	54.7	73.4	51.7
03:00 AM - 04:00 AM	50.6	73.8	42.7
04:00 AM - 05:00 AM	49.3	69.0	43.6
05:00 AM - 06:00 AM	50.6	70.5	45.7
06:00 AM - 07:00 AM	56.8	74.8	54.0
07:00 AM - 08:00 AM	56.2	77.6	53.3
08:00 AM - 09:00 AM	53.1	68.3	49.3
09:00 AM - 10:00 AM	55.0	77.0	49.6
10:00 AM - 11:00 AM	53.3	75.1	48.2
11:00 AM - 12:00 PM	59.1	72.9	52.9
12:00 PM - 01:00 PM	54.0	70.1	49.1
01:00 PM - 02:00 PM	59.7	83.6	55.7
02:00 PM - 03:00 PM	52.1	69.0	48.1
03:00 PM - 04:00 PM	51.7	71.3	47.4
04:00 PM - 05:00 PM	53.6	74.1	48.9
05:00 PM - 06:00 PM	54.6	77.6	49.7
Leq Average 24 hrs. (dB(A))	55.1		
Lmax (dB(A))		83.6	
L90 (dB(A))			49.1
Ldn (dB(A))	59.8		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262450-1

Sample Number	2227211-11
Parameter	Noise (Leq 24 hrs.)
Location	บ้านอ่าวประดู่ (ศูนย์บริการสาธารณสุขตากวน) (GPS 47P 0735531, 1402769)
Measurement Date	Mar 10 - Mar 11, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 233183

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
06:00 PM - 07:00 PM	61.1	72.9	58.6
07:00 PM - 08:00 PM	54.7	76.7	50.7
08:00 PM - 09:00 PM	53.7	70.9	49.6
09:00 PM - 10:00 PM	52.9	78.4	46.9
10:00 PM - 11:00 PM	50.5	76.8	45.5
11:00 PM - 12:00 AM	50.1	75.5	43.0
12:00 AM - 01:00 AM	59.0	74.7	55.3
01:00 AM - 02:00 AM	46.4	68.1	42.1
02:00 AM - 03:00 AM	45.8	68.5	42.1
03:00 AM - 04:00 AM	47.6	72.9	42.6
04:00 AM - 05:00 AM	46.9	62.4	43.5
05:00 AM - 06:00 AM	59.8	71.7	56.2
06:00 AM - 07:00 AM	56.5	72.0	52.5
07:00 AM - 08:00 AM	55.7	77.3	52.5
08:00 AM - 09:00 AM	54.8	75.9	51.4
09:00 AM - 10:00 AM	51.4	68.5	46.6
10:00 AM - 11:00 AM	55.8	69.8	50.9
11:00 AM - 12:00 PM	56.2	72.8	51.4
12:00 PM - 01:00 PM	52.9	74.1	47.9
01:00 PM - 02:00 PM	58.2	67.0	54.5
02:00 PM - 03:00 PM	53.9	83.3	49.5
03:00 PM - 04:00 PM	52.2	76.2	47.4
04:00 PM - 05:00 PM	53.6	70.0	49.9
05:00 PM - 06:00 PM	57.0	74.3	50.5
Leq Average 24 hrs. (dB(A))	55.3		
Lmax (dB(A))		83.3	
L90 (dB(A))			49.6
Ldn (dB(A))	61.2		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supt S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262451-1

Sample Number	2227211-12
Parameter	Noise (Leq 24 hrs.)
Location	บ้านอ่าวประดู่ (ศูนย์บริการสาธารณสุขตากวน) (GPS 47P 0735531, 1402769)
Measurement Date	Mar 11 - Mar 12, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 233183

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
06:00 PM - 07:00 PM	59.9	74.9	55.9
07:00 PM - 08:00 PM	55.7	78.9	52.0
08:00 PM - 09:00 PM	55.3	79.8	50.7
09:00 PM - 10:00 PM	53.4	71.9	49.1
10:00 PM - 11:00 PM	51.2	71.9	47.3
11:00 PM - 12:00 AM	52.2	81.8	45.1
12:00 AM - 01:00 AM	48.8	71.8	43.6
01:00 AM - 02:00 AM	47.8	72.4	43.8
02:00 AM - 03:00 AM	54.8	69.2	49.5
03:00 AM - 04:00 AM	46.8	69.6	42.3
04:00 AM - 05:00 AM	48.9	74.7	42.3
05:00 AM - 06:00 AM	58.6	72.6	55.5
06:00 AM - 07:00 AM	56.1	76.7	51.9
07:00 AM - 08:00 AM	56.0	78.2	53.0
08:00 AM - 09:00 AM	54.1	76.6	50.0
09:00 AM - 10:00 AM	52.4	72.4	46.7
10:00 AM - 11:00 AM	55.5	77.8	47.3
11:00 AM - 12:00 PM	55.8	77.7	51.2
12:00 PM - 01:00 PM	55.2	77.5	49.2
01:00 PM - 02:00 PM	52.3	72.8	48.5
02:00 PM - 03:00 PM	52.7	69.9	48.1
03:00 PM - 04:00 PM	51.6	70.5	46.3
04:00 PM - 05:00 PM	58.5	71.9	50.7
05:00 PM - 06:00 PM	56.0	82.4	50.3
Leq Average 24 hrs. (dB(A))	54.9		
Lmax (dB(A))		82.4	
L90 (dB(A))			49.1
Ldn (dB(A))	60.2		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supt S.
Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262452-1

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Sample Number	2227211-13
Parameter	Noise (Leq 24 hrs.)
Location	บ้านอ่าวประดู่ (ศูนย์บริการสาธารณสุขตากวน) (GPS 47P 0735531, 1402769)
Measurement Date	Mar 12 - Mar 13, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 233183

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
06:00 PM - 07:00 PM	60.8	73.7	58.0
07:00 PM - 08:00 PM	55.9	78.9	50.4
08:00 PM - 09:00 PM	55.4	77.8	49.3
09:00 PM - 10:00 PM	52.4	76.8	46.5
10:00 PM - 11:00 PM	51.7	75.3	45.6
11:00 PM - 12:00 AM	51.9	74.2	44.9
12:00 AM - 01:00 AM	52.3	82.5	43.0
01:00 AM - 02:00 AM	49.8	72.3	43.7
02:00 AM - 03:00 AM	48.1	77.5	42.3
03:00 AM - 04:00 AM	46.6	68.5	42.0
04:00 AM - 05:00 AM	48.4	68.4	43.2
05:00 AM - 06:00 AM	59.3	72.1	57.0
06:00 AM - 07:00 AM	54.5	74.1	49.9
07:00 AM - 08:00 AM	54.0	80.3	49.9
08:00 AM - 09:00 AM	56.1	75.8	48.8
09:00 AM - 10:00 AM	53.3	71.0	49.5
10:00 AM - 11:00 AM	54.0	74.4	49.6
11:00 AM - 12:00 PM	54.9	74.2	50.7
12:00 PM - 01:00 PM	57.2	75.3	54.3
01:00 PM - 02:00 PM	52.2	70.7	48.1
02:00 PM - 03:00 PM	52.7	75.2	47.9
03:00 PM - 04:00 PM	52.7	75.0	46.8
04:00 PM - 05:00 PM	55.7	70.4	49.3
05:00 PM - 06:00 PM	58.1	74.8	51.1
Leq Average 24 hrs. (dB(A))	55.0		
Lmax (dB(A))		82.5	
L90 (dB(A))			48.8
Ldn (dB(A))	60.1		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

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.0042

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262453-1

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Sample Number	2227211-14
Parameter	Noise (Leq 24 hrs.)
Location	บ้านอ่าวประดู่ (ศูนย์บริการสาธารณสุขตากวน) (GPS 47P 0735531, 1402769)
Measurement Date	Mar 13 - Mar 14, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 233183

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
06:00 PM - 07:00 PM	58.9	75.4	56.3
07:00 PM - 08:00 PM	55.0	75.7	50.7
08:00 PM - 09:00 PM	54.0	76.9	49.0
09:00 PM - 10:00 PM	53.1	73.5	47.6
10:00 PM - 11:00 PM	51.7	74.3	47.8
11:00 PM - 12:00 AM	51.6	80.6	46.4
12:00 AM - 01:00 AM	49.0	74.2	44.8
01:00 AM - 02:00 AM	48.5	76.0	43.2
02:00 AM - 03:00 AM	49.1	72.6	47.1
03:00 AM - 04:00 AM	47.4	76.1	42.9
04:00 AM - 05:00 AM	47.6	70.8	43.5
05:00 AM - 06:00 AM	60.6	72.2	54.6
06:00 AM - 07:00 AM	57.1	77.7	50.5
07:00 AM - 08:00 AM	54.0	74.5	49.5
08:00 AM - 09:00 AM	53.0	70.8	49.5
09:00 AM - 10:00 AM	51.2	67.9	45.5
10:00 AM - 11:00 AM	51.3	69.3	45.8
11:00 AM - 12:00 PM	54.1	77.7	50.6
12:00 PM - 01:00 PM	57.1	73.6	50.8
01:00 PM - 02:00 PM	52.8	77.5	48.3
02:00 PM - 03:00 PM	53.7	72.7	49.8
03:00 PM - 04:00 PM	53.5	68.1	47.6
04:00 PM - 05:00 PM	54.0	73.9	47.7
05:00 PM - 06:00 PM	55.3	77.7	50.3
Leq Average 24 hrs. (dB(A))	54.4		
Lmax (dB(A))		80.6	
L90 (dB(A))			47.8
Ldn (dB(A))	60.5		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262454-1

Sample Number	2227211-15
Parameter	Noise (Leq 24 hrs.)
Location	รีมรั้วโครงการด้านทิศใต้ (GPS 47P 0733727, 1404233)
Measurement Date	Mar 07 - Mar 08, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	60.3	83.3	59.8
12:00 PM - 01:00 PM	60.9	80.1	60.2
01:00 PM - 02:00 PM	63.0	78.4	61.5
02:00 PM - 03:00 PM	65.5	88.9	61.2
03:00 PM - 04:00 PM	62.3	83.3	61.2
04:00 PM - 05:00 PM	62.0	79.8	61.4
05:00 PM - 06:00 PM	62.1	70.9	61.7
06:00 PM - 07:00 PM	62.5	67.7	62.1
07:00 PM - 08:00 PM	62.2	64.5	61.9
08:00 PM - 09:00 PM	62.2	65.2	61.9
09:00 PM - 10:00 PM	61.7	72.0	61.3
10:00 PM - 11:00 PM	61.7	63.2	61.3
11:00 PM - 12:00 AM	63.1	74.6	62.6
12:00 AM - 01:00 AM	64.2	71.3	63.6
01:00 AM - 02:00 AM	63.4	65.6	63.0
02:00 AM - 03:00 AM	63.6	66.0	63.2
03:00 AM - 04:00 AM	63.4	66.1	62.9
04:00 AM - 05:00 AM	63.7	74.9	63.2
05:00 AM - 06:00 AM	63.4	77.7	62.9
06:00 AM - 07:00 AM	63.0	70.2	62.6
07:00 AM - 08:00 AM	63.1	72.1	62.7
08:00 AM - 09:00 AM	63.8	79.1	63.1
09:00 AM - 10:00 AM	63.6	73.0	62.1
10:00 AM - 11:00 AM	62.7	84.4	61.8
Leq Average 24 hrs. (dB(A))	62.9		
Lmax (dB(A))		88.9	
L90 (dB(A))			61.9
Ldn (dB(A))	69.6		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supt S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262455-1

Sample Number	2227211-16
Parameter	Noise (Leq 24 hrs.)
Location	รีมรั้วโครงการด้านทิศใต้ (GPS 47P 0733727, 1404233)
Measurement Date	Mar 08 - Mar 09, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	61.8	78.1	61.3
12:00 PM - 01:00 PM	62.6	83.9	61.6
01:00 PM - 02:00 PM	62.3	75.4	61.5
02:00 PM - 03:00 PM	61.6	74.5	61.0
03:00 PM - 04:00 PM	64.0	85.1	61.8
04:00 PM - 05:00 PM	64.1	78.6	61.7
05:00 PM - 06:00 PM	62.4	75.1	61.6
06:00 PM - 07:00 PM	62.3	70.9	61.9
07:00 PM - 08:00 PM	62.1	74.0	61.7
08:00 PM - 09:00 PM	62.2	69.7	61.9
09:00 PM - 10:00 PM	62.0	63.8	61.7
10:00 PM - 11:00 PM	62.3	64.2	61.9
11:00 PM - 12:00 AM	62.6	74.9	62.3
12:00 AM - 01:00 AM	62.5	64.1	62.2
01:00 AM - 02:00 AM	62.5	64.0	62.2
02:00 AM - 03:00 AM	62.5	64.8	62.2
03:00 AM - 04:00 AM	62.4	64.2	62.1
04:00 AM - 05:00 AM	62.3	64.4	62.0
05:00 AM - 06:00 AM	62.5	76.1	62.2
06:00 AM - 07:00 AM	62.3	71.0	61.9
07:00 AM - 08:00 AM	61.5	73.3	61.1
08:00 AM - 09:00 AM	61.7	75.4	61.1
09:00 AM - 10:00 AM	62.2	77.5	61.5
10:00 AM - 11:00 AM	62.0	79.4	60.9
Leq Average 24 hrs. (dB(A))	62.4		
Lmax (dB(A))		85.1	
L90 (dB(A))			61.7
Ldn (dB(A))	68.8		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supt S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262456-1

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Sample Number	2227211-17
Parameter	Noise (Leq 24 hrs.)
Location	ริมรั้วโครงการด้านทิศใต้ (GPS 47P 0733727, 1404233)
Measurement Date	Mar 09 - Mar 10, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	61.0	71.1	60.5
12:00 PM - 01:00 PM	60.9	70.4	60.4
01:00 PM - 02:00 PM	61.8	76.1	61.1
02:00 PM - 03:00 PM	61.8	79.4	60.9
03:00 PM - 04:00 PM	62.0	78.3	61.2
04:00 PM - 05:00 PM	61.9	72.3	61.3
05:00 PM - 06:00 PM	63.5	77.9	62.0
06:00 PM - 07:00 PM	64.5	80.3	62.1
07:00 PM - 08:00 PM	62.0	76.6	61.4
08:00 PM - 09:00 PM	61.9	69.7	61.6
09:00 PM - 10:00 PM	61.9	68.0	61.6
10:00 PM - 11:00 PM	61.9	63.8	61.6
11:00 PM - 12:00 AM	61.9	68.2	61.6
12:00 AM - 01:00 AM	62.0	63.5	61.7
01:00 AM - 02:00 AM	61.8	63.6	61.4
02:00 AM - 03:00 AM	61.6	63.7	61.3
03:00 AM - 04:00 AM	61.5	63.2	61.2
04:00 AM - 05:00 AM	61.7	63.8	61.3
05:00 AM - 06:00 AM	62.0	68.3	61.6
06:00 AM - 07:00 AM	61.8	75.9	61.3
07:00 AM - 08:00 AM	61.5	72.2	61.0
08:00 AM - 09:00 AM	62.9	76.3	61.4
09:00 AM - 10:00 AM	62.2	81.6	61.2
10:00 AM - 11:00 AM	62.8	77.4	60.5
Leq Average 24 hrs. (dB(A))	62.1		
Lmax (dB(A))		81.6	
L90 (dB(A))			61.3
Ldn (dB(A))	68.3		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

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.0042

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262457-1

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Sample Number	2227211-18
Parameter	Noise (Leq 24 hrs.)
Location	ริมรั้วโครงการด้านทิศใต้ (GPS 47P 0733727, 1404233)
Measurement Date	Mar 10 - Mar 11, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	60.3	78.8	59.7
12:00 PM - 01:00 PM	60.7	72.7	60.0
01:00 PM - 02:00 PM	61.6	79.9	60.7
02:00 PM - 03:00 PM	63.9	85.3	61.4
03:00 PM - 04:00 PM	62.1	73.1	61.3
04:00 PM - 05:00 PM	62.2	77.5	61.2
05:00 PM - 06:00 PM	62.1	71.1	61.4
06:00 PM - 07:00 PM	62.8	76.8	61.7
07:00 PM - 08:00 PM	64.2	82.8	61.5
08:00 PM - 09:00 PM	63.4	82.7	61.6
09:00 PM - 10:00 PM	62.5	78.8	62.1
10:00 PM - 11:00 PM	62.2	64.0	61.9
11:00 PM - 12:00 AM	62.2	65.5	61.9
12:00 AM - 01:00 AM	61.6	75.3	61.2
01:00 AM - 02:00 AM	61.5	65.3	61.2
02:00 AM - 03:00 AM	61.6	64.4	61.2
03:00 AM - 04:00 AM	61.5	63.1	61.1
04:00 AM - 05:00 AM	61.6	65.4	61.3
05:00 AM - 06:00 AM	62.0	82.1	61.5
06:00 AM - 07:00 AM	62.0	75.5	61.6
07:00 AM - 08:00 AM	62.8	77.6	61.7
08:00 AM - 09:00 AM	65.2	79.2	62.0
09:00 AM - 10:00 AM	64.9	75.8	62.7
10:00 AM - 11:00 AM	63.4	80.2	61.0
Leq Average 24 hrs. (dB(A))	62.6		
Lmax (dB(A))		85.3	
L90 (dB(A))			61.4
Ldn (dB(A))	68.4		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

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.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262458-1

Sample Number	2227211-19
Parameter	Noise (Leq 24 hrs.)
Location	ริมรั้วโครงการดำนทิศใต้ (GPS 47P 0733727, 1404233)
Measurement Date	Mar 11 - Mar 12, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	60.3	71.5	59.9
12:00 PM - 01:00 PM	60.6	71.7	60.0
01:00 PM - 02:00 PM	65.0	78.0	62.6
02:00 PM - 03:00 PM	64.0	79.9	62.6
03:00 PM - 04:00 PM	66.7	75.6	65.7
04:00 PM - 05:00 PM	66.7	78.3	66.2
05:00 PM - 06:00 PM	62.0	75.1	61.5
06:00 PM - 07:00 PM	64.7	70.7	63.7
07:00 PM - 08:00 PM	61.9	67.7	61.4
08:00 PM - 09:00 PM	61.7	66.4	61.4
09:00 PM - 10:00 PM	61.9	64.8	61.4
10:00 PM - 11:00 PM	61.8	63.2	61.5
11:00 PM - 12:00 AM	62.1	75.5	61.6
12:00 AM - 01:00 AM	62.2	64.5	61.8
01:00 AM - 02:00 AM	61.9	64.3	61.6
02:00 AM - 03:00 AM	61.8	63.5	61.4
03:00 AM - 04:00 AM	61.8	63.2	61.5
04:00 AM - 05:00 AM	61.8	63.9	61.4
05:00 AM - 06:00 AM	62.2	71.3	61.8
06:00 AM - 07:00 AM	62.1	70.9	61.8
07:00 AM - 08:00 AM	62.7	76.5	62.0
08:00 AM - 09:00 AM	62.3	70.7	61.6
09:00 AM - 10:00 AM	61.5	74.2	60.9
10:00 AM - 11:00 AM	60.9	80.3	60.4
Leq Average 24 hrs. (dB(A))	62.9		
Lmax (dB(A))		80.3	
L90 (dB(A))			61.5
Ldn (dB(A))	68.6		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supt S.
Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262459-1

Sample Number	2227211-20
Parameter	Noise (Leq 24 hrs.)
Location	ริมรั้วโครงการดำนทิศใต้ (GPS 47P 0733727, 1404233)
Measurement Date	Mar 12 - Mar 13, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	60.4	73.7	59.9
12:00 PM - 01:00 PM	60.6	70.6	59.9
01:00 PM - 02:00 PM	62.1	77.8	60.9
02:00 PM - 03:00 PM	62.0	76.4	60.7
03:00 PM - 04:00 PM	61.6	74.1	60.9
04:00 PM - 05:00 PM	61.5	72.7	60.9
05:00 PM - 06:00 PM	62.1	75.0	61.4
06:00 PM - 07:00 PM	62.2	67.1	61.7
07:00 PM - 08:00 PM	63.0	74.2	61.8
08:00 PM - 09:00 PM	62.8	70.1	61.9
09:00 PM - 10:00 PM	62.0	67.8	61.7
10:00 PM - 11:00 PM	61.6	63.2	61.3
11:00 PM - 12:00 AM	61.9	74.8	61.6
12:00 AM - 01:00 AM	62.0	64.2	61.7
01:00 AM - 02:00 AM	62.3	64.2	62.0
02:00 AM - 03:00 AM	62.2	64.2	61.9
03:00 AM - 04:00 AM	62.1	63.9	61.7
04:00 AM - 05:00 AM	62.4	64.0	62.1
05:00 AM - 06:00 AM	62.6	73.7	62.3
06:00 AM - 07:00 AM	62.3	71.1	61.9
07:00 AM - 08:00 AM	62.4	70.8	61.7
08:00 AM - 09:00 AM	62.4	77.7	61.7
09:00 AM - 10:00 AM	61.4	73.2	60.8
10:00 AM - 11:00 AM	61.5	78.6	60.7
Leq Average 24 hrs. (dB(A))	62.0		
Lmax (dB(A))		78.6	
L90 (dB(A))			61.7
Ldn (dB(A))	68.5		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supt S.
Supot Salamteh
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Analysis / Test Report

TESTING
No.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227211
Date Received : Mar 15, 2022
Date Reported : Mar 19, 2022
Report Number: 2262460-1

Sample Number	2227211-21
Parameter	Noise (Leq 24 hrs.)
Location	ริมรั้วโครงการด้านทิศใต้ (GPS 47P 0733727, 1404233)
Measurement Date	Mar 13 - Mar 14, 2022
Measurement by	Satcha Phetsawaeng
Sound Level meter	Serial No. 734220

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	60.5	68.7	60.0
12:00 PM - 01:00 PM	60.8	75.9	60.1
01:00 PM - 02:00 PM	62.1	78.4	60.9
02:00 PM - 03:00 PM	62.2	73.2	61.3
03:00 PM - 04:00 PM	61.8	71.4	61.3
04:00 PM - 05:00 PM	61.6	65.8	61.2
05:00 PM - 06:00 PM	62.3	75.4	61.7
06:00 PM - 07:00 PM	62.3	70.3	61.9
07:00 PM - 08:00 PM	61.8	64.9	61.5
08:00 PM - 09:00 PM	61.8	67.9	61.4
09:00 PM - 10:00 PM	61.8	68.6	61.4
10:00 PM - 11:00 PM	61.9	67.0	61.5
11:00 PM - 12:00 AM	62.1	69.0	61.7
12:00 AM - 01:00 AM	62.2	66.8	61.8
01:00 AM - 02:00 AM	62.5	66.8	61.6
02:00 AM - 03:00 AM	62.7	67.3	61.9
03:00 AM - 04:00 AM	62.2	66.4	61.8
04:00 AM - 05:00 AM	62.1	72.6	61.6
05:00 AM - 06:00 AM	62.2	79.7	61.8
06:00 AM - 07:00 AM	62.1	76.7	61.7
07:00 AM - 08:00 AM	62.0	70.5	61.6
08:00 AM - 09:00 AM	61.7	69.4	61.1
09:00 AM - 10:00 AM	62.9	75.0	61.8
10:00 AM - 11:00 AM	61.3	74.6	60.6
Leq Average 24 hrs. (dB(A))	62.0		
Lmax (dB(A))		79.7	
L90 (dB(A))			61.5
Ldn (dB(A))	68.6		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supt S.
Supot Salamteh
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ภาคผนวก ค-4

คุณภาพน้ำทิ้ง

Analysis / Test Report

TESTING
No.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 21145034
Date Received : Jan 19, 2022
Date Reported : Jan 27, 2022
Report Number : 2216865-1

Sample Number	21145034-1
Sampled Date	Jan 19, 2022 9:50 AM
Sample Description	Wastewater
Location	Domestic Inlet
Date Analysis Commenced	Jan 19, 2022
Condition of Sample	Contained in two 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	89	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	231	APHA (2017), 5220 D	Rayong
Oil & Grease	mg/L	-	3	9	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.9	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	28.5	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	390	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	<1.0	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	94	APHA (2017), 2540 D	Rayong

Sampled By : Wanlop Hunchainaow , Thanasoun Namakunna

Remark :
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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Technical Management N.Banchongkit
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by D.Changchon
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 21145034
Date Received : Jan 19, 2022
Date Reported : Jan 27, 2022
Report Number : 2216865-2

Sample Number	21145034-1
Sampled Date	Jan 19, 2022 9:50 AM
Sample Description	Wastewater
Location	Domestic Inlet
Date Analysis Commenced	Jan 21, 2022
Condition of Sample	Contained in two 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						
Total Organic Carbon	mg/L	0.01	0.1	30.1	Based on APHA (2017), 5310 B	Bangkok

Sampled By : Wanlop Hunchainaow , Thanasoun Namakunna

Remark :
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Approved by Siriluk P.
Siriluk Puengpang
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
ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 21145034
Date Received : Jan 19, 2022
Date Reported : Jan 27, 2022
Report Number : 2216866-1

Sample Number	21145034-2
Sampled Date	Jan 19, 2022 9:40 AM
Sample Description	Wastewater
Location	Domestic Outlet
Date Analysis Commenced	Jan 19, 2022
Condition of Sample	Contained in two 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	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	28	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	17	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	16	≤300	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.2	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	30.1	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	294	≤3000	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	2.2	≤100	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	6	≤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).
Sampled By : Wanlop Hunchainaow , Thanasoun Namakunna

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Technical Management N.Banchongkit
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by D.Changchon
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 21145034
Date Received : Jan 19, 2022
Date Reported : Jan 27, 2022
Report Number : 2216866-2

Sample Number	21145034-2
Sampled Date	Jan 19, 2022 9:40 AM
Sample Description	Wastewater
Location	Domestic Outlet
Date Analysis Commenced	Jan 21, 2022
Condition of Sample	Contained in two 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	4.96	No Standard	Based on APHA (2017), 5310 B	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 : Wanlop Hunchainaow , Thanasoun Namakunna

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Approved by Siriluk P.
Siriluk Puengpang
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
ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 221505
Date Received : Feb 02, 2022
Date Reported : Feb 10, 2022
Report Number : 2229265-1

Sample Number	221505-1
Sampled Date	Feb 02, 2022 9:39 AM
Sample Description	Wastewater
Location	Domestic Inlet
Date Analysis Commenced	Feb 02, 2022
Condition of Sample	Contained in two 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	76	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	233	APHA (2017), 5220 D	Rayong
Oil & Grease	mg/L	-	3	8	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.8	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	31.3	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	476	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	39.4	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	71	APHA (2017), 2540 D	Rayong

Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Manager
ทะเบียนเลขที่ ว-225-ล-5283

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Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 221505
Date Received : Feb 02, 2022
Date Reported : Feb 10, 2022
Report Number : 2229265-2

Sample Number	221505-1
Sampled Date	Feb 02, 2022 9:39 AM
Sample Description	Wastewater
Location	Domestic Inlet
Date Analysis Commenced	Feb 04, 2022
Condition of Sample	Contained in two 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						
Total Organic Carbon	mg/L	0.01	0.1	39.8	Based on APHA (2017), 5310 B	Bangkok

Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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Approved by
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.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 221505
Date Received : Feb 02, 2022
Date Reported : Feb 10, 2022
Report Number : 2229266-1

Sample Number	221505-2
Sampled Date	Feb 02, 2022 9:36 AM
Sample Description	Wastewater
Location	Domestic Outlet
Date Analysis Commenced	Feb 02, 2022
Condition of Sample	Contained in two 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	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	5	≤20	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	41	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	19	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	17	≤300	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.3	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	31.8	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	372	≤3000	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	5.3	≤100	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	13	≤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).
Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 221505
Date Received : Feb 02, 2022
Date Reported : Feb 10, 2022
Report Number : 2229266-2

Sample Number	221505-2
Sampled Date	Feb 02, 2022 9:36 AM
Sample Description	Wastewater
Location	Domestic Outlet
Date Analysis Commenced	Feb 04, 2022
Condition of Sample	Contained in two 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	6.97	No Standard	Based on APHA (2017), 5310 B	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 : Pathompong Kornsawat , Thanasoun Namakunna

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Approved by
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.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2217965
Date Received : Mar 02, 2022
Date Reported : Mar 10, 2022
Report Number : 2255380-1

Sample Number	2217965-1
Sampled Date	Mar 02, 2022 10:00 AM
Sample Description	Wastewater
Location	Domestic Inlet
Date Analysis Commenced	Mar 02, 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	116	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	293	APHA (2017), 5220 D	Rayong
Oil & Grease	mg/L	-	3	3	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.8	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	30.8	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 Kjeldahl Nitrogen as N	mg/L	-	1.0	50.4	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	72	APHA (2017), 2540 D	Rayong

Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Manager
ทะเบียนเลขที่ ว-225-ล-5283

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Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2217965
Date Received : Mar 02, 2022
Date Reported : Mar 09, 2022
Report Number : 2255380-2

Sample Number	2217965-1
Sampled Date	Mar 02, 2022 10:00 AM
Sample Description	Wastewater
Location	Domestic Inlet
Date Analysis Commenced	Mar 07, 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						
Total Organic Carbon	mg/L	0.01	0.1	53.0	Based on APHA (2017), 5310 B	Bangkok

Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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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.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2217965
Date Received : Mar 02, 2022
Date Reported : Mar 10, 2022
Report Number : 2255381-1

Sample Number	2217965-2
Sampled Date	Mar 02, 2022 10:10 AM
Sample Description	Wastewater
Location	Domestic Outlet
Date Analysis Commenced	Mar 02, 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	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	9	≤20	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	39	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	27	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	28	≤300	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.0	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	32.0	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	344	≤3000	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	2.4	≤100	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	15	≤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).
Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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www.alsglobal.com

Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2217965
Date Received : Mar 02, 2022
Date Reported : Mar 09, 2022
Report Number : 2255381-2

Sample Number	2217965-2
Sampled Date	Mar 02, 2022 10:10 AM
Sample Description	Wastewater
Location	Domestic Outlet
Date Analysis Commenced	Mar 07, 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	7.73	No Standard	Based on APHA (2017), 5310 B	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 : Pathompong Kornsawat , Thanasoun Namakunna

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

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Approved by
Narin Saiseng
Supervisor

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Analysis / Test Report

TESTING
No.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2224896
Date Received : Apr 05, 2022
Date Reported : Apr 12, 2022
Report Number : 2286576-1

Sample Number	2224896-1
Sampled Date	Apr 05, 2022 10:05 AM
Sample Description	Wastewater
Location	Domestic Inlet
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	59	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	271	APHA (2017), 5220 D	Rayong
Oil & Grease	mg/L	-	3	10	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	*	-	-	7.8	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	30.8	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	544	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	82.1	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	70	APHA (2017), 2540 D	Rayong

Sampled By : Pathompong Kornsawat

Remark :
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Technical Management N.Banchongkit
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by D.Changchon
Dej Changchon
Manager
ทะเบียนเลขที่ ว-225-ล-5283

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Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2224896
Date Received : Apr 05, 2022
Date Reported : Apr 12, 2022
Report Number : 2286576-2

Sample Number	2224896-1
Sampled Date	Apr 05, 2022 10:05 AM
Sample Description	Wastewater
Location	Domestic Inlet
Date Analysis Commenced	Apr 07, 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						
Total Organic Carbon	mg/L	0.01	0.1	55.7	Based on APHA (2017), 5310 B	Bangkok

Sampled By : Pathompong Kornsawat

Remark :
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Approved by Nant Somb
Nanthawadee Somboon
Specialist 1

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.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2224896
Date Received : Apr 05, 2022
Date Reported : Apr 12, 2022
Report Number : 2286577-1

Sample Number	2224896-2
Sampled Date	Apr 05, 2022 9:58 AM
Sample Description	Wastewater
Location	Domestic Outlet
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	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	4	≤20	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	27	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	20	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	18	≤300	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.4	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	30.9	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	344	≤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	13	≤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).
Sampled By : Pathompong Kornsawat

Remark :
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Technical Management N.Banchongkit
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by D.Changchon
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2224896
Date Received : Apr 05, 2022
Date Reported : Apr 12, 2022
Report Number : 2286577-2

Sample Number	2224896-2
Sampled Date	Apr 05, 2022 9:58 AM
Sample Description	Wastewater
Location	Domestic Outlet
Date Analysis Commenced	Apr 07, 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	6.09	No Standard	Based on APHA (2017), 5310 B	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 : Pathompong Kornsawat

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Approved by Nant Somb
Nanthawadee Somboon
Specialist 1

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Analysis / Test Report

TESTING
No.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512621611
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2232241
Date Received : May 03, 2022
Date Reported : May 11, 2022
Report Number : 2309402-1

Sample Number	2232241-1
Sampled Date	May 03, 2022 10:35 AM
Sample Description	Wastewater
Location	Domestic Inlet
Date Analysis Commenced	May 03, 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	181	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	461	APHA (2017), 5220 D	Rayong
Oil & Grease	mg/L	-	3	13	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	8.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	29.6	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	468	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	91.3	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	121	APHA (2017), 2540 D	Rayong

Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

Remark :
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Technical Management — Narumon Banchongkit, Supervisor, ทะเบียนเลขที่ ว-323-ง-9445

Approved by — Dej Changchon, Senior Manager, ทะเบียนเลขที่ ว-323-ง-9442

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Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512621611
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2232241
Date Received : May 03, 2022
Date Reported : May 11, 2022
Report Number : 2309402-2

Sample Number	2232241-1
Sampled Date	May 03, 2022 10:35 AM
Sample Description	Wastewater
Location	Domestic Inlet
Date Analysis Commenced	May 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						
Total Organic Carbon	mg/L	0.01	0.1	90.1	Based on APHA (2017), 5310 B	Bangkok

Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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Approved by — Narin Saiseng, Supervisor

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Analysis / Test Report

TESTING
No.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512621611
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2232241
Date Received : May 03, 2022
Date Reported : May 11, 2022
Report Number : 2309403-1

Sample Number	2232241-2
Sampled Date	May 03, 2022 10:25 AM
Sample Description	Wastewater
Location	Domestic Outlet
Date Analysis Commenced	May 03, 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	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	5	≤20	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	24	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	22	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	20	≤300	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.4	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	31.3	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	346	≤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	10	≤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).
Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

Remark :
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Technical Management — Narumon Banchongkit, Supervisor, ทะเบียนเลขที่ ว-323-ง-9445

Approved by — Dej Changchon, Senior Manager, ทะเบียนเลขที่ ว-323-ง-9442

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Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512621611
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2232241
Date Received : May 03, 2022
Date Reported : May 11, 2022
Report Number : 2309403-2

Sample Number	2232241-2
Sampled Date	May 03, 2022 10:25 AM
Sample Description	Wastewater
Location	Domestic Outlet
Date Analysis Commenced	May 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	5.21	No Standard	Based on APHA (2017), 5310 B	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 : Pathompong Kornsawat , Thanasoun Namakunna

Remark :
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Approved by — Narin Saiseng, Supervisor

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Analysis / Test Report

TESTING
No.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512621611
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2255929
Date Received :Jun 08, 2022
Date Reported :Jun 16, 2022
Report Number :2346487-1

Sample Number	2255929-1
Sampled Date	Jun 08, 2022 10:05 AM
Sample Description	Wastewater
Location	Domestic Inlet
Date Analysis Commenced	Jun 08, 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	120	APHA (2017), 5210 B	Rayong
COD	mg/L	1.5	5	311	APHA (2017), 5220 D	Rayong
Oil & Grease	mg/L	-	3	10	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	-	-	32.0	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	436	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	95.5	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	84	APHA (2017), 2540 D	Rayong

Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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

Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512621611
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2255929
Date Received :Jun 08, 2022
Date Reported :Jun 16, 2022
Report Number :2346487-2

Sample Number	2255929-1
Sampled Date	Jun 08, 2022 10:05 AM
Sample Description	Wastewater
Location	Domestic Inlet
Date Analysis Commenced	Jun 09, 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						
Total Organic Carbon	mg/L	0.01	0.1	64.8	Based on APHA (2017), 5310 B	Bangkok

Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

Remark :
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Approved by
Siriluk Puengpang
Supervisor

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Analysis / Test Report

TESTING
No.0042

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512621611
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2255929
Date Received : Jun 08, 2022
Date Reported : Jun 16, 2022
Report Number : 2346488-1

Sample Number	2255929-2
Sampled Date	Jun 08, 2022 10:15 AM
Sample Description	Wastewater
Location	Domestic Outlet
Date Analysis Commenced	Jun 08, 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	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	39	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	29	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	29	≤300	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.6	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	33.0	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	432	≤3000	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	1.6	≤100	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	10	≤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).
Sampled By : Pathompong Kornsawat , 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.
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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Analysis / Test Report

Client : Siam Synthetic Latex Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512621611
Project Name : Water Testing
Project Location : Map Ta Phut_Latex (SSLC)

Lot ID: 2255929
Date Received : Jun 08, 2022
Date Reported : Jun 16, 2022
Report Number : 2346488-2

Sample Number	2255929-2
Sampled Date	Jun 08, 2022 10:15 AM
Sample Description	Wastewater
Location	Domestic Outlet
Date Analysis Commenced	Jun 09, 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	6.70	No Standard	Based on APHA (2017), 5310 B	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 : Pathompong Kornsawat , Thanasoun Namakunna

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Approved by
Siriluk Puengpang
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.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 21143861
Date Received : Jan 19, 2022
Date Reported : Jan 27, 2022
Report Number : 2170012-1

Sample Number	21143861-1
Sampled Date	Jan 19, 2022 9:50 AM
Sample Description	Wastewater
Location	ES-1890
Date Analysis Commenced	Jan 19, 2022
Condition of Sample	Contained in two 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	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	27	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	8	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	7	≤300	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.6	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	28.3	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	684	≤3000	APHA (2017), 2540 C	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).
Sampled By : Wanlop Hunchainaow

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Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O :
Project Name : Water Testing
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 21143861
Date Received : Jan 19, 2022
Date Reported : Jan 27, 2022
Report Number : 2170012-2

Sample Number	21143861-1
Sampled Date	Jan 19, 2022 9:50 AM
Sample Description	Wastewater
Location	ES-1890
Date Analysis Commenced	Jan 21, 2022
Condition of Sample	Contained in two 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	8.10	No Standard	Based on APHA (2017), 5310 B	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 : Wanlop Hunchainaow

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Siriluk Puengpang
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.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Water Testing
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 221516
Date Received : Feb 02, 2022
Date Reported : Feb 09, 2022
Report Number : 2195093-1

Sample Number	221516-1
Sampled Date	Feb 02, 2022 10:10 AM
Sample Description	Wastewater
Location	ES-1890
Date Analysis Commenced	Feb 02, 2022
Condition of Sample	Contained in two 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	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	27	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	12	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	10	≤300	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.9	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	31.2	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	644	≤3000	APHA (2017), 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	6	≤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).
Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Water Testing
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 221516
Date Received : Feb 02, 2022
Date Reported : Feb 10, 2022
Report Number : 2195093-2

Sample Number	221516-1
Sampled Date	Feb 02, 2022 10:10 AM
Sample Description	Wastewater
Location	ES-1890
Date Analysis Commenced	Feb 04, 2022
Condition of Sample	Contained in two 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	8.46	No Standard	Based on APHA (2017), 5310 B	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 : Pathompong Kornsawat , Thanasoun Namakunna

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Approved by
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.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 2217992
Date Received : Mar 02, 2022
Date Reported : Mar 10, 2022
Report Number : 2227953-1

Sample Number	2217992-1
Sampled Date	Mar 02, 2022 10:20 AM
Sample Description	Wastewater
Location	ES-1890
Date Analysis Commenced	Mar 02, 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	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	28	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	7	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	6	≤300	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.9	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	30.6	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	684	≤3000	APHA (2017), 2540 C	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).
Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 2217992
Date Received : Mar 02, 2022
Date Reported : Mar 09, 2022
Report Number : 2227953-2

Sample Number	2217992-1
Sampled Date	Mar 02, 2022 10:20 AM
Sample Description	Wastewater
Location	ES-1890
Date Analysis Commenced	Mar 07, 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	9.69	No Standard	Based on APHA (2017), 5310 B	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 : Pathompong Kornsawat , Thanasoun Namakunna

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Approved by
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.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 2224904
Date Received : Apr 05, 2022
Date Reported : Apr 12, 2022
Report Number : 2241894-1

Sample Number	2224904-1
Sampled Date	Apr 05, 2022 10:15 AM
Sample Description	Wastewater
Location	ES-1890
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	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	20	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	12	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	10	≤300	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.7	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	29.4	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	536	≤3000	APHA (2017), 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	7	≤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).
Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 2224904
Date Received : Apr 05, 2022
Date Reported : Apr 12, 2022
Report Number : 2241894-2

Sample Number	2224904-1
Sampled Date	Apr 05, 2022 10:15 AM
Sample Description	Wastewater
Location	ES-1890
Date Analysis Commenced	Apr 07, 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	7.39	No Standard	Based on APHA (2017), 5310 B	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 : Pathompong Kornsawat , Thanasoun Namakunna

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Approved by
Nanthawadee Somboon
Specialist 1

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.0042

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Water Testing
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2232245
Date Received : May 03, 2022
Date Reported : May 11, 2022
Report Number : 2256883-1

Sample Number	2232245-1
Sampled Date	May 03, 2022 10:40 AM
Sample Description	Wastewater
Location	ES-1890
Date Analysis Commenced	May 03, 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	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	22	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	12	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	12	≤300	APHA (2017), 2120 F	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
Temperature *	Degree C	-	-	28.6	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	182	≤3000	APHA (2017), 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	9	≤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).
Sampled By : Pathompong Kornsawat , Thanasoun Namakunna

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Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Water Testing
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2232245
Date Received : May 03, 2022
Date Reported : May 11, 2022
Report Number : 2256883-2

Sample Number	2232245-1
Sampled Date	May 03, 2022 10:40 AM
Sample Description	Wastewater
Location	ES-1890
Date Analysis Commenced	May 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	4.13	No Standard	Based on APHA (2017), 5310 B	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 : Pathompong Kornsawat , Thanasoun Namakunna

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

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Approved by
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
ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

TESTING
No.0042

Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Water Testing
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2255957
Date Received : Jun 08, 2022
Date Reported : Jun 16, 2022
Report Number : 2308415-1

Sample Number	2255957-1
Sampled Date	Jun 08, 2022 10:40 AM
Sample Description	Wastewater
Location	ES-1890
Date Analysis Commenced	Jun 08, 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	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	32	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	11	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	11	≤300	APHA (2017), 2120 F	Rayong
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C		-	-	7.2	5.5-9.0	Based on APHA (2017), 4500-H (B)	Rayong
Temperature *	Degree C	-	-	32.2	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	492	≤3000	APHA (2017), 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	8	≤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).
Sampled By : Pathompong Kornsawat , 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.
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ล-9442

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Water Testing
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2255957
Date Received : Jun 08, 2022
Date Reported : Jun 16, 2022
Report Number : 2308415-2

Sample Number	2255957-1
Sampled Date	Jun 08, 2022 10:40 AM
Sample Description	Wastewater
Location	ES-1890
Date Analysis Commenced	Jun 09, 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	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	9.68	No Standard	Based on APHA (2017), 5310 B	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 : Pathompong Kornsawat , Thanasoun Namakunna

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

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Approved by
Siriluk Puengpang
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
ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

TESTING
No.0042

Lot ID: 2217933

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 00081114
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Date Received : Mar 08, 2022
Date Reported : Mar 17, 2022
Report Number : 2227861-1 Rev. No.1C3

Sample Number	2217933-1
Sampling Date	Mar 08, 2022 10:05 AM
Sample Description	Wastewater
Location	Outfall
Date Analysis Commenced	Mar 08, 2022
Condition of Sample	Contained in four amber glass bottles, eight plastic bottles and six glass vials, 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	19	≤120	APHA (2017), 5220 D	Rayong
Color (at Original pH)	ADMI	-	5	17	≤300	APHA (2017), 2120 F	Rayong
Color (at pH 7.0)	ADMI	-	5	15	≤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		-	-	8.1	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	-	-	30.8	≤40	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	692	≤3000	APHA (2017), 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	2.0	≤100	APHA (2017), 4500-Norg (C), NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	10	≤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).

Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-ล-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

Lot ID: 2217933

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 00081114
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Date Received : Mar 08, 2022
Date Reported : Mar 17, 2022
Report Number : 2227861-3 Rev. No.1C3

Sample Number	2217933-1
Sampling Date	Mar 08, 2022 10:05 AM
Sample Description	Wastewater
Location	Outfall
Date Analysis Commenced	Mar 09, 2022
Condition of Sample	Contained in four amber glass bottles, eight plastic bottles and six glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Total Organic Carbon	mg/L	0.01	0.1	8.52	No Standard	Based on APHA (2017), 5310 B	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 : This Analysis test report is reissued to supersede report No.2227861-3, Date Reported : Mar 16, 2022 due to revise sampling information.

Sampling By : Satcha Phetsawaeng , Thitipong Buadaeng

Remark :
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Approved by
Siriluk Puengpang
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.0009

Lot ID: 2217933

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 00081114
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Date Received : Mar 08, 2022
Date Reported : Mar 16, 2022
Report Number : 2227861-2 Rev. No.1

Sample Number	2217933-1
Sampled Date	Mar 08, 2022 10:05 AM
Sample Description	Wastewater
Location	Outfall
Date Analysis Commenced	Mar 09, 2022
Condition of Sample	Contained in four amber glass bottles, eight plastic bottles and six 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	0.003	≤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
Copper	mg/L	0.0003	0.0005	0.01	≤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	0.003	≤0.2	Based on APHA (2017), 3125	Bangkok
Manganese	mg/L	0.0003	0.0005	0.13	≤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	0.007	≤1.0	Based on APHA (2017), 3125	Bangkok
Selenium	mg/L	0.0003	0.0005	0.0007	≤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	0.98	≤5.0	Based on APHA (2017), 3125	Bangkok
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

Technical Management
Siriluk Puengpang
Supervisor
ทะเบียนเลขที่ ว-204-ล-4720

Approved by
Kanokkorn Anek
Senior Manager
ทะเบียนเลขที่ ว-204-ค-6111

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Analysis / Test Report

TESTING
No.0009

Lot ID: 2217933

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 00081114
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Date Received : Mar 08, 2022
Date Reported : Mar 16, 2022
Report Number : 2227861-2 Rev. No.1

Sample Number	2217933-1
Sampled Date	Mar 08, 2022 10:05 AM
Sample Description	Wastewater
Location	Outfall
Date Analysis Commenced	Mar 09, 2022
Condition of Sample	Contained in four amber glass bottles, eight plastic bottles and six 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							
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

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 : This Analysis test report is reissued to supersede report No.2227861-2, Date Reported : Mar 16, 2022 due to revise sampling information.

Sampled By : Satcha Phetsawaeng , Thitipong Buadaeng

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 Puengpang
Supervisor
ทะเบียนเลขที่ ว-204-ล-4720

Approved by
Kanokkorn Anek
Senior Manager
ทะเบียนเลขที่ ว-204-ค-6111

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Analysis / Test Report

TESTING
No.0009

Lot ID: 2217933

Date Received : Mar 08, 2022
Date Reported : Mar 16, 2022
Report Number : 2227861-3 Rev. No.1

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 00081114
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Sample Number	2217933-1
Sampled Date	Mar 08, 2022 10:05 AM
Sample Description	Wastewater
Location	Outfall
Date Analysis Commenced	Mar 09, 2022
Condition of Sample	Contained in four amber glass bottles, eight plastic bottles and six glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Phosphorus	mg/L	0.03	0.05	0.37	No Standard	Based on US EPA, Method 200.7, Revision 4.4	Bangkok
Pesticides - Organochlorine Group							
alpha-Chlordane *	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
gamma-Chlordane *	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Hexachlorobenzene	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Mirex *	ug/L	0.001	0.02	Not Detected	Not Detected	Based on APHA (2017), 6630 C	Bangkok
Volatile Organics Compounds							
1,1,1-Trichloroethane	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
1,1,2-Trichloroethane	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
1,1-Dichloroethylene	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
1,2-Dichloroethane	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
1,3-Dichloropropane *	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Benzene	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Bromodichloromethane *	ug/L	0.2	0.5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Bromoform *	ug/L	0.2	0.5	2.4	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Carbontetrachloride	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Chloroform *	ug/L	0.2	0.5	0.7	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
cis-1,2-Dichloroethylene	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Dibromochloromethane *	ug/L	0.2	0.5	0.9	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok

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Approved by Siriluk P.
Siriluk Puengpang
Supervisor

Analysis / Test Report

TESTING
No.0009

Lot ID: 2217933

Date Received : Mar 08, 2022
Date Reported : Mar 16, 2022
Report Number : 2227861-3 Rev. No.1

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 00081114
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Sample Number	2217933-1
Sampled Date	Mar 08, 2022 10:05 AM
Sample Description	Wastewater
Location	Outfall
Date Analysis Commenced	Mar 09, 2022
Condition of Sample	Contained in four amber glass bottles, eight plastic bottles and six glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Volatile Organics Compounds							
Ethylbenzene	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Hexachlorobutadiene *	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Methyl Chloride *	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Methylene Chloride (Dichloromethane)	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Styrene	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Tetrachloroethylene	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Toluene	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Total Trihalomethanes *	ug/L	0.2	1	4.1	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Total Xylene	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
trans-1,2-Dichloroethylene	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Trichloroethylene	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Vinyl chloride	ug/L	1.5	5	Not Detected	No Standard	Based on US EPA, Method 5030B and 8260D	Bangkok
Water Testing							
Total Organic Carbon *	mg/L	0.01	0.1	8.52	No Standard	Based on APHA (2017), 5310 B	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 : This Analysis test report is reissued to supersede report No.2227861-3, Date Reported : Mar 16, 2022 due to revise sampling information.

Sampled By : Satcha Phetsawaeng , Thitipong Buadaeng

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

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Approved by Siriluk P.
Siriluk Puengpang
Supervisor

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ภาคผนวก ค-5

คุณภาพน้ำใต้ดิน

Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4700033695
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 212535
Date Received : Jul 20, 2021
Date Reported : Aug 03, 2021
Report Number : 1872229-1 C8

Sample Number	212535-1
Sampling Date	Jul 20, 2021 9:40 AM
Sample Description	Groundwater
Location	MW-3 (Near Latex Plant)
Date Analysis Commenced	Jul 21, 2021
Condition of Sample	Contained in one amber glass bottle, one plastic bottle and two glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
pH at 25 degree C		-	-	6.2	6.5-9.2 (I)	Based on APHA (2017), 4500-H (B)	Rayong

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
(I): ในกรณีที่มีการปนเปื้อนของกรดหรือด่างให้เปรียบเทียบผลวิเคราะห์ค่าพีเอชจากจุดเก็บตัวอย่างบ่อท้ายน้ำที่ใช้ในการติดตามตรวจสอบการปนเปื้อนกับผลวิเคราะห์จากจุดเก็บตัวอย่างบ่อเหนือน้ำที่ใช้เป็นบ่ออ้างอิงบนทิศทางการไหลของน้ำใต้ดินในพื้นที่ โดยค่าพีเอชที่เปลี่ยนแปลงจะต้องไม่เกินหนึ่งระดับ และไม่อยู่นอกช่วงค่าเกณฑ์อนุโลมสูงสุดของมาตรฐานคุณภาพน้ำบาดาลที่ใช้บริโภคคือ 6.5-9.2
Sampling By : Chainusorn Lertnanthakunchai , 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
ทะเบียนเลขที่ ว-323-จ-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4700033695
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 212535
Date Received : Jul 20, 2021
Date Reported : Aug 03, 2021
Report Number : 1872229-2 C8

Sample Number	212535-1
Sampling Date	Jul 20, 2021 9:40 AM
Sample Description	Groundwater
Location	MW-3 (Near Latex Plant)
Date Analysis Commenced	Jul 21, 2021
Condition of Sample	Contained in one amber glass bottle, one plastic bottle and two glass vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Conductivity at 25 Degree C	micromhos/cm	-	0.5	308	No Standard	Based on APHA (2017), 2510 B	Rayong
Total Organic Carbon	mg/L	0.01	0.1	3.07	No Standard	Based on APHA (2017), 5310 B	Bangkok
Total Petroleum Hydrocarbon	mg/L	1	3	<3	No Standard	Based on APHA (2017), 5520 F	Rayong

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

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

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4700033695
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 2186630
Date Received : Jul 21, 2021
Date Reported : Aug 03, 2021
Report Number : 2050480-2 C8

Sample Number	2186630-1
Sampling Date	Jul 21, 2021 10:30 AM
Sample Description	Groundwater
Location	MW-5 (Near PS Heater)
Date Analysis Commenced	Jul 22, 2021
Condition of Sample	Contained in two amber glass bottles, 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
Water Testing							
pH at 25 degree C		-	-	7.6	6.5-9.2 (I)	Based on APHA (2017), 4500-H (B)	Rayong

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
(I): ในกรณีที่มีการปนเปื้อนของกรดหรือด่างให้เปรียบเทียบผลวิเคราะห์ค่าพีเอชจากจุดเก็บตัวอย่างบ่อท้ายน้ำที่ใช้ในการติดตามตรวจสอบการปนเปื้อนกับผลวิเคราะห์จากจุดเก็บตัวอย่างบ่อเหนือน้ำที่ใช้เป็นบ่ออ้างอิงบนทิศทางการไหลของน้ำใต้ดินในพื้นที่ โดยค่าพีเอชที่เปลี่ยนแปลงจะต้องไม่เกินหนึ่งระดับ และไม่อยู่นอกช่วงค่าเกณฑ์อนุโลมสูงสุดของมาตรฐานคุณภาพน้ำบาดาลที่ใช้บริโภคคือ 6.5-9.2
Sampling By : Chainusorn Lertnanthakunchai , 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

Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-จ-9445

Approved by

Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-9442

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Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4700033695
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 2186630
Date Received : Jul 21, 2021
Date Reported : Aug 03, 2021
Report Number : 2050480-3 C8

Page 1 of 1

Sample Number	2186630-1
Sampling Date	Jul 21, 2021 10:30 AM
Sample Description	Groundwater
Location	MW-5 (Near PS Heater)
Date Analysis Commenced	Jul 22, 2021
Condition of Sample	Contained in two amber glass bottles, 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
Water Testing							
Conductivity at 25 Degree C	micromhos/cm	-	0.5	371	No Standard	Based on APHA (2017), 2510 B	Rayong
Total Organic Carbon	mg/L	0.01	0.1	2.61	No Standard	Based on APHA (2017), 5310 B	Bangkok
Total Petroleum Hydrocarbon	mg/L	1	3	Not Detected	No Standard	Based on APHA (2017), 5520 F	Rayong

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 : Chainusorn Lertnanthakunchai , Thanasoun Namakunna

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Approved by

Nanthawadee Somboon
Specialist 1

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Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4700033695
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 2186121
Date Received : Jul 20, 2021
Date Reported : Aug 03, 2021
Report Number : 2049685-2 C8

Sample Number	2186121-1
Sampling Date	Jul 20, 2021 11:15 AM
Sample Description	Groundwater
Location	MW-4 (Behind Warehouse)
Date Analysis Commenced	Jul 21, 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
Water Testing							
pH at 25 degree C		-	-	6.3	6.5-9.2 (I)	Based on APHA (2017), 4500-H (B)	Rayong

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
(I): ในกรณีที่มีการปนเปื้อนของกรดหรือด่างให้เปรียบเทียบผลวิเคราะห์ค่าพีเอชจากจุดเก็บตัวอย่างปอขท้ายน้ำที่ใช้ในการติดตามตรวจสอบการปนเปื้อนกับผลวิเคราะห์จากจุดเก็บตัวอย่างปอเหนือน้ำที่ใช้เป็นปออ้างอิงบนทิศทางการไหลของน้ำใต้ดินในพื้นที่ โดยค่าพีเอชที่เปลี่ยนแปลงจะต้องไม่เกินหนึ่งระดับ และไม่อยู่นอกช่วงค่าเกณฑ์อนุโลมสูงสุดของมาตรฐานคุณภาพน้ำบาดาลที่ใช้บริโภคคือ 6.5-9.2
Sampling By : Chainusorn Lertnanthakunchai , Thanasoun Namakunna

Remark :
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Technical Management
Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-จ-9445

Approved by
Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4700033695
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 2186121
Date Received : Jul 20, 2021
Date Reported : Aug 03, 2021
Report Number : 2049685-3 C8

Sample Number	2186121-1
Sampling Date	Jul 20, 2021 11:15 AM
Sample Description	Groundwater
Location	MW-4 (Behind Warehouse)
Date Analysis Commenced	Jul 22, 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
Water Testing							
Conductivity at 25 Degree C	micromhos/cm	-	0.5	705	No Standard	Based on APHA (2017), 2510 B	Rayong
Total Organic Carbon	mg/L	0.01	0.1	10.5	No Standard	Based on APHA (2017), 5310 B	Bangkok
Total Petroleum Hydrocarbon	mg/L	1	3	<3	No Standard	Based on APHA (2017), 5520 F	Rayong

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 : Chainusorn Lertnanthakunchai , Thanasoun Namakunna

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Approved by
Siriluk Puengpang
Supervisor

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4700033695
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 2186120
Date Received : Jul 21, 2021
Date Reported : Aug 03, 2021
Report Number : 2059157-2 C8

Sample Number	2186120-1
Sampling Date	Jul 21, 2021 9:30 AM
Sample Description	Groundwater
Location	MW-6 (South Fence)
Date Analysis Commenced	Jul 22, 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
Water Testing							
pH at 25 degree C		-	-	7.0	6.5-9.2 (1)	Based on APHA (2017), 4500-H (B)	Rayong

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
(1): ในกรณีที่มีการปนเปื้อนของกรดหรือด่างให้เปรียบเทียบผลวิเคราะห์ค่าพีเอชจากจุดเก็บตัวอย่างบ่อท้ายน้ำที่ใช้ในการติดตามตรวจสอบการปนเปื้อนกับผลวิเคราะห์จากจุดเก็บตัวอย่างบ่อเหนือน้ำที่ใช้เป็นบ่ออ้างอิงบนทิศทางการไหลของน้ำใต้ดินในพื้นที่ โดยค่าพีเอชที่เปลี่ยนแปลงจะต้องไม่เกินหนึ่งระดับ และไม่อยู่นอกช่วงค่าเกณฑ์อนุโลมสูงสุดของมาตรฐานคุณภาพน้ำบาดาลที่ใช้บริโภคคือ 6.5-9.2
Sampling By : Chainusorn Lertnanthakunchai , Thanasoun Namakunna

Remark :
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Technical Management

Narumon Banchongkit
Supervisor
ทะเบียนเลขที่ ว-323-จ-9445

Approved by

Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4700033695
Project Name : Water Testing
Project Location: Map Ta Phut_PS (SPCL)

Lot ID: 2186120
Date Received : Jul 21, 2021
Date Reported : Aug 03, 2021
Report Number : 2059157-3 C8

Sample Number	2186120-1
Sampling Date	Jul 21, 2021 9:30 AM
Sample Description	Groundwater
Location	MW-6 (South Fence)
Date Analysis Commenced	Jul 22, 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
Water Testing							
Conductivity at 25 Degree C	micromhos/cm	-	0.5	589	No Standard	Based on APHA (2017), 2510 B	Rayong
Total Organic Carbon	mg/L	0.01	0.1	9.36	No Standard	Based on APHA (2017), 5310 B	Bangkok
Total Petroleum Hydrocarbon	mg/L	1	3	Not Detected	No Standard	Based on APHA (2017), 5520 F	Rayong

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 : Chainusorn Lertnanthakunchai , Thanasoun Namakunna

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Approved by

Nanthawadee Somboon
Specialist 1

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ภาคผนวก ค-6

คุณภาพอากาศในสภาพแวดล้อมการทำงาน

Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227248
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2246042-1

Sample Number	2227248-1
Sampled Date	Mar 07, 2022
Sample Description	Air Quality
Location	RM Preparation
Date Analysis Commenced	Mar 10, 2022
Condition of Sample	Drawn into one 10-L air sampling bag, one filter paper placed in plastic cassette and one sorbent tube, refrigerated
Barometric Pressure	757 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	10:10 AM - 10:30 AM	ppm	-	0.33	0.85	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	10:10 AM - 10:30 AM	ppm	-	0.33	1.14	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Styrene	10:10 AM - 12:10 PM	ppm	-	0.05	<0.05	100	Based on NIOSH (2003), 1501	MOL	Bangkok
Total Dust	10:10 AM - 12:10 PM	mg/m3	-	0.15	0.25	15	Based on NIOSH (1994), 0500	OSHA	Rayong
Total Hydrocarbon as Propane	10:10 AM - 10:30 AM	ppm	-	0.33	1.99	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)
OSHA : Occupational Safety and Health Administration
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 : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227248
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2246042-1

Sample Number	2227248-2
Sampled Date	Mar 07, 2022
Sample Description	Air Quality
Location	Polymerization
Date Analysis Commenced	Mar 10, 2022
Condition of Sample	Drawn into one 10-L air sampling bag, one filter paper placed in plastic cassette and one sorbent tube, refrigerated
Barometric Pressure	757 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	10:20 AM - 10:40 AM	ppm	-	0.33	0.83	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	10:20 AM - 10:40 AM	ppm	-	0.33	0.43	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Styrene	10:20 AM - 12:20 PM	ppm	-	0.05	<0.05	100	Based on NIOSH (2003), 1501	MOL	Bangkok
Total Dust	10:20 AM - 12:20 PM	mg/m3	-	0.15	<0.15	15	Based on NIOSH (1994), 0500	OSHA	Rayong
Total Hydrocarbon as Propane	10:20 AM - 10:40 AM	ppm	-	0.33	1.26	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)
OSHA : Occupational Safety and Health Administration
Sampled By : Satcha Phetsawaeng

Remark :
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Approved by
Sararat Mongkonjirawut
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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227248
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2246042-1

Sample Number	2227248-3
Sampled Date	Mar 07, 2022
Sample Description	Air Quality
Location	Devolatization
Date Analysis Commenced	Mar 10, 2022
Condition of Sample	Drawn into one 10-L air sampling bag, one filter paper placed in plastic cassette and one sorbent tube, refrigerated
Barometric Pressure	757 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	10:25 AM - 10:45 AM	ppm	-	0.33	0.85	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	10:25 AM - 10:45 AM	ppm	-	0.33	0.80	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Styrene	10:25 AM - 12:25 PM	ppm	-	0.05	<0.05	100	Based on NIOSH (2003), 1501	MOL	Bangkok
Total Dust	10:25 AM - 12:25 PM	mg/m3	-	0.15	<0.15	15	Based on NIOSH (1994), 0500	OSHA	Rayong
Total Hydrocarbon as Propane	10:25 AM - 10:45 AM	ppm	-	0.33	1.66	No Standard	Total Hydrocarbon Analyzer	-	Rayong

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OSHA : Occupational Safety and Health Administration
Sampled By : Satcha Phetsawaeng

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227248
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2246042-1

Sample Number	2227248-4
Sampled Date	Mar 07, 2022
Sample Description	Air Quality
Location	Finishing
Date Analysis Commenced	Mar 10, 2022
Condition of Sample	Drawn into one 10-L air sampling bag, one filter paper placed in plastic cassette and one sorbent tube, refrigerated
Barometric Pressure	757 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	10:30 AM - 10:50 AM	ppm	-	0.33	0.85	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	10:30 AM - 10:50 AM	ppm	-	0.33	0.76	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Styrene	10:30 AM - 12:30 PM	ppm	-	0.05	<0.05	100	Based on NIOSH (2003), 1501	MOL	Bangkok
Total Dust	10:30 AM - 12:30 PM	mg/m3	-	0.15	<0.15	15	Based on NIOSH (1994), 0500	OSHA	Rayong
Total Hydrocarbon as Propane	10:30 AM - 10:50 AM	ppm	-	0.33	1.62	No Standard	Total Hydrocarbon Analyzer	-	Rayong

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OSHA : Occupational Safety and Health Administration
Sampled By : Satcha Phetsawaeng

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227248
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2246042-1

Sample Number	2227248-5
Sampled Date	Mar 07, 2022
Sample Description	Air Quality
Location	Packaging
Date Analysis Commenced	Mar 10, 2022
Condition of Sample	Drawn into one 10-L air sampling bag, one filter paper placed in plastic cassette and one sorbent tube, refrigerated
Barometric Pressure	757 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	10:15 AM - 10:35 AM	ppm	-	0.33	0.86	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	10:15 AM - 10:35 AM	ppm	-	0.33	1.55	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Styrene	10:15 AM - 12:15 PM	ppm	-	0.05	<0.05	100	Based on NIOSH (2003), 1501	MOL	Bangkok
Total Dust	10:15 AM - 12:15 PM	mg/m3	-	0.15	<0.15	15	Based on NIOSH (1994), 0500	OSHA	Rayong
Total Hydrocarbon as Propane	10:15 AM - 10:35 AM	ppm	-	0.33	2.41	No Standard	Total Hydrocarbon Analyzer	-	Rayong

Guideline :
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OSHA : Occupational Safety and Health Administration
Sampled By : Satcha Phetsawaeng

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2253557
Date Received : May 06, 2022
Date Reported : May 14, 2022
Report Number : 2303074-1

Sample Number	2253557-1
Sampled Date	May 05, 2022
Sample Description	Air Quality
Location	RM Preparation
Date Analysis Commenced	May 07, 2022
Condition of Sample	Drawn into one 10-L air sampling bag, one filter paper placed in plastic cassette and one sorbent tube, 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									
Methane as Propane	09:30 AM - 11:30 AM	ppm	-	0.33	0.92	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	09:30 AM - 11:30 AM	ppm	-	0.33	1.13	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Styrene	09:30 AM - 11:30 AM	ppm	-	0.05	<0.05	100	Based on NIOSH (2003), 1501	MOL	Bangkok
Total Dust	09:30 AM - 11:30 AM	mg/m3	-	0.15	<0.15	15	Based on NIOSH (1994), 0500	OSHA	Rayong
Total Hydrocarbon as Propane	09:30 AM - 11:30 AM	ppm	-	0.33	2.05	No Standard	Total Hydrocarbon Analyzer	-	Rayong

Guideline :
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OSHA : Occupational Safety and Health Administration
Sampled By : Satcha Phetsawaeng

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Approved by
Saranya Chalermthamrong
Scientist (4)

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2253557
Date Received : May 06, 2022
Date Reported : May 14, 2022
Report Number : 2303074-1

Sample Number	2253557-2
Sampled Date	May 05, 2022
Sample Description	Air Quality
Location	Polymerization
Date Analysis Commenced	May 07, 2022
Condition of Sample	Drawn into one 10-L air sampling bag, one filter paper placed in plastic cassette and one sorbent tube, 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									
Methane as Propane	09:35 AM - 11:35 AM	ppm	-	0.33	0.93	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	09:35 AM - 11:35 AM	ppm	-	0.33	0.48	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Styrene	09:35 AM - 11:35 AM	ppm	-	0.05	<0.05	100	Based on NIOSH (2003), 1501	MOL	Bangkok
Total Dust	09:35 AM - 11:35 AM	mg/m3	-	0.15	<0.15	15	Based on NIOSH (1994), 0500	OSHA	Rayong
Total Hydrocarbon as Propane	09:35 AM - 11:35 AM	ppm	-	0.33	1.41	No Standard	Total Hydrocarbon Analyzer	-	Rayong

Guideline :
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OSHA : Occupational Safety and Health Administration
Sampled By : Satcha Phetsawaeng

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Saranya Chalermthamrong
Scientist (4)

Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2253557
Date Received : May 06, 2022
Date Reported : May 14, 2022
Report Number : 2303074-1

Sample Number	2253557-3
Sampled Date	May 05, 2022
Sample Description	Air Quality
Location	Devolatization
Date Analysis Commenced	May 07, 2022
Condition of Sample	Drawn into one 10-L air sampling bag, one filter paper placed in plastic cassette and one sorbent tube, 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									
Methane as Propane	09:40 AM - 11:40 AM	ppm	-	0.33	0.91	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	09:40 AM - 11:40 AM	ppm	-	0.33	0.55	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Styrene	09:40 AM - 11:40 AM	ppm	-	0.05	<0.05	100	Based on NIOSH (2003), 1501	MOL	Bangkok
Total Dust	09:40 AM - 11:40 AM	mg/m3	-	0.15	<0.15	15	Based on NIOSH (1994), 0500	OSHA	Rayong
Total Hydrocarbon as Propane	09:40 AM - 11:40 AM	ppm	-	0.33	1.46	No Standard	Total Hydrocarbon Analyzer	-	Rayong

Guideline :
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Sampled By : Satcha Phetsawaeng

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Saranya Chalermthamrong
Scientist (4)

Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand
21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2253557
Date Received : May 06, 2022
Date Reported : May 14, 2022
Report Number : 2303074-1

Sample Number	2253557-4
Sampled Date	May 05, 2022
Sample Description	Air Quality
Location	Finishing
Date Analysis Commenced	May 07, 2022
Condition of Sample	Drawn into one 10-L air sampling bag, one filter paper placed in plastic cassette and one sorbent tube, 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									
Methane as Propane	09:42 AM - 11:42 AM	ppm	-	0.33	0.91	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	09:42 AM - 11:42 AM	ppm	-	0.33	<0.33	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Styrene	09:42 AM - 11:42 AM	ppm	-	0.05	<0.05	100	Based on NIOSH (2003), 1501	MOL	Bangkok
Total Dust	09:42 AM - 11:42 AM	mg/m3	-	0.15	<0.15	15	Based on NIOSH (1994), 0500	OSHA	Rayong
Total Hydrocarbon as Propane	09:42 AM - 11:42 AM	ppm	-	0.33	0.91	No Standard	Total Hydrocarbon Analyzer	-	Rayong

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Sampled By : Satcha Phetsawaeng

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Approved by Saranya C.
Saranya Chalermthamrong
Scientist (4)

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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand
21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2253557
Date Received : May 06, 2022
Date Reported : May 14, 2022
Report Number : 2303074-1

Sample Number	2253557-5
Sampled Date	May 05, 2022
Sample Description	Air Quality
Location	Packaging
Date Analysis Commenced	May 07, 2022
Condition of Sample	Drawn into one 10-L air sampling bag, one filter paper placed in plastic cassette and one sorbent tube, 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									
Methane as Propane	09:45 AM - 11:45 AM	ppm	-	0.33	0.93	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Non Methane Hydrocarbon as Propane	09:45 AM - 11:45 AM	ppm	-	0.33	0.39	No Standard	Total Hydrocarbon Analyzer	-	Rayong
Styrene	09:45 AM - 11:45 AM	ppm	-	0.05	<0.05	100	Based on NIOSH (2003), 1501	MOL	Bangkok
Total Dust	09:45 AM - 11:45 AM	mg/m3	-	0.15	0.17	15	Based on NIOSH (1994), 0500	OSHA	Rayong
Total Hydrocarbon as Propane	09:45 AM - 11:45 AM	ppm	-	0.33	1.33	No Standard	Total Hydrocarbon Analyzer	-	Rayong

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OSHA : Occupational Safety and Health Administration
Sampled By : Satcha Phetsawaeng

Remark :
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Approved by Saranya C.
Saranya Chalermthamrong
Scientist (4)

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ระดับเสียงในสถานที่ทำงาน

Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227251
Date Received : Mar 09, 2022
Date Reported : Mar 15, 2022
Report Number: 2257258-1

Sample Number 2227251-1
Parameter Noise (Leq 8 hrs.)
Location MRU
Measurement Date Mar 07, 2022
Measurement by Satcha Phetsawaeng

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	87.2	106.4	83.7
11:00 AM - 12:00 PM	83.8	84.6	83.6
12:00 PM - 01:00 PM	83.9	84.5	83.7
01:00 PM - 02:00 PM	83.9	84.6	83.8
02:00 PM - 03:00 PM	84.2	84.8	84.1
03:00 PM - 04:00 PM	84.3	87.0	84.1
04:00 PM - 05:00 PM	84.4	85.0	84.2
05:00 PM - 06:00 PM	83.8	85.2	83.6
Leq Average 8 hrs. (dB(A))	84.6		
Lmax (dB(A))		106.4	
Standard (dB(A))	90	140	

Reference Method : ISO1996-1 and 1996-2
Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
ในการประกอบกิจการโรงงานเกี่ยวกับสภาวะแวดล้อมในการทำงาน 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

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227251
Date Received : Mar 09, 2022
Date Reported : Mar 15, 2022
Report Number: 2257259-1

Sample Number 2227251-2
Parameter Noise (Leq 8 hrs.)
Location Transfer Blower
Measurement Date Mar 07, 2022
Measurement by Satcha Phetsawaeng

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	86.8	102.2	85.8
11:00 AM - 12:00 PM	86.0	86.5	85.9
12:00 PM - 01:00 PM	84.4	86.5	84.1
01:00 PM - 02:00 PM	79.5	81.4	79.1
02:00 PM - 03:00 PM	79.6	81.2	79.2
03:00 PM - 04:00 PM	84.6	91.3	84.3
04:00 PM - 05:00 PM	86.1	86.9	86.0
05:00 PM - 06:00 PM	85.7	86.3	85.6
Leq Average 8 hrs. (dB(A))	84.8		
Lmax (dB(A))		102.2	
Standard (dB(A))	90	140	

Reference Method : ISO1996-1 and 1996-2
Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227251
Date Received : Mar 09, 2022
Date Reported : Mar 15, 2022
Report Number: 2257260-1

Sample Number 2227251-3
Parameter Noise (Leq 8 hrs.)
Location Emergency Generator
Measurement Date Mar 07, 2022
Measurement by Satcha Phetsawaeng

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:30 AM - 10:30 AM	86.8	92.1	85.9
10:30 AM - 11:30 AM	87.4	88.8	86.7
11:30 AM - 12:30 PM	87.4	89.2	86.7
12:30 PM - 01:30 PM	87.0	89.2	86.0
01:30 PM - 02:30 PM	86.0	88.0	84.9
02:30 PM - 03:30 PM	85.3	88.0	83.6
03:30 PM - 04:30 PM	83.7	87.1	82.0
04:30 PM - 05:30 PM	84.1	86.8	82.5
Leq Average 8 hrs. (dB(A))	86.2		
Lmax (dB(A))		92.1	
Standard (dB(A))	90	140	

Reference Method : ISO1996-1 and 1996-2
Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
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Analysis / Test Report

Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2227251
Date Received : Mar 09, 2022
Date Reported : Mar 15, 2022
Report Number: 2257261-1

Sample Number 2227251-4
Parameter Noise (Leq 8 hrs.)
Location Pelletizer
Measurement Date Mar 07, 2022
Measurement by Satcha Phetsawaeng

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:01 PM - 12:01 AM	88.6	95.3	88.5
12:01 AM - 01:01 AM	89.0	98.9	88.9
01:01 AM - 02:01 AM	89.1	94.8	89.0
02:01 AM - 03:01 AM	89.1	92.9	89.0
03:01 AM - 04:01 AM	89.7	99.6	89.0
04:01 AM - 05:01 AM	89.1	90.2	88.9
05:01 AM - 06:01 AM	89.0	96.7	88.7
06:01 AM - 07:01 AM	88.6	89.6	88.5
Leq Average 8 hrs. (dB(A))	89.0		
Lmax (dB(A))		99.6	
Standard (dB(A))	90	140	

Reference Method : ISO1996-1 and 1996-2
Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2253565
Date Received : May 06, 2022
Date Reported : May 11, 2022
Report Number: 2307298-1

Sample Number	2253565-1
Parameter	Noise (Leq 8 hrs.)
Location	MRU
Measurement Date	May 05, 2022
Measurement by	Satcha Phetsawaeng

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:39 AM - 10:39 AM	85.1	93.0	84.5
10:39 AM - 11:39 AM	84.8	86.0	84.4
11:39 AM - 12:39 PM	84.5	86.2	83.9
12:39 PM - 01:39 PM	84.0	85.6	83.5
01:39 PM - 02:39 PM	84.3	85.9	83.9
02:39 PM - 03:39 PM	85.3	86.2	84.9
03:39 PM - 04:39 PM	85.2	86.1	84.9
04:39 PM - 05:39 PM	85.4	90.3	84.9
Leq Average 8 hrs. (dB(A))	84.9		
Lmax (dB(A))		93.0	
Standard (dB(A))	90	140	

Reference Method : ISO1996-1 and 1996-2
Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2253565
Date Received : May 06, 2022
Date Reported : May 11, 2022
Report Number: 2307299-1

Sample Number	2253565-2
Parameter	Noise (Leq 8 hrs.)
Location	Transfer Blower
Measurement Date	May 05, 2022
Measurement by	Satcha Phetsawaeng

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:25 AM - 10:25 AM	87.9	88.7	87.8
10:25 AM - 11:25 AM	88.1	89.9	87.6
11:25 AM - 12:25 PM	88.1	90.0	87.7
12:25 PM - 01:25 PM	88.3	89.6	88.1
01:25 PM - 02:25 PM	87.8	89.5	87.5
02:25 PM - 03:25 PM	87.8	88.7	87.5
03:25 PM - 04:25 PM	88.4	90.1	88.1
04:25 PM - 05:25 PM	88.4	89.8	88.0
Leq Average 8 hrs. (dB(A))	88.1		
Lmax (dB(A))		90.1	
Standard (dB(A))	90	140	

Reference Method : ISO1996-1 and 1996-2
Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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Technical Management Thanita K.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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Client : Siam Polystyrene Co., Ltd.
8, Map Ta Phut Industrial Estate, I-4 Road, Map ta phut, Muang, Rayong Thailand 21150
P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2253565
Date Received : May 06, 2022
Date Reported : May 11, 2022
Report Number: 2307300-1

Sample Number	2253565-3
Parameter	Noise (Leq 8 hrs.)
Location	Emergency Generator
Measurement Date	May 05, 2022
Measurement by	Satcha Phetsawaeng

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:35 AM - 10:35 AM	85.1	86.8	83.9
10:35 AM - 11:35 AM	85.6	87.8	84.3
11:35 AM - 12:35 PM	85.0	87.3	83.5
12:35 PM - 01:35 PM	85.2	87.4	84.0
01:35 PM - 02:35 PM	85.0	88.3	83.7
02:35 PM - 03:35 PM	85.9	89.0	84.5
03:35 PM - 04:35 PM	86.9	88.5	86.0
04:35 PM - 05:35 PM	85.1	88.2	83.9
Leq Average 8 hrs. (dB(A))	85.5		
Lmax (dB(A))		89.0	
Standard (dB(A))	90	140	

Reference Method : ISO1996-1 and 1996-2
Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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Technical Management ThanitaK.
Thanita Kulsuriwong
Scientist (4)

Approved by Supot S.
Supot Salamteh
Section Head

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P/O : 4512792880
Project Name : Environmental Quality Monitoring
Project Location : Map Ta Phut_PS (SPCL)

Lot ID: 2253565
Date Received : May 06, 2022
Date Reported : May 11, 2022
Report Number: 2307301-1

Sample Number	2253565-4
Parameter	Noise (Leq 8 hrs.)
Location	Pelletizer
Measurement Date	May 05, 2022
Measurement by	Satcha Phetsawaeng

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:50 AM - 10:50 AM	88.7	91.4	88.4
10:50 AM - 11:50 AM	88.9	99.4	88.5
11:50 AM - 12:50 PM	88.9	90.5	88.6
12:50 PM - 01:50 PM	88.9	97.0	88.5
01:50 PM - 02:50 PM	88.9	91.4	88.4
02:50 PM - 03:50 PM	88.9	95.2	88.4
03:50 PM - 04:50 PM	89.0	96.3	88.6
04:50 PM - 05:50 PM	88.8	97.6	88.4
Leq Average 8 hrs. (dB(A))	88.9		
Lmax (dB(A))		99.4	
Standard (dB(A))	90	140	

Reference Method : ISO1996-1 and 1996-2
Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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Technical Management ThanitaK.
Thanita Kulsuriwong
Scientist (4)

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Supot Salamteh
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ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ

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

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Stack	Carbon Monoxide	Console Control Unit	RYG_FS0315	12-Jan-22	12-Jul-22	6
Stack	Carbon Monoxide	CO Analyzer	RYG_EN0034	29-Nov-21	29-Nov-22	12
Stack	Oxides of Nitrogen	Console Control Unit	RYG_FS0315	12-Jan-22	12-Jul-22	6
Stack	Oxides of Nitrogen	Vacuum Gauge	RYG_FS0333	6-Oct-21	6-Apr-23	18
Stack	Oxides of Nitrogen	SPECTROPHOTOMETER	RYG_EN0037	1-Apr-21	1-Oct-22	18
Stack	Total Suspended Particulate	Console Control Unit	RYG_FS0315	12-Jan-22	12-Jul-22	6
Stack	Total Suspended Particulate	Analytical Balance 4 D.	RYG_EN0003	31-Mar-21	31-Mar-22	12
Ambient	Total Suspended Particulate	High Volume	RYG_FS0393	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0291	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0292	-	-	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	BKK_FS1064	4-Jan-22	4-Jul-22	6
Ambient	Nitrogen Dioxide	NO_2 Analyzer	BKK_FS0797	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_FS0413	29-Jul-21	27-Jan-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0412	29-Jul-21	27-Jan-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0087	13-Jul-21	11-Jan-23	18

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Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand
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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0215	9-Aug-21	9-Aug-22	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0025	21-Jan-22	21-Jan-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0024	4-Oct-21	4-Oct-22	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0026	21-Jan-22	21-Jan-23	12
Noise	Leq 5 min	Sound Calibrator	RYG_FS0215	9-Aug-21	9-Aug-22	12
Noise	Leq 5 min	Sound Level Meter	RYG_FS0025	21-Jan-22	21-Jan-23	12
Noise	Leq 5 min	Sound Level Meter	RYG_FS0024	4-Oct-21	4-Oct-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_FS0029	21-Apr-21	21-Apr-22	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0030	21-Jan-22	21-Jan-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0021	21-Jan-22	21-Jan-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0022	21-Jan-22	21-Jan-23	12
Noise	Leq 8 hrs	Sound Calibrator	RYG_FS0215	9-Aug-21	9-Aug-22	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0026	21-Jan-22	21-Jan-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0303	2-Jun-21	2-Jun-22	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0027	10-Jan-22	10-Jan-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0381	7-Jul-21	7-Jul-22	12
Workplace	Total Dust	Field Rotameter	RYG_FS0197	4-Jan-22	4-Apr-22	3
Workplace	Total Dust	Field Rotameter	RYG_FS0198	1-Apr-22	1-Jul-22	3
Workplace	Total Dust	Digital Balance	RYG_EN0004	23-Mar-22	23-Mar-23	12

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104 Phatthanakan 40, Phatthanakan Rd., Khwaeng
Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand
T +66 2 760 3000 F +66 2 760 3197

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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	Styrene	Field Rotameter	RYG_FS0199	4-Jan-22	4-Apr-22	3
Workplace	Styrene	Field Rotameter	RYG_FS0199	1-Apr-22	1-Jul-22	3
Workplace	Styrene	GC-MSD	BKK_EN0119	1-Oct-21	1-Apr-23	18
Workplace	Total Hydrocarbon	Field Rotameter	BKK_FS1039	4-Jan-22	4-Apr-22	3
Workplace	Total Hydrocarbon	Field Rotameter	BKK_FS1042	1-Apr-22	1-Jul-22	3
Workplace	Total Hydrocarbon	Total Hydrocarbon Analyzer	RYG_EN0038	14-Jan-22	14-Jan-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	Chember 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	Chember 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	Chember 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	Total Kjeldahl Nitrogen	Block Digestion Unit	RYG_EN0188	17-Mar-22	17-Mar-23	12
Rayong Lab	Total Kjeldahl Nitrogen	pH Meter	RYG_EN0152	23-Dec-21	23-Dec-22	12

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104 Phatthanakan 40, Phatthanakan Rd., Khwaeng
Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand
T +66 2 760 3000 F +66 2 760 3197

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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Total Organic carbon	TOC Analyzer	BKK_EN0066	25-Oct-21	25-Oct-22	12
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
Rayong Lab	Cyanide	SPECTROPHOTOMETER	RYG_EN0037	1-Apr-21	1-Oct-22	18
Rayong Lab	Formaldehyde	SPECTROPHOTOMETER	RYG_EN0037	1-Apr-21	1-Oct-22	18
Rayong Lab	Phenols compounds	SPECTROPHOTOMETER	RYG_EN0037	1-Apr-21	1-Oct-22	18
Rayong Lab	Sulphide	Chamber (Cold Room)	RYG_EN0184	22-Feb-22	22-Feb-23	12
Rayong Lab	Conductivity	Conductivity meter	RYG_EN0029	23-Feb-22	24-Aug-23	18
Rayong Lab	Total Petroleum Hydrocarbon	Electronic Balance	RYG_EN0002	6-May-21	6-May-22	12
Rayong Lab	Total Petroleum Hydrocarbon	Chember Oven	RYG_EN0006	5-May-21	3-Nov-22	18
Rayong Lab	Total Petroleum Hydrocarbon	Water Bath	RYG_EN0061	5-May-21	3-Nov-22	18
Water Lab	Organochlorine Pesticide	Gas Chromatography (ECD)	BKK_EN0096	4-Nov-20	3-May-22	18
Water Lab	Hexavalent Chromium	Spectrophotometer	BKK_EN0018	15-Oct-21	15-Oct-22	12
Water Lab	Barium	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Barium	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Water Lab	Barium	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Lead	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Lead	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Water Lab	Lead	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 F +66 2 760 3197

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ (ต่อ)

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Manganese	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Manganese	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Water Lab	Manganese	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Copper	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Copper	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Water Lab	Copper	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Nickel	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Nickel	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Water Lab	Nickel	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Arsenic	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Arsenic	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Water Lab	Arsenic	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Selenium	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Selenium	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Water Lab	Selenium	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Cadmium	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Cadmium	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Water Lab	Cadmium	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18

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104 Phatthanakan 40, Phatthanakan Rd.,.Khwaeng
Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand
T +66 2 760 3000 F +66 2 760 3197

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ (ต่อ)

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Zinc	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Zinc	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Water Lab	Zinc	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Trivalent Chromium	ICP-MS	BKK_EL0026	26-Nov-20	26-May-22	18
Water Lab	Trivalent Chromium	Hot Block	BKK_EL0054	17-Nov-20	18-May-22	18
Water Lab	Trivalent Chromium	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Water Lab	Mercury	DUO-CVAFS / CVAAS	BKK_EL0023	11-May-21	11-May-22	12

CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date : 12 Jan 22
Next Cal. Date : 12 Jul 22

Barometric Pressure (mm.Hg) : 760
Relative Humidity (%) : 58.3
Temperature (°C) : 25.0

Console Control Meter Data.

Calibration No. : C-120122-RYG_FS0315
Dry Gas Meter No. : RYG_FS0315
Console Serial No. : 1706091
Console Model No. : XC-572-V

Reference Dry Gas Meter Data

Serial No. : 1607009
Model No. : DGM-SK25RM-QS8
Correction Factor (Yr) : 1.0060
Next Calibration Date : 8 Apr 22

ΔH (mm.H_2O)	Θ Minutes	Reference Dry Gas Meter Calibration: Vr (Liters) Final	Vr Initial	Vr Total	Tr (°C)	Console Control : Drygas Meter: Vm (Liters) Final	Vm Initial	Vm Total	Ti (°C)	To (°C)	Avg.Tm (°C)	Dry Gas Meter Correction Factor (Y)	Orifice Calibration Factor ΔH@
15	12.30	150.00	0.00	150.00	27.0	1274534.0	1274390.0	144.00	27.0	27.0	27.0	1.0464	45.8249
25	9.45	150.00	0.00	150.00	30.0	1274689.0	1274545.0	144.00	28.0	28.0	28.0	1.0385	45.8355
50	6.73	150.00	0.00	150.00	30.0	1274843.0	1274700.0	143.00	28.0	28.0	28.0	1.0432	46.4941
80	5.22	150.00	0.00	150.00	30.0	1275003.0	1274860.0	143.00	30.0	30.0	30.0	1.0471	44.4583
120	4.27	150.00	0.00	150.00	30.0	1275163.0	1275020.0	143.00	30.0	30.0	30.0	1.0431	44.6230
											Avg.	1.0437	45.4472

Y Ratio of reading of reference to dry gas meter : tolerance for individual values ± 0.02 from average.

Δ@ Orifice pressure differential that equates to 21.24 lm of air@ 25 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: (Mr.Warawut Pubpa)
Field Scientist(3)

Approved by: (Mr.Wichan Choonharat)
Manager

Form No. QS 281-023 (13/01/03)

DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date : 12-Jan-22
Calibration sheet No. : C-120122-RYG_FS0316

Ambient Temperature (°C) : 24
Relative Humidity (%) : 58.4

Digital Temperature ID RYG_FS0316
Console Serial No. : 1706091
Console Model : XC-572-V

Reference Temperature ID . BKK_FS0609
Serial No. : 7688004
Model : FLUKE 714
Next Calibrate : 13 Jan 22

Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	0	0	
	25	27	2	
	50	53	3	
	100	104	4	
	150	154	4	
	200	202	2	
	250	253	3	
	300	304	4	
	500	505	5	
	1000	1003	3	
	1200	1202	2	
Probe	100	104	4	
	125	129	4	
	150	154	4	
Oven	100	104	4	
	125	129	4	
	150	154	4	
Filter	100	104	4	
	125	129	4	
	150	154	4	
Exit	0	0	0	
	10	11	1	
	20	22	2	
Meter	0	0	0	
	25	27	2	
	50	52	2	
AUX	0	0	0	
	25	27	2	
	50	53	3	

Calibrated by : (Mr.Warawut Pubpa)
Field Scientist (3)

Approved by : Mr.Wichan Choonharat
Manager

Form 281-048 (02/05/02)

PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date 12 Jan 22
Calibration Sheet No. : C-120122-RYG_FS0319

Nozzle Set ID. : RYG_FS0319
Vernier Caliper ID. : BKK_FS0626

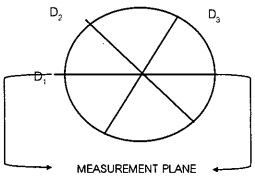
Nozzle ID #	Nozzle Diameter (cm.) D_1	D_2	D_3	Hi - Lo ΔD	$(D_1 + D_2 + D_3) / 3$ D_{avg}
1	0.300	0.300	0.300	0.000	0.300
2	0.470	0.465	0.465	0.005	0.467
3	0.600	0.600	0.600	0.000	0.600
4	0.770	0.760	0.755	0.015	0.762
5	0.920	0.930	0.930	0.010	0.927
6	1.080	1.080	1.085	0.005	1.082
7	1.240	1.220	1.235	0.020	1.232
8	1.550	1.570	1.540	0.030	1.553

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 : (Mr.Warawut Pubpa)
Field Scientist (3)

Approved by : (Mr.Wichan Choonharat)
Manager

Form No. QS 281-025 (13/01/03)

Pitot Tube Calibration Data

Pitot Tube Identification Number : RYG_FS0320
Lab test duct Number : 258-1-13-01
Calibration Sheet No. : C-120122-RYG_FS0320

Calibration Date : 12 Jan 22
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_2O)	Type s pitot tube (ΔP, mm.H_2O)	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
			$\overline{Cp}$	0.842	0.842

$$Cp(S) = Cp_{(std)} \sqrt{\frac{\Delta P(std)}{\Delta P\ (s)}}$$

$$\left[\overline{Cp}_{(A)} - \overline{Cp}_{(B)}\right] \text{ must BE } \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum_{1}^{3}\left[Cp\ (s) - Cp(A \text{ or } B)\right]}{3} \text{ must BE } \leq 0.01$$

Calibrated by : (Mr.Warawut Pubpa)
Field Scientist (3)

Approved by : Mr.Wichan Choonharat
Manager

Form 281-046 (04/03/02)

ALS

Pitot Tube Calibration Data

Pitot Tube Identification Number :	RYG_FS0321	Calibration Date :	12 Jan 22
Lab test duct Number :	258-1-13-01	Standard Pitot ID :	BKK_FS0441
Calibration Sheet No. :	C-120122-RYG_FS0321	Cp Standard :	0.99

Type S Pitot Tube Coefficient Data

	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm.H_2O)	Type s pitot tube (ΔP, mm.H_2O)	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

$$Cp(S) = Cp_{std} \sqrt{\frac{\Delta P(std)}{\Delta P\ (s)}}$$

$$\left| \bar{Cp}_{(A)} - \bar{Cp}_{(B)} \right] \text{ must BE} \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum \left[Cp\ (s) - Cp(A \text{ or } B) \right]}{3} \text{ must BE} \leq 0.01$$

Calibrated by (Mr.Warawut Pubpa) Field Scientist (3)

Approved by Wichan Choonharat — Mr.Wichan Choonharat, Manager

Form 281-046 (04/03/02)

RYG_EN0034

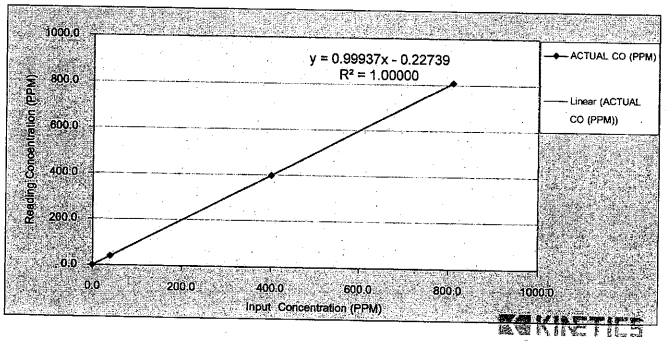
MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : ALS Laboratory Group (Thailand) Co.Ltd.		
EQUIPMENT NAME : CO Analyzer		
MANUFACTURER : Teledyne - API	MODEL : T300	SERIAL NO : 1215
STANDARD GAS CONCENTRATION (PPM) : 4512		CYLINDER NO : CC745169
CYLINDER PRESSURE (psig) : 2015		CERTIFIED DATE : Mar 10, 2021
CERTIFIED BY : AIRGAS SPECIALTY GASES		EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.0	0.015	0.015	-
1	40.0	40.065	0.065	0.162
2	400.3	398.742	-1.558	-0.389
3	808.9	808.679	-0.221	-0.027
AVERAGE (%)				0.192

REVIEW BY Thanita K.
APPROVED BY
NEXT CAL. DATE 29 Nov 22



CALIBRATED BY : คุณพรชัย ผาติวนารักษ์ DATE : 29 พฤศจิกายน 2564

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : คุณพรชัย ผาติวนารักษ์ โทรศัพท์ : 02-515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทรเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

KINETICS
บริษัท ไคเนติคส์ คอร์ปอเรชั่น จำกัด
KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : ALS Laboratory Group (Thailand) Co.Ltd. วันที่ : 29 พฤศจิกายน 2564
รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer บริษัทผู้ผลิต : Teledyne API
รุ่นของอุปกรณ์ / เครื่องมือ : T300 หมายเลขอุปกรณ์ / เครื่องมือ : 1215

TEST VALUES				
	API MODEL: T300		BEFORE	AFTER
1	RANGE	1 - 1000 PPM	100.0	100.0
2	STABILITY	≤ 1 PPM	0.071	0.092
3	CO MEASURE	2500 - 4800 mV	3122.4	3317.8
4	CO REFERENCE	2000 - 4800 mV	2585.8	2745.2
5	PRESEEURE	25 - 35 in - Hg-A	29.8	29.9
6	SAMPLE FLOW	800 ± 10% cc/min	813	815
7	SAMPLE TEMP	48 ± 4 °C	45.3	44.7
8	BENCH TEMP	48 ± 2 °C	48.0	48.0
9	WHEEL TEMP	68 ± 2 °C	68.0	68.1
10	BOX TEMP	AMBIENT ± 5 °C	31.9	33.9
11	SLOPE	1.0 ± 0.3	0.870	0.871
12	OFFSET	0.0 ± 0.3	0.008	0.008
13	CO READING (AMBIENT)	PPM	0.400	0.285
14	ELECTRICAL TEST	40 ± 2 PPM	39.537	39.538
15	VOLTAGE TEST	+5 V +12 V -15 V -15 V	5.23 / 12.22 / 16.67 / -15.28	5.23 / 12.22 / 16.67 / -15.28
16	ZERO GAS	0.00 PPM	0.061	0.015
17	SPAN GAS	40.0 PPM	40.035	40.065

หมายเหตุ
- เปลี่ยน O-ring 2 ชิ้น , Spring 1 ชิ้น , Sintered Filter 1 ชิ้น
- เปลี่ยน Filter 47 mm 1 แผ่น

KINETICS บริษัท ไคเนติคส์ คอร์ปอเรชั่น จำกัด

(คุณพรชัย ผาติวนารักษ์)
ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย ผาติวนารักษ์ โทรศัพท์ : 0-2515-8987
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทรเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

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

NSC-TISI-TIS17025 CALIBRATION 0008

Certificate of Calibration

Certificate No. : 21P3344
Page : 1 of 2

Equipment :	Vacuum Gauge
Manufacturer:	QualityWell
Model :	F221AVD
Serial No.:	VG02
ID No.:	RYG_FS0333
Condition As-Received:	Used Item
Received Date:	01 October 2021
Calibration Date:	06 October 2021
Reference:	2110-0066WSC
Ambient Temperature:	(23 ± 2) °C
Relative Humidity:	(50 ± 15) %
Atmospheric Pressure:	1008 mbar

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.
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 instuments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Pressure Gauge	15PSIXP2I	158670	21P2929	03 Sep 2022

2.This instrument was installed in vertical orientation and center of the dial 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 Phakon P.
APPROVED BY
NEXT CAL. DATE 6/4/23

Calibrated by : Nopparat Phongam
Issue Date : 07 October 2021

Approved Signatory : Attapol P.
[ ] Phalinee Prabpaipal
[ ] Sura Suwannasri
[✓] Attapol Panurach

B 0270821

Cert.No.: 21P3344
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Vacuum Pressure Measurement

Range : 0 inHg to -30 inHg
Scale Interval : 0.5 inHg(The Fifth Estimate)

Increasing Pressure

Applied Pressure (inHg)	0.00	-4.97	-9.97	-14.97	-19.99	-26.02
UUC* Indication (inHg)	0.0	-5.0	-10.0	-15.0	-20.0	-26.0
Error (inHg)	0.00	-0.03	-0.03	-0.03	-0.01	0.02

Decreasing Pressure

Applied Pressure (inHg)	-26.00	-19.97	-14.95	-9.96	-4.97	0.00
UUC* Indication (inHg)	-26.0	-20.0	-15.0	-10.0	-5.0	0.0
Error (inHg)	0.00	-0.03	-0.05	-0.04	-0.03	0.00

The uncertainty of measurement was ± 0.12 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 %.

-oOo-

Attapol P.

a 1075036

Certificate of Calibration

NSC-TISI-TIS 17025 Calibration 0007

Equipment:	SPECTROPHOTOMETER	Certificate No.:	C06210159
Model:	DR6000	Issued Date:	01 April 2021
Serial No. (or ID.):	1627845 (RYG_EN0037)	Job No.:	KSPR2104738
Manufacturer:	HACH	Page:	1 of 3
Condition:	In Condition		

REVIEW BY Mr.Bamrit
APPROVED BY
NEXT CAL. DATE 01/10/22

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. Chattuphon Foithong
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 Starna 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

SPRT บริษัท เอสพีซี อาร์ที จำกัด SPC RT Co., Ltd

(Mr. Chattuphon Foithong)
Person in charge

(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.

บริษัท เอสพีซี อาร์ที จำกัด
SPC RT CO., LTD.
ชั้นที่ 00003 : 1194 ซอยวชิรธรรมสาธิต 57 ถนนสุขุมวิท 101/1 แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
Floor 00003 : 1194 Soi Wachirathamsathit 57 Sukhumvit 101/1 Road, Bangchak, Phrakhanong, Bangkok 10260 Thailand

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

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 +/- 0.11 nm	260.6	1.5	1.824
392.03 +/- 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

SPC Calibration Center

SEKI Part of DKSH Grou

RYG_EN0003

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2104738

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR6000 หมายเลขเครื่อง: 1627845

ตรวจสอบ (รับ) 01 Apr 2021 ปกติ	ไม่ปกติ	รายการตรวจเช็ค	ตรวจสอบ (ส่ง) 01 Apr 2021 ปกติ	ไม่ปกติ	หมายเหตุ
		General			
☑	☐	1. ความสมบูรณ์เครื่อง	☑	☐	
☑	☐	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	☑	☐	
☑	☐	3. สวิทซ์ ปิด – เปิด เครื่อง (On-Off Swicth)	☑	☐	
☑	☐	4. ปุ่มกด (Keypad)	☑	☐	
☑	☐	5. หน้าจอ (Display, Screen Contrast)	☑	☐	
		Spectrophotometer			
☐	☐	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	☐	☐	
☐	☐	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	☐	☐	
☑	☐	8. ความยาวคลื่น (Wavelength Check)	☑	☐	656.1=656.1 nm
☑	☐	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	☑	☐	
☑	☐	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	☑	☐	
☑	☐	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	☑	☐	
		pH Meter and Conductivity Meter			
☐	☐	12. อิเล็คโทรด (Electrode and Connection Cable)	☐	☐	
☐	☐	13. ระดับสารละลายใน Electrode (Level KCl)	☐	☐	
☐	☐	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	☐	☐	
☐	☐	15. ขาจับอิเล็คโทรด (Stand)	☐	☐	
		Turbidimeter			
☐	☐	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	☐	☐	
☐	☐	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่เกิน 3.0)	☐	☐	
		Automatic titrator			
☐	☐	18. สภาพ Piston Burettes	☐	☐	
☐	☐	19. Function Rinsing and Dosing	☐	☐	
☐	☐	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	☐	☐	

เพิ่มเติม/ข้อแนะนำ :

Mr. Chattuphon Foithong

Service Engineer

บริษัท เอสซีซี ซาร์วิส จำกัด
SCC RT CO., LTD.
สาขาที่ 00003 1194 ซอยวชิรธรรมสาธิต 57 ถนนสุขุมวิท 101/1 แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
Branch 00003 1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Road, Bangchak, Phrakhanong, Bangkok 10260 Thailand

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

NSC-TISI-TIS-17025 CALIBRATION 0219

SARTORIUS

REVIEW BY Thanitak.
APPROVED BY D.
NEXT CAL. DATE 31/03/2022

Certificate of Calibration

Model Number : MSU224S-100-DU
Description : Analytical Balance
Serial Number : 31709552
Manufacturer : Sartorius

Certificate No. : 21BCI0111rev1
Issued Date : Monday, April 26, 2021
Reference No. : 501627
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 : Wednesday, March 31, 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 : 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 expended 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 form list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Cetificate 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/Barometer/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/IEC17025.RF15 26/03/2020 R2

Mr.chonchai Inthana(Technical Manager)

STAMP

SARTORIUS (THAILAND) CO., LTD. sartorius ISO/IEC 17025 Cert no. 2207

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8361-6 Fax: +66 2643-8367, e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number : MSU224S-100-DU
Description : Analytical Balance
Serial Number : 31709552
Manufacturer : Sartorius

Certificate No. : 21BCI0111rev1
Issued Date : Monday, April 26, 2021
Reference No. : 501627
Page No. : 2 of 2

Calibration Results : Without Adjustment

Repeatability

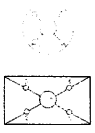
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load) 20 g		
Tolerance 0.0001 g	20.0000	200.0001
	20.0000	200.0001
	20.0000	200.0001
	20.0000	200.0000
	20.0000	200.0001
Nominal Value : (High Load) 200 g	20.0001	200.0001
Tolerance 0.0001 g	20.0000	200.0002
	20.0001	200.0001
	20.0000	200.0001
	20.0000	200.0001
Standard Deviation	0.00004	0.00005

Eccentricity (Off-center loading error)

The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 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 : 50 g
Tolerance 0.0004 g



	Difference
1	–
2	0.0000
3	0.0000
4	-0.0001
5	-0.0001
6	–

Linearity

The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolearance 0.0002 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (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

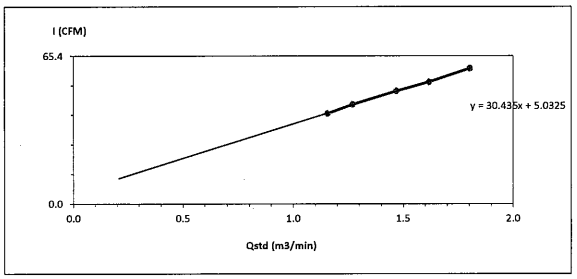
Note : This certificate is replacement with Certificate no.21BCI0111

ALS

High Volume Air Sampler Calibration Worksheet

Project Site :	Siam Polystyrene Co., Ltd.	Barometric Pressure (mm Hg) :	758
Calibrate Location :	บ้านอ่างประดู่ (โรงพยาบาลส่งเสริมสุขภาพตำบลตากวน)	Temperature (°C) :	31
Calibrate Date :	21-Mar-22	High Volume ID :	RYG_FS0393
CalibrationSheet No.:	C-210322-RYG_FS0393	High Volume Model :	TE-5170D
Calibrator ID:	RYG_FS0206	High Volume S/N :	5682
Calibrator Model :	TE-5028A	Calibrator Slope :	1.4867
Calibrator S/N :	1543	Calibrator Intercept :	-0.0445

Test No.	Delta H_2O (inch)	Q_{std} (m^3/min)	I : Chart (CFM)	Linear Regression	
1	2.8	1.1574	40	Slope :	30.4354
2	3.4	1.2708	44	Intercept :	5.0325
3	4.6	1.4709	50	Correlation Coefficient :	0.9995
4	5.6	1.6184	54		
5	7.0	1.8041	60		



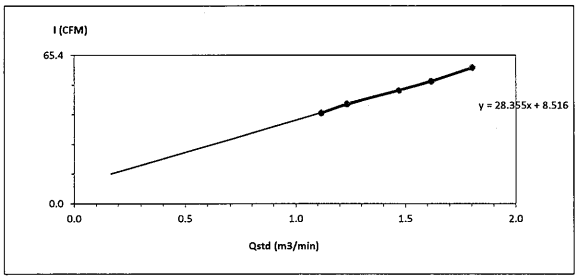
Calibrated by Adisak.T
(Mr. Adisak Talesoon)
Field Scientist(2)

Approved by :
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)

High Volume Air Sampler Calibration Worksheet

Project Site :	Siam Polystyrene Co., Ltd.	Barometric Pressure (mm Hg) :	758
Calibrate Location :	บ้านมาบตาพุด	Temperature (°C) :	31
Calibrate Date :	21-Mar-22	High Volume ID :	RYG_FS0291
CalibrationSheet No.:	C-210322-RYG_FS0291	High Volume Model :	TE-5170D
Calibrator ID:	RYG_FS0206	High Volume S/N :	5333
Calibrator Model :	TE-5028A	Calibrator Slope :	1.4867
Calibrator S/N :	1543	Calibrator Intercept :	-0.0445

Test No.	Delta H_2O (inch)	Q_{std} (m^3/min)	I : Chart (CFM)	Linear Regression
1	2.6	1.1169	40	Slope : 28.3550
2	3.2	1.2342	44	Intercept : 8.5160
3	4.6	1.4709	50	Correlation Coefficient : 0.9988
4	5.6	1.6184	54	
5	7.0	1.8041	60	



Calibrated by Adisak.T
(Mr. Adisak Talesoon)
Field Scientist(2)

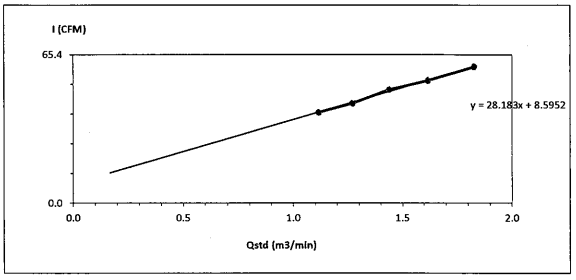
Approved by :
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)

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

High Volume Air Sampler Calibration Worksheet

Project Site :	Siam Polystyrene Co.,Ltd	Barometric Pressure (mm Hg) :	758
Calibrate Location :	ริมร้วด้านทิศตะวันตกของ บริษัท ปุ๋ยเอ็น เอฟซี จำกัด(มหาชน)	Temperature (°C) :	31
Calibrate Date :	21-Mar-22	High Volume ID :	RYG_FS0292
CalibrationSheet No.:	C-210322-RYG_FS0292	High Volume Model :	TE-5170D
Calibrator ID:	RYG_FS0206	High Volume S/N :	5497
Calibrator Model :	TE-5028A	Calibrator Slope :	1.4867
Calibrator S/N :	1543	Calibrator Intercept :	-0.0445

Test No.	Delta H_2O (inch)	Q_{std} (m^3/min)	I : Chart (CFM)	Linear Regression
1	2.6	1.1169	40	Slope : 28.1828
2	3.4	1.2708	44	Intercept : 8.5952
3	4.4	1.4396	50	Correlation Coefficient : 0.9981
4	5.6	1.6184	54	
5	7.2	1.8291	60	



Calibrated by Adisak.T
(Mr. Adisak Talesoon)
Field Scientist(2)

Approved by :
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)

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

RYG_EN0001

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

NSC-TISI-TIS-17025 CALIBRATION 0219

SARTORIUS

Certificate of Calibration

REVIEW BY Thanyalk.
APPROVED BY D. Kw
NEXT CAL. DATE 6/5/22

Model Number :	LA130S-F	Certificate No. :	21BCI0162
Description :	Analytical Balance	Issued Date :	Monday, May 10, 2021
Serial Number :	25409664 (RYG_EN0001)	Reference No. :	501644
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 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

Ambients Conditions:
Temperature : 21.9 °C ± 5.0 °C
Humidity : 48.0 % 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 expended 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 form list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Cetificate 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/Barometer/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.

Mr.chonchai Intrhana(Technical Manager)

STAMP

SARTORIUS (THAILAND) CO., LTD. GAL sartorius ISO/IEC 17025 Cert no. 2307 C219

ISO/IEC17025. 26/03/2020 R2

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8361-6 Fax: +66 2643-8367, e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number :	LA130S-F	Certificate No. :	21BCI0162
Description :	Analytical Balance	Issued Date :	Monday, May 10, 2021
Serial Number :	25409664 (RYG_EN0001)	Reference No. :	501644
Manufacturer :	Sartorius	Page No. :	2 of 2

Calibration Results : Without Adjustment

Repeatability

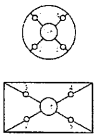
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load)	10.0000	100.0001
10 g	9.9999	100.0002
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

Eccentricity (Off-center loading error)

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 : 50 g
Tolerance 0.0004 g



	Difference
1	–
2	0.0000
3	-0.0001
4	0.0001
5	-0.0001
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 (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (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

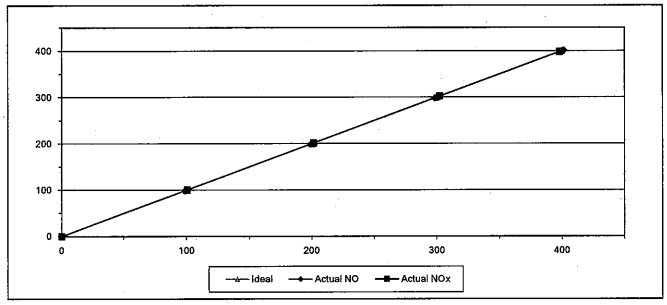
End of Report.

ISO/IEC17025. 26/03/2020 R2

MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-22	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	148EH0E0	Equipment ID	BKK_FS1064
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	51.33	Cylinder No.	LL36633
Cylinder Pressure (psi)	1200	Certified By	Airgas Inc.
Certified Date	18-Mar-14	Expired Date	18-Mar-22

Point	CALIBRATION RESULTS						
	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	99.00	-1.00	-1.00	100.70	0.70	0.70
2	200.00	199.40	-0.60	-0.30	201.50	1.50	0.75
3	300.00	298.60	-1.40	-0.47	302.30	2.30	0.77
4	400.00	401.40	1.40	0.35	398.00	-2.00	-0.50
AVERAGE (%)				-0.26			0.36



Calibrated By

(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

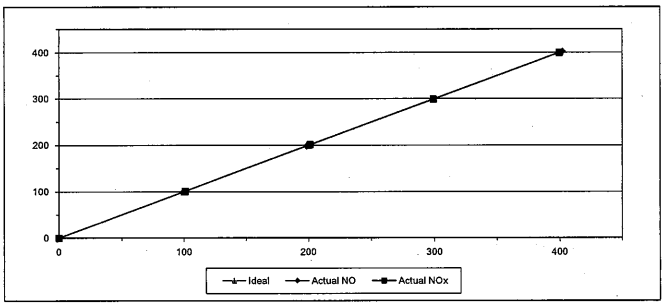
ALS Laboratory Group

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.	H73KYD1M	Equipment ID	BKK_FS0797
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	51.33	Cylinder No.	LL36633
Cylinder Pressure (psi)	1200	Certified By	Airgas Inc.
Certified Date	18-Mar-14	Expired Date	18-Mar-22

Point	CALIBRATION RESULTS						
	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	99.70	-0.30	-0.30	101.00	1.00	1.00
2	200.00	198.60	-1.40	-0.70	201.30	1.30	0.65
3	300.00	299.00	-1.00	-0.33	299.20	-0.80	-0.27
4	400.00	402.10	2.10	0.53	399.50	-0.50	-0.13
AVERAGE (%)				-0.14			0.27



Calibrated By

(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

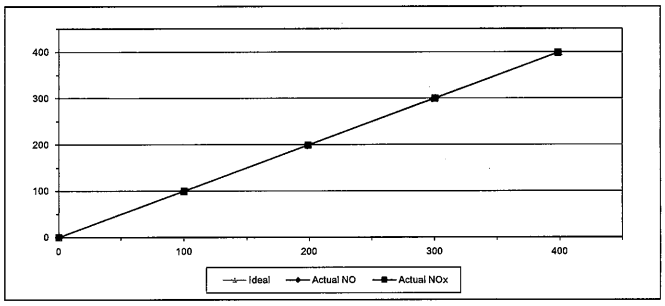
ALS Laboratory Group

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.	LL36633
Cylinder Pressure (psi)	1200	Certified By	Airgas Inc.
Certified Date	18-Mar-14	Expired Date	18-Mar-22

Point	CALIBRATION RESULTS						
	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

(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

ALS Laboratory Group

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

63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,
Wathapra, Bangkokyai,Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com

CERTIFICATE OF CALIBRATION

Certificate No: WS-13072021
Page 1 of 2 pages

Measurement Item : Cup anemometer with data logger.

Manufacturer : Data logger: Novalynx.
: Cup anemometer: Novalynx.

Model/Type : Data logger: 200-WS-25LB.
: Cup anemometer: WS-02F.

Serial Number : Data logger: 45375.
: Cup anemometer: -

ID No : Data logger: RYG_FS0413
: Cup anemometer: -

REVIEW BY
APPROVED BY
NEXT CAL. DATE 27/1/23

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	cm^2
	Anemometer frontal area	100	cm^2
	Diameter of mounting pipe		mm
	Blockage ratio of test object	0.111	[-]

Test Conditions			
	Air temperature	24.6	±0.8 °C
	Air pressure	1007.4	±0.4 mPa
	Relative air humidity	52.4	±3.5 %RH

Calibration Procedure : Calibration was carried out base on:
IEC 61400-12-1 ED.1: 2005 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 Thailand (NIMT).

Measurement Date : Jul 29, 2021
Issued Date : Jul 29, 2021

Calibrated by
☑ Mr. Sorawit Thaonaiad
☐ Miss Orathai Wiwatwitaya

JNAC JIRANATE ASSOCIATES CO., LTD.

Approved Signatory:
Mr. Pariya Roonchiandee
Technical Support
and Calibration Manager

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Watthapra, Bangkokyai,Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com

Continuation of Certificate of Calibration Number

Certificate No: WS-13072021

Result of calibration: ☑ Without adjustment ☐ With adjustment

Calibration in the range of 1 - 10 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_{std} Reading m/s	V_{UUC} Reading m/s	Error (m/s)	Uncertainty (%)
2.067	2.0	-0.1	2.4
4.138	4.1	0.0	1.2
6.03	6.1	0.1	0.97
7.99	8.0	0.0	0.84
10.00	10.1	0.1	0.59
12.03	12.2	0.2	0.72
13.99	14.3	0.3	0.47
15.98	16.4	0.4	0.35
16.03	16.3	0.3	0.38
12.99	13.1	0.1	0.69
11.01	11.1	0.1	0.67
9.01	9.0	0.0	0.87
6.99	7.1	0.1	0.81
5.177	5.1	-0.1	0.97
2.972	3.1	0.1	1.6
1.044	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	TESTO INC	0635 2145	July 16, 2020	MW-0035-20	5 - 30 m/s
2	Precision Differential Pressure Meter	Zogjak	DPM2500	July 16, 2020	MW-0035-20	5 - 30 m/s
3	Air velocity transducer (hot wire)	TSI INC.	8455-12	July 20, 2020	MW-0036AA-20	0 - 5 m/s
4	Temperature	Zogjak	DSR-THP	March 30, 2021	DI-027-64	-30 - 70°C
5	Relative humidity	Zogjak	DSR-THP	March 30, 2021	RH-03C32021	0 - 100 %RH
6	Atmospheric pressure	Zogjak	DSR-THP	March 30, 2021	BP-01C32021	500 - 1100 hPa
7	Wind tunnel	ESSOM	MP33CD	-	-	0 - 50 Hz

End of certificate of calibration

JIRANATE ASSOCIATES CO., LTD.

63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,
Watthapra, Bangkokyai,Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com

CERTIFICATE OF CALIBRATION

Certificate No.: WD-13072021

Measurement Item : Wind direction sensor with data logger.

Manufacturer : Data logger: Novalynx.
: Wind direction sensor: Novalynx.

Model/Type : Data logger: 200-WS-25LB.
: Wind direction sensor: WS-02F.

Serial Number : Data logger: A5375.
: Wind direction sensor: -.

ID No : Data logger: RYG_FS0413.
: Wind direction sensor: -

Customer : ALS laboratory group (Thailand) Co.,Ltd.
104 Phaithanakan 40, Phaithanakan 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 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: 00563-07-0045, Certificate No: KWS63/0044.

Measurement Date : Jul. 29, 2021.
Issued Date : Jul. 29, 2021.

Performed by
☑ Mr. Sorawit Thachalad
☐ Miss Orathai Wiwatwittaya

JIRANATE ASSOCIATES CO., LTD.

Approved Signatory:

Mr. Pariya Booncharoen.
Technical Support
and Calibration Manager

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Watthapra, Bangkokyai,Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com

Continuation of Certificate of Calibration Number

Certificate No: WD-13072021

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	134	-1	3.0
5		180	180	181	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	42	-3	3.0
11		90	90	87	-3	3.0
12		135	135	134	-1	3.0
13		180	180	181	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

JIRANATE ASSOCIATES CO., LTD.

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Watthapra, Bangkokyai,Bangkok 10600 Thailand.
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CERTIFICATE OF CALIBRATION

Certificate No: WS-12072021

Measurement Item : Cup anemometer with data logger.

Manufacturer : Data logger: Novalynx.
: Cup anemometer: Novalynx.

Model/Type : Data logger: 200-WS-25LB.
: Cup anemometer: WS-02F.

Serial Number : Data logger: A5374.
: Cup anemometer: -

ID No : Data logger: RYG_FS0412
: Cup anemometer: -

REVIEW BY Narakom P.
APPROVED BY
NEXT CAL. DATE 27/1/23

Customer : ALS laboratory group (Thailand) Co. Ltd.
: 104 Phaithanakan 40, Phaithanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Test Conditions

: Wind tunnel cross test section area	900	cm^2
: Anemometer frontal area	100	cm^2
: Diameter of mounting pipe		mm
: Blockage ratio of test object	0.111	[-]

Test Conditions

: Air temperature	23.9	±0.8 °C
: Air pressure	1007.7	±0.4 hPa
: Relative air humidity	57.7	±3.5 %RH

Calibration Procedure Calibration was carried out base on:
IEC 61400-12-1 : Ed.1: 2005-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 Thailand (NIMT)

Measurement Date : Jul. 29, 2021.
Issued Date : Jul. 29, 2021.

Calibrated by
☑ Mr. Sorawit Thachalad
☐ Miss Orathai Wiwatwittaya

JIRANATE ASSOCIATES CO., LTD.

Approved Signatory:

Mr. Pariya Booncharoen
Technical Support
and Calibration Manager

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Watthapra, Bangkokyai,Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com

Continuation of Certificate of Calibration Number

Certificate No: WS-12072021

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_{STD} Reading m/s	V_{UUC}* Reading m/s	Error (m/s)	Uncertainty (%)
2.075	2.0	-0.1	2.5
4.150	4.1	-0.1	1.3
5.98	6.0	0.0	0.98
8.01	8.1	0.1	0.66
10.03	10.1	0.1	0.77
12.02	12.2	0.2	0.65
13.98	14.3	0.3	0.41
16.03	16.4	0.4	0.59
14.98	15.3	0.3	0.49
13.00	13.2	0.2	0.61
11.01	11.1	0.1	0.52
8.97	9.0	0.0	0.97
7.01	7.0	0.0	0.81
5.196	5.1	-0.1	0.98
2.980	3.1	0.1	1.7
1.037	0.9	-0.1	5.4

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	TSI INC	0635214E	July 16, 2020	MW-0035-20	5 - 30 m/s
2	Precision Differential Pressure Meter	Zoglab	DPM2500	July 16, 2020	MW-0035-20	5 - 30 m/s
3	Air velocity transducer (hot wire)	TSI INC.	8455-12	July 20, 2020	MW-0036AA-20	0 - 5 m/s
4	Temperature	Zoglab	DSR-THP	March 30, 2021	CL-027.64	-30 - 70°C
5	Relative humidity	Zoglab	DSR-THP	March 30, 2021	RH-0303 2021	0 - 100 %RH
6	Atmospheric pressure	Zoglab	DSR-THP	March 30, 2021	BP-0103 2021	500 - 1100 hPa
7	Wind tunnel	CSSOM	MF330C	-	-	0 - 50 Hz

End of certificate of calibration

JIRANATE ASSOCIATES CO., LTD.

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Watthapra, Bangkokyai,Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com

CERTIFICATE OF CALIBRATION

Certificate No.: WD-12072021

Measurement Item : Wind direction sensor with data logger.

Manufacturer : Data logger: Novalynx.
: Wind direction sensor: Novalynx.

Model/Type : Data logger: 200-WS-25LB.
: Wind direction sensor: WS-02F.

Serial Number : Data logger: A5374.
: Wind direction sensor: -.

ID No : Data logger: RYG_FS0412.
: 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.: CC563-07-0045, Certificate No.: KW563/0044.

Measurement Date : Jul 29, 2021.
Issued Date : Jul 29, 2021.

Performed by
☑ Mr. Sorawit Thachalad
☐ Miss Orathai Wiwatwittaya

JIRANATE ASSOCIATES CO., LTD.

Approved Signatory:
Mr. Parinya Boonchareon
Technical Support
and Calibration Manager

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63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,
Watthapra, Bangkokyai,Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com

Continuation of Certificate of Calibration Number

Certificate No: WD-12072021

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	133	-2	3.0
5		180	180	178	-2	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	360	359	-1	3.0
10		45	45	42	-3	3.0
11		90	90	87	-3	3.0
12		135	135	133	-2	3.0
13		180	180	178	-2	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

JIRANATE ASSOCIATES CO., LTD.

63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,
Watthapra, Bangkokyai,Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com

CERTIFICATE OF CALIBRATION

Certificate No: WS-03072021

Measurement Item : Cup anemometer with data logger.

Manufacturer : Data logger: Novalynx.
: Cup anemometer: Novalynx.

Model/Type : Data logger: 200-WS-25CL.
: Cup anemometer: WS-02F.

Serial Number : Data logger: A4986.
: Cup anemometer: -.

ID No : Data logger: RYG_FS0097.
: Cup anemometer: -.

REVIEW BY Nakorn P.
APPROVED BY
NEXT CAL. DATE 11/7/23

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 cm^2
: Anemometer frontal area 100 cm^2
: Diameter of mounting pipe - 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 ±3.5 %RH

Calibration Procedure
Calibration was carried out base on:
IEC 61400-12-1 ED.1: 2005-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 Thailand (NIMT).

Measurement Date : Jul. 13, 2021
Issued Date : Jul. 14, 2021

Calibrated by:
☑ Mr. Sorawit Thachalad
☐ Miss Orathai Wiwatwittaya

JIRANATE ASSOCIATES CO., LTD.

Approved Signatory:
Mr. Parinya Boonchareon
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_{std} 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
10.32	10.2	0.2	0.58
11.98	12.3	0.3	0.56
13.97	14.3	0.3	0.55
16.02	16.6	0.6	0.46
14.96	15.5	0.5	0.37
13.03	13.4	0.4	0.66
10.97	11.2	0.2	0.69
9.02	9.1	0.1	0.65
7.02	7.0	0.0	0.81
5.165	5.0	-0.2	0.88
3.018	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: Instrumentations

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Print static	TESTO INC.	05352145	July 16, 2020	MW-CC35-20	5 - 30 m/s
2	Precision Differential Pressure Meter	Zeglab	DPM2500	July 16, 2020	MW-CC35-20	5 - 30 m/s
3	Air velocity transducer (hot wire)	TSI INC.	8455-12	July 20, 2020	MW-CC36AA-20	0 - 5 m/s
4	Temperature	Zeglab	DSR-THP	March 30, 2021	CL-027-64	-30 - 70°C
5	Relative humidity	Zeglab	DSR-THP	March 30, 2021	RH-03032021	0 - 100 %RH
6	Atmospheric pressure	Zeglab	DSR-THP	March 30, 2021	BP-01032021	500 - 1100 hPa
7	Wind turbine	CSSCM	MP33CD	-		0 - 50 Hz

End of certificate of calibration

NAC JIRANATE ASSOCIATES CO., LTD.

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Wathapra, Bangkokyai,Bangkok 10600 Thailand.
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CERTIFICATE OF CALIBRATION

Certificate No.: WD-03072021
Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger.

Manufacturer : Data logger: Novalynx.
: Wind direction sensor: Novalynx.

Model/Type : Data logger: 200-WS-25DL.
: Wind direction sensor: WS-02F.

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 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 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: CC563-07-0045, Certificate No: KW563/0044.

Measurement Date : Jul. 14, 2021.
Issued Date : Jul. 14, 2021.

NAC JIRANATE ASSOCIATES CO., LTD.

Performed by
☑ Mr. Sorawit Thachaled
☐ Miss Orathai Wiwatwittaya

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

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCEDUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,
Wathapra, Bangkokyai,Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com

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*: 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

NAC JIRANATE ASSOCIATES CO., LTD.

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com

NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. 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) %

REVIEW BY Nattakorn
APPROVED BY
NEXT CAL. DATE 9/8/22

Received Date : 05 AUGUST 2021
Calibration Date : 09 AUGUST 2021
Date of Issue : 11 AUGUST 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.

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-42KAI	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).

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 lavel of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com

NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACL22054
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233184 / 144837 / 23232
ID No.: RYG_FS0025

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) %

REVIEW BY Nanakorn P.
APPROVED BY
NEXT CAL. DATE 21/1/23

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.

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).

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

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	17.0
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	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.9	-0.8	-0.8	±5.0

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	0.0	±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

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	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	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

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, Lcpeak (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	135.2	-0.2	±2.0

11. Overload indication

Measured value (dB) Positive one-half cycle	Measured value (dB) Negative one-half cycle	Deviated Value (dB)	Acceptance Limits (dB)
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 lavel of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY
451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com

NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACL21117
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233183 / 144835 / 23230
ID No.: RYG_FS0024

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) %

REVIEW BY Thanakorn P.
APPROVED BY
NEXT CAL. DATE 4/10/22

Received Date : 21 SEPTEMBER 2021
Calibration Date : 04-06 OCTOBER 2021
Date of Issue : 11 OCTOBER 2021

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.

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-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).

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

T. Petch.

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)
22.9

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	13.8
C - weight	19.7
Flat	25.4

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	-0.1	-0.1	-0.1	± 1.5
1000	0.0	-0.1	0.0	± 1.0
8000	0.3	0.4	0.4	±5.0

T. Petch.

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	94.0	0.0	± 0.3

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	29.1	0.1	± 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	25.2	0.2	± 1.1

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	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (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	133.1	0.1	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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 lavel of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY
451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com

NSC-TISI-TIS 17025 CALIBRATION 0394

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,
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) %

REVIEW BY Nanakorn P.
APPROVED BY
NEXT CAL. DATE 21/1/23

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.

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).

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

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

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	94.0	0.0	± 0.3

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

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, Lcpeak (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

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 lavel of confidence of approximately 95 %

End of Calibration Certificate

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

NSC-TS1-TS 17025 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 Labolatory 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 Phrakom P.
APPROVED BY
NEXT CAL. DATE 21/4/22

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.

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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 0305TE20	31 May 2021 28 June 2021
8) Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P200052 0306TE20	1 June 2021 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.

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

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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
LAE	200	120.0	0.0	±1.0
	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

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com

NSC-TISI-TIS 17025
CALIBRATION 0394

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) %

REVIEW BY
APPROVED BY
NEXT CAL. DATE 21/1/23

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.

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).

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

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

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

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

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, Lcpeak (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

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 lavel of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com

NSC-TISI-TIS 17025
CALIBRATION 0394

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 01222722 / 143840 / 22769
ID No.: RYG_FS0021

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) %

REVIEW BY Nanakorn P.
APPROVED BY
NEXT CAL. DATE 21/1/23

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.

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).

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

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)
16.8

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	11.9
C - weight	18.0
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	0.0	0.1	0.1	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.5	-0.4	-0.4	±5.0

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	0.0	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

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	64.0	0.0	± 1.1
59.0	59.1	0.1	± 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	29.1	0.1	± 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

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, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.7	-0.7	±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

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

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com

NSC-TISI-TIS 17025
CALIBRATION 0394

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) %

REVIEW BY Nnakorn P.
APPROVED BY
NEXT CAL. DATE 21/1/23

Received Date : 14 JANUARY 2022
Calibration Date : 21-24 JANUARY 2022
Date of Issue : 25 JANUARY 2022

Calibrated by : Nathakorn Pisutpaisan

Approved by : T. Petch.
(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.

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).

T. Petch.

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

T. Petch.

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

T. Petch.

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

T. Petch.

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

T. Petch.

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, Lcpeak (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

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 lavel of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com

NSC-TISI-TIS 17025
CALIBRATION 0394

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,
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) %

REVIEW BY Nanakorn P.
APPROVED BY
NEXT CAL. DATE 21/1/23

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.

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).

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

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

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	94.0	0.0	± 0.3

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

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, Lcpeak (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

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 lavel of confidence of approximately 95 %

End of Calibration Certificate

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

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: 0224SV21
Operation No.: CP2021050034

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	RION
Model/Type:	NL-42 (Meter), UC-52 (Microphone), NH-24 (Preamplifier)
Serial No.:	00472130 (Meter), 157774 (Microphone), 72464 (Preamplifier)
ID No.:	RYG_FS0303
Customer:	ALS Labolatory Group (Thailand) Co.,Ltd.
Address:	104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan Khet Suan Luang, Bangkok 10250 Thailand
Received Date:	28 May 2021
Calibrated Date:	2 - 9 June 2021
Issued Date:	11 June 2021
Calibrated by:	Ms. Juntaporn Kunhakom

REVIEW BY Pitrakorn P.
APPROVED BY
NEXT CAL. DATE 2/6/22

Approved by:
(Mr. Sittichai Swa[illegible])
Group M[illegible]

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.

Certificate No.: 0224SV21

Calibration Report

Equipment:	Sound Level Meter
Manufacturer:	RION
Model/Type:	NL-42 (Meter), UC-52 (Microphone), NH-24 (Preamplifier)
Serial No.:	00472130 (Meter), 157774 (Microphone), 72464 (Preamplifier)
ID No.:	RYG_FS0303
Ambient Temperature:	(23 ± 2) °C
Relative Humidity:	(50 ± 15) %
Pressure:	(101.3 ± 1.5) kPa

Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1001-21	12 January 2022
2) Sine generator	1051	1501442	0151RF20	21 September 2021
3) Arbitrary Function Generator	AFG2021	C010063	0099RF20	17 June 2021
4) Programmable Attenuator	PA5	2913	EF-0017-21	1 April 2022
5) Programmable Attenuator	PA5	2755	EF-0034-20	10 November 2021
6) 6.5 Digit precision multimeter	8846A	9609027	0498EL20	10 August 2021
7) 6.5 Digit precision multimeter	8846A	9610014	0669EL20	27 October 2021
8) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P210020 0176TE21	22 March 2022 1 April 2022

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.

Certificate No.: 0224SV21

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone installed

Measured value (dB)
19.6

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	15.8
C-weighting	21.5
Z-weighting	27.7

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	0.3	0.7	0.3	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-0.9	-0.9	-1.0	±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	0.0	-0.1	0.0	±2.0
125	0.0	-0.2	0.0	±1.5
250	0.0	-0.1	0.0	±1.5
500	0.0	-0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	0.0	0.0	±2.0
4000	0.0	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.: 0224SV21

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.: 0224SV21

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	33.9	-0.1	±1.1
29.0	29.0	0.0	±1.1
24.0	24.1	0.1	±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	108.9	-0.1	+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
LAE	200	120.0	0.0	±1.0
	2	100.0	0.0	+1.0 ; -2.5
	0.25	90.8	-0.2	+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	Acceptance limits
Positive one-half cycle	Negative one-half cycle	(dB)	(dB)
139.5	139.5	0.0	±1.5

Certificate No.: 0224SV21

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.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com

NSC-TISI-TIS 17025
CALIBRATION 0394

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) %

REVIEW BY Nathakorn P.
APPROVED BY
NEXT CAL. DATE 10/1/23

Received Date : 05 JANUARY 2022
Calibration Date : 10-12 JANUARY 2022
Date of Issue : 13 JANUARY 2022

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.

SITHIPORN associates 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-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).

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

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

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

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

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, Lcpeak (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

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 lavel of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY
451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com

NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACL21068
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00873057 / 171591 / 73333
ID No.: RYG_FS0381

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) %

REVIEW BY Nathakorn P.
APPROVED BY
NEXT CAL. DATE 7/7/22

Received Date : 06 JULY 2021
Calibration Date : 07-08 JULY 2021
Date of Issue : 13 JULY 2021

Calibrated by : Nathakorn Pisutpaisan

Approved by : T. Petch
(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.

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	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-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).

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

T. Petch.

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)
13.8

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	9.9
C - weight	16.5
Flat	22.1

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	-0.9	-0.8	-0.8	±5.0

T. Petch.

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	-0.1	±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

T. Petch.

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	53.9	-0.1	± 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	29.9	-0.1	± 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	25.8	-0.2	± 1.1
25.0	24.8	-0.2	± 1.1

T. Petch.

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, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-0.4	±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

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.8	89.5	-0.3	±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 lavel of confidence of approximately 95 %

End of Calibration Certificate

ROTA METER CALIBRATION RESULT JANUARY 2022

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R^2)
BKK_FS0577	05 Jan 22	Y = 0.9899x + 0.9112	0.9999
BKK_FS0579	05 Jan 22	Y = 1.007x - 0.0299	1.0000
BKK_FS0583	05 Jan 22	Y = 1.0513x + 1.869	0.9967
BKK_FS0584	05 Jan 22	Y = 1.0048x - 1.069	1.0000
BKK_FS0585	05 Jan 22	Y = 1.0076x - 1.1036	0.9999
BKK_FS0586	05 Jan 22	Y = 0.9933x + 3.2655	1.0000
BKK_FS0587	05 Jan 22	Y = 1.0401x - 17.457	0.9996
BKK_FS0588	05 Jan 22	Y = 1.0154x + 4.8357	0.9999
BKK_FS0589	05 Jan 22	Y = 0.9918x + 4.8069	0.9999
BKK_FS0590	05 Jan 22	Y = 0.9861x + 10.07	0.9995
BKK_FS0591	05 Jan 22	Y = 1.0117x - 92.415	0.9995
BKK_FS0592	05 Jan 22	Y = 1.0031x - 69.305	0.9996
BKK_FS0593	05 Jan 22	Y = 1.0131x - 98.198	0.9996
BKK_FS0594	05 Jan 22	Y = 1.0075x - 7.0829	0.9999
BKK_FS0595	05 Jan 22	Y = 1.0249x - 98.162	0.9999
BKK_FS0596	05 Jan 22	Y = 0.9843x - 26.806	0.9991
BKK_FS0597	05 Jan 22	Y = 1.0203x - 122.14	0.9999
BKK_FS1004	04 Jan 22	Y = 0.9651x + 19.648	0.9989
BKK_FS1005	04 Jan 22	Y = 1.0096x + 4.6643	0.9997
BKK_FS1006	04 Jan 22	Y = 1.2188x - 7.1214	0.9994
BKK_FS1007	05 Jan 22	Y = 1.0563x - 1.0912	1.0000
BKK_FS1008	05 Jan 22	Y = 0.9689x + 1.9061	1.0000
BKK_FS1009	05 Jan 22	Y = 1.0132x + 1.1633	0.9960
BKK_FS1010	05 Jan 22	Y = 1.0033x + 0.5758	0.9999
BKK_FS1014	05 Jan 22	Y = 1.0021x + 0.3148	0.9998
BKK_FS1015	05 Jan 22	Y = 0.9994x + 1.786	1.0000
BKK_FS1016	05 Jan 22	Y = 1.0105x - 80.256	0.9998
BKK_FS1017	05 Jan 22	Y = 0.9995x + 0.649	1.0000
BKK_FS1018	05 Jan 22	Y = 1.0011x + 1.1786	1.0000
BKK_FS1019	05 Jan 22	Y = 1.0023x - 68.424	0.9996
BKK_FS1020	05 Jan 22	Y = 0.9887x + 2.8844	0.9999
BKK_FS1021	05 Jan 22	Y = 0.9659x + 1.4905	0.9978
BKK_FS1022	05 Jan 22	Y = 1.022x - 17.957	0.9997
BKK_FS1023	05 Jan 22	Y = 1.0094x + 0.0717	0.9999
BKK_FS1024	05 Jan 22	Y =1.0042x + 0.4086	0.9997
BKK_FS1025	05 Jan 22	Y = 1.0132x - 88.507	0.9996
BKK_FS1026	05 Jan 22	Y = 0.9902x + 0.9554	1.0000
BKK_FS1027	05 Jan 22	Y = 1.0086x - 2.279	1.0000
BKK_FS1028	05 Jan 22	Y = 1.0105x - 81.055	0.9997

ROTA METER CALIBRATION RESULT JANUARY 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 : (Mr. Wichan Choonharat) Enviro Field Services Manager

Approved By : (Mr.Sarayuth Jittranont) Assistant General Manager

ROTA METER CALIBRATION RESULT APRIL 2022

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

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 : (Mr. Wichan Choonharat) Enviro Field Services Manager

Approved By : (Mr.Sarayuth Jittranont) Assistant General Manager

RYG_EN0004

PENTA CALIBRATION CO., LTD.
66/124 The Connect 33 Village Kanchanaphisek Road
Dokmai Prawet Bangkok 10250
Tel: +66 (0) 2069-9773
www.pentacal.com

Certificate of Calibration

NSC-TISI-TIS17025 CALIBRATION 0324

Represent to Certificate of Calibration ,PTC/07/22104

Certificate No.:	PTC/07/22104	Page:	1 of 3
Equipment:	Digital Balance	Condition:	Normal
Manufacturer:	Sartorius	Serial No:	33108993
Model:	MSE125P-100-DU	ID No:	RYG_EN0004
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 Thanitall.
APPROVED BY P.
NEXT CAL. DATE 28/00/23.

Environment Condition: Temperature 23.9 °C ± 0.3 °C; Humidity 58.1 %RH ± 4.4 %RH; Air density 1.17 kg/m^3

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. Rungroje Metakul

PENTA CALIBRATION CO.,LTD

(Mr.Kriangsak Kalasri) Reviewed by

Approved By : (Mr. Keattisak Kerdto) Laboratory Manager

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 recognised 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). The effect that the results relate only to the items calibrated.

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Represent to Certificate of Calibration ,PTC/07/22104

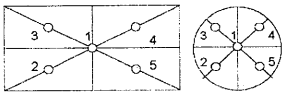
Certificate No.: PTC/07/22104 Page: 2 of 3

Measurement Results:

Without Adjustment :

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3 .1/2 or of Maximum capacity



Eccentricity test 50 (g)

Position (g)				
1	2	3	4	5
0.00000	-0.00004	-0.00001	0.00000	0.00001
Maximum deviation:		0.00004		

Repeatability Test : Weight to be 1/2 ≤ L_1 ≤ Maximum capacity

Determination of the standard deviation of weighing balance., Readability 0.00001 (g)

Nominal test value (g)	Standard Deviation
50	0.000007

Error of indication : from nominal value., Readability 0.00001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.000000	0.00000	0.00000	0.000020	2.65
0.01	0.010001	0.01000	0.00000	0.000022	2.17
0.05	0.050002	0.04999	0.00001	0.000022	2.17
0.1	0.099999	0.09999	0.00001	0.000022	2.17
0.5	0.500001	0.50001	-0.00001	0.000022	2.17
1	1.000004	0.99999	0.00001	0.000022	2.14
2	1.999999	1.99999	0.00001	0.000022	2.14
5	5.000015	4.99999	0.00002	0.000023	2.14
10	10.000004	10.00000	0.00000	0.000024	2.10
20	20.000029	20.00000	0.00003	0.000032	2.00
50	50.000043	49.99999	0.00005	0.000069	2.00

Note: Weight of adjust - (g)

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Represent to Certificate of Calibration ,PTC/07/22104

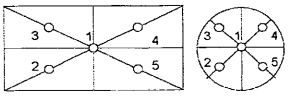
Certificate No.: PTC/07/22104

Measurement Results:

Without Adjustment :

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3 .1/2 or of Maximum capacity



Eccentricity test 50 (g)

Position (g)				
1	2	3	4	5
0.0000	0.0000	0.0000	0.0000	0.0000
Maximum deviation:			0.0000	

Repeatability Test : Weight to be 1/2 $\leq L_1 \leq$ Maximum capacity

Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
100	0.00000

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
65	65.00006	65.0000	0.0001	0.00013	2.00
70	70.00007	70.0000	0.0001	0.00013	2.00
75	75.00009	75.0000	0.0001	0.00014	2.00
80	80.00008	80.0000	0.0001	0.00014	2.00
85	85.00009	85.0000	0.0001	0.00015	2.00
90	90.00010	90.0000	0.0001	0.00015	2.00
95	95.00012	95.0000	0.0001	0.00016	2.00
100	100.00004	100.0000	0.0000	0.00014	2.00
110	110.00004	110.0000	0.0000	0.00015	2.00
120	120.00007	120.0000	0.0001	0.00016	2.00

Note: Weight of adjust - (g)

The End of Certificate

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Certificate of System Qualification

GC-OQ + GCMS-OQ

REVIEW BY Sarawut M.
APPROVED BY
NEXT CAL. DATE 1 April 23

System ID: GM-2
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Phatthanakan 40, Phattanakan Rd., Kheiwaeng Suan Luang, Khet Suan Luang, Bangkok 10250
Date: October 1, 2021 1:10:17 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.51, GCMS.02.51
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 MMI

Setpoint Status: **Pass**

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	24.9	psi

Accuracy: 0.1 psi
Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

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Setpoint Status: Pass
Zone: Oven

	Setpoint	Actual	
Temperature:	230.0	230.5	°C

Accuracy: 0.5 °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	
Temperature:	100.0	101.5	°C

Accuracy: 1.5 °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	
Temperature:	100.0	101.5	°C

Stability: 0.0 °C
Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1 Front MMI / External SQ
Name: 5975C Inert XL with TAD

Setpoint Status: Pass

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Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front MMI / External SQ
Name: 5975C inert XL with TAD

Setpoint Status: Pass

Amu: 1050 m/z

	Drift After Five Minutes:				RFPA Voltage:
	6 mV				461 mV
Agilent Recommended:	>= -100	and	<=	100	<= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front MMI / External SQ
Name: 5975C inert XL with TAD

Setpoint Status: Pass
Filament: 1

Setpoint Status: Pass
Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1 Front MMI / External SQ
Injection Tower
Name: 7693A
Source: EI - Inert

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Signal to Noise EI

Tested Combination1 Front MMI / External SQ

Name: 5975C Inert XL with TAD

Source: EI - Inert Filament: 1

Setpoint Status: Pass

Signal to Noise: 619

Agilent Recommended: >= 320

Source: EI - Inert Filament: 2

Setpoint Status: Pass

Signal to Noise: 647

Agilent Recommended: >= 320

Overall Signal to Noise EI Test Status

Pass

Injection Precision

Tested Combination1 Front MMI / External SQ

Name: 7693A

Source: EI - Inert

Setpoint Status: Pass

Injection Volume on Column: 1.0 uL

Area RSD: 4.75 % Retention Time RSD: 0.02 %

Agilent Recommended: <= 5.00 <= 1.00

Overall Injection Precision Test Status

Pass

Mass Ratio Precision

Tested Combination1 Front MMI / External SQ

Injection Tower

Name: 7693A

Source: EI - Inert

Setpoint Status: Pass

Injection Volume on Column: 1.0 uL

	Area Mass 1 Abundance*s	Mass Ratio
RSD:	4.75 %	0.81 %
Agilent Recommended:	<= 5.00	<= 5.00
	Pass	Pass

Overall Mass Ratio Precision Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GM-2
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
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN10120123
Firmware Revision	A.10.06
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN10060099
Firmware Revision	A.10.16
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN10141049
Firmware Revision	A.01.16
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	MMI
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	5975C inert XL with TAD
Serial Number	US10153217
Firmware Revision	5.02.12
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std

MS EI Source 1

Manufacturer	Agilent Technologies
Source Type	EI - Inert
Number of filaments	2

Electronic Signature

Purpose

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Details

Full Name of Signer:	Supasak Nimsongtham
Logged On User Name:	supasak.nimsongtham@agilent.com
Signature Creation Date:	October 1, 2021
Reason for Signature:	Executed protocol and published this original version of document

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User Name: supasak.nimsongtham
Hostname: 5CG1115HKC
System Id: GM-2
Print Date: October 1, 2021 1:10:19 PM

ALS_GM2 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 1, 2021 12:42:37 PM	Audit	SessionCreated	Session	None
October 1, 2021 12:42:37 PM	Start	Configuration	Session	None
October 1, 2021 12:42:37 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
October 1, 2021 12:44:21 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.51/Gc.02.51.eqp], EQP File Name: [Gc.02.51.eqp], EQP Name: [AgilentRecommended] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.51/GcMs.02.51.eqp], EQP File Name: [GcMs.02.51.eqp], EQP Name: [AgilentRecommended]
October 1, 2021 12:44:24 PM	End	Configuration	Session	None
October 1, 2021 12:44:28 PM	Start	Qualification	Session	OQ
October 1, 2021 12:44:28 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None

Page 1 / 7

User Name: supasak.nimsongtham
Hostname: 5CG1115HKC
System Id: GM-2
Print Date: October 1, 2021 1:10:19 PM

ALS_GM2 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 1, 2021 12:47:35 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1
October 1, 2021 12:47:37 PM	Start	Execution	Inlet Pressure Accuracy - Front MMI: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 1, 2021 12:47:42 PM	End	Execution	Inlet Pressure Accuracy - Front MMI: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 1, 2021 12:47:44 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 1, 2021 12:48:04 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 1, 2021 12:48:05 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 1, 2021 12:48:07 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 1, 2021 12:48:34 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
October 1, 2021 12:48:36 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

Page 2 / 7

User Name: supasak.nimsongtham
Hostname: 5CG1115HKC

System Id: GM-2
Print Date: October 1, 2021 1:10:19 PM

ALS_GM2 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 1, 2021 12:48:38 PM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
October 1, 2021 12:49:34 PM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
October 1, 2021 12:49:36 PM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
October 1, 2021 12:49:37 PM	Start	Execution	Log Amp - 5975C Inert XL with TAD SQ: - Source: EI - Inert	None
October 1, 2021 12:49:47 PM	End	Execution	Log Amp - 5975C Inert XL with TAD SQ: - Source: EI - Inert	Run Count : 1
October 1, 2021 12:49:48 PM	Start	Execution	RFPA - 5975C Inert XL with TAD SQ: - Source: EI - Inert	None
October 1, 2021 12:50:23 PM	End	Execution	RFPA - 5975C Inert XL with TAD SQ: - Source: EI - Inert	Run Count : 1
October 1, 2021 12:50:25 PM	Start	Execution	Tune EI - 5975C Inert XL with TAD SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	None
October 1, 2021 12:50:49 PM	End	Execution	Tune EI - 5975C Inert XL with TAD SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
October 1, 2021 12:50:50 PM	Start	Execution	Tune EI - 5975C Inert XL with TAD SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated)	None
October 1, 2021 12:50:59 PM	End	Execution	Tune EI - 5975C Inert XL with TAD SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated)	Run Count : 1

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User Name: supasak.nimsongtham
Hostname: 5CG1115HKC

System Id: GM-2
Print Date: October 1, 2021 1:10:19 PM

ALS_GM2 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 1, 2021 12:51:01 PM	Start	Execution	Scouting Run - Injection Tower, Front MMI, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	None
October 1, 2021 12:51:18 PM	Audit	Data	Scouting Run - Injection Tower, Front MMI, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	Data files Path : E:\GM2OQ2021\SCOUTING RUN001.D\DATA.MS
October 1, 2021 12:51:42 PM	Audit	Data	Scouting Run - Injection Tower, Front MMI, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	Data files Path : E:\GM2OQ2021\SCOUTING RUN001.D\DATA.MS
October 1, 2021 12:52:42 PM	Audit	Data	Scouting Run - Injection Tower, Front MMI, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	Data files Path : E:\GM2OQ2021\SCOUTING RUN001.D\DATA.MS
October 1, 2021 12:53:25 PM	End	Execution	Scouting Run - Injection Tower, Front MMI, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	Run Count : 1
October 1, 2021 12:53:27 PM	Start	Execution	Signal to Noise EI - Injection Tower, Front MMI, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None
October 1, 2021 12:53:40 PM	Audit	Data	Signal to Noise EI - Injection Tower, Front MMI, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	Data files Path : E:\GM2OQ2021\SNF1_001.D \DATA.MS
October 1, 2021 12:53:56 PM	End	Execution	Signal to Noise EI - Injection Tower, Front MMI, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	Run Count : 1

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User Name: supasak.nimsongtham
Hostname: 5CG1115HKC

System Id: GM-2
Print Date: October 1, 2021 1:10:19 PM

ALS_GM2 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 1, 2021 12:53:59 PM	Start	Execution	Signal to Noise EI - Injection Tower, Front MMI, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	None
October 1, 2021 12:54:04 PM	Audit	Data	Signal to Noise EI - Injection Tower, Front MMI, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	Data files Path : E:\GM2OQ2021\SNF2_001.D \DATA.MS
October 1, 2021 12:54:22 PM	End	Execution	Signal to Noise EI - Injection Tower, Front MMI, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	Run Count : 1
October 1, 2021 12:54:28 PM	Start	Execution	Injection Precision - Injection Tower, Front MMI, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	None
October 1, 2021 12:54:37 PM	Audit	Data	Injection Precision - Injection Tower, Front MMI, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\GM2OQ2021\IP_MRP003. D\DATA.MS
October 1, 2021 12:54:37 PM	Audit	Data	Injection Precision - Injection Tower, Front MMI, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\GM2OQ2021\IP_MRP004. D\DATA.MS
October 1, 2021 12:54:37 PM	Audit	Data	Injection Precision - Injection Tower, Front MMI, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\GM2OQ2021\IP_MRP005. D\DATA.MS
October 1, 2021 12:54:37 PM	Audit	Data	Injection Precision - Injection Tower, Front MMI, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\GM2OQ2021\IP_MRP006. D\DATA.MS

Page 5 / 7

User Name: supasak.nimsongtham
Hostname: 5CG1115HKC

System Id: GM-2
Print Date: October 1, 2021 1:10:19 PM

ALS_GM2 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 1, 2021 12:54:37 PM	Audit	Data	Injection Precision - Injection Tower, Front MMI, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\GM2OQ2021\IP_MRP007. D\DATA.MS
October 1, 2021 12:54:37 PM	Audit	Data	Injection Precision - Injection Tower, Front MMI, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\GM2OQ2021\IP_MRP008. D\DATA.MS
October 1, 2021 12:54:52 PM	End	Execution	Injection Precision - Injection Tower, Front MMI, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Run Count : 1
October 1, 2021 12:54:55 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front MMI, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	None
October 1, 2021 12:55:06 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MMI, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : E:\GM2OQ2021\IP_MRP003. D\DATA.MS
October 1, 2021 12:55:06 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MMI, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : E:\GM2OQ2021\IP_MRP004. D\DATA.MS
October 1, 2021 12:55:06 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MMI, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : E:\GM2OQ2021\IP_MRP005. D\DATA.MS
October 1, 2021 12:55:06 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MMI, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : E:\GM2OQ2021\IP_MRP006. D\DATA.MS

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Agilent CrossLab Compliance Services

User Name: supasak.nimsongtham
Hostname: SCG1115HKC

System Id: GM-2
Print Date: October 1, 2021 1:10:19 PM

ALS_GM2 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 1, 2021 12:55:06 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MMI, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : E:\GM2\OQ2021\P_MRP007.D\DATA.MS
October 1, 2021 12:55:06 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MMI, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : E:\GM2\OQ2021\P_MRP008.D\DATA.MS
October 1, 2021 12:55:10 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front MMI, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Run Count : 1
October 1, 2021 12:55:13 PM	End	Qualification	Session	OQ
October 1, 2021 12:55:13 PM	Start	Reporting	Session	None
October 1, 2021 1:09:11 PM	Audit	Reporting	Session	Report Generated : Certificate

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Date: October 1, 2021 1:10:17 PM
System ID: GM-2

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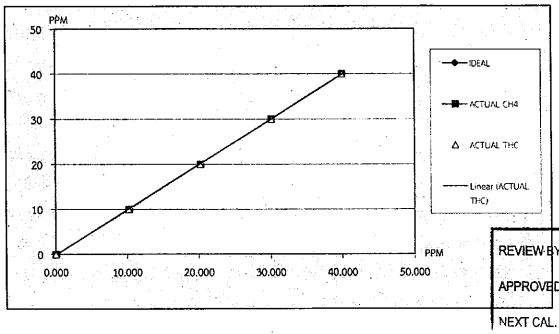
TEST REPORT

CUSTOMER NAME	: ALS Laboratory Group (Thailand) Co., Ltd. [บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด]				
EQRIPMENT NAME	: THC Analyzer				
MANUFACTURER	: HORIBA	MODEL	: APHA-370	SERIAL NO	: U430GTHB
STANDARD GAS CONCENTRATION (PPM) :	506.1 PPM			CYLINDER NO	: CC734373
CYLINDER PRESSURE (psig) :	1,600 PSI			CERTIFIED DATE	: 12/05/2020
CERTIFIED BY :	AIRGAS			EXPIRED DATE	: 12/05/2028

TEST RESULTS

POINT NO	TEST RESULTS						
	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	10.240	0.240	2.40	10.210	0.210	2.10
2	20.000	20.230	0.230	1.15	20.200	0.200	1.00
3	30.000	30.120	0.120	0.40	30.170	0.170	0.57
4	40.000	40.000	0.000	0.00	40.000	0.000	0.00
AVERAGE (%)				0.99			0.92



REVIEW BY Thanitaik.
APPROVED BY
NEXT CAL. DATE 14/1/2023

CALIBRATED BY : วรายุส ศิลปจารีย์ DATE : 4/1/65
CHECKED BY : สันติ ปัสนะ DATE : 14/1/65

JIRANATE ASSOCIATES CO., LTD.

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 15,16 , E-Mail : Engineer@jiranatee.com
เลขที่ 63/14-15,67/35-36 ถนนเพชรเกษม 7,7/1 แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-8680812-13 โทรสาร 02-868-1889

FO-EN-206 R01/22-10-14

CHECK LIST

CUSTOMER NAME : ALS Laboratory Group (Thailand) Co., Ltd. [บริษัท เอแอลเอส แลบอราทอรี 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 (CH4)	mV	29.500	51.300
2	Signal (THC)	mV	39.200	56.500
3	Detector	Temp °C , Standard Value : Ambient temp+(5°Cto15°C)	47.300	47.400
		Pressure kPa , Standard Value : (Ambient/1013x100-20)±4kPa	81.900	81.800
4	Ambient	kPa current atmospheric pressure	101.500	101.400
5	Purlifire	°C , Standard Value : 390 °C to 430 °C	420.200	420.300
		kPa , Normal value : 8 kPa to 25 kPa	10.200	10.300
6	NMHC	°C , Standard Value : 230 °C to 260 °C	243.000	243.200
7	DC 24 V	V , Standard Value : 24 V ± 0.5 V	23.900	23.900
8	DC 5 V	V , Standard Value : 5 V ± 0.5 V	5.000	5.000
9	Bypass (Optional)	L/min, Normal value : 0.9 L/min ± 0.3 L/min	-	-
10	Over Flow (Optional)	L/min, Standard Value : 0.8 L/min or More	-	-
11	CH4 Samping Reading	PPM	2.900	3.680
12	NMHC Samping Reading	PPM	0.720	0.230
13	THC Samping Reading	PPM	3.620	3.730
14	Zero Gas CH4/THC	PPM	0.27/0.32	0.00/0.00
15	Span Gas	PPM	37.80/37.85	40.0/40.0
G	Gas H2 ...../.....	20 PSI	20	20

Remark : Reference EX-EN-017-56 , Ambient HC Monitor APHA-370 Operetion Manual Page #81
Remark : (Ambeint temperature = 5°C to 40°C)

อาการที่ตรวจพบ
- Service Maintenance

รายละเอียดการดำเนินการ
-

ผลการดำเนินการ
- เรียบร้อย เครื่องสามารถดำเนินการตรวจวัดได้ตามปกติ

CALIBRATED BY : วรายุส ศิลปจารีย์ DATE : 14/1/65
CHECKED BY : สันติ ปัสนะ DATE : 14/1/65

JIRANATE ASSOCIATES CO., LTD.

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 15-16 , E-Mail : Engineer@jiranatee.com
เลขที่ 63/14-15,67/35-36 ซอยเพชรเกษม 7,7/1 ถนนเพชรเกษม แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-868-0812-13 โทรสาร 02-868-1889

FO-EN-207 R00/01-08-13

Cert. No.: 21E1084
Page.: 2 of 2

Result of calibration :- (*) Without adjustment ( ) After adjustment
Function: DC voltage measurement **Range:** 2000 mV

Standard Value (mV)	UUC* Reading (mV)	Error (mV)	Uncertainty (± µV)
-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.

-oOo-

a 1049303

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484

NSC-TISI-TIS17025 CALIBRATION 0008

Cert.No.: 21CH432
Page.: 1 of 3

Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	SevenCompact S220
Serial No. :	C104059460
ID No. :	RYG_EN0183
Condition As-Received:	Used Item
Received Date :	19 March 2021
Calibration Date :	23 March 2021
Reference :	2103-0903DSC-1
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. Bannyt
APPROVED BY D.
NEXT CAL. DATE 23/3/22.

Calibrated by : Warakorn Lerngagtrakul

Approved by : Malee
Approved Signatory

(✓) Malee Butkruea
( ) Saithip Meangmai
( ) Warakorn Lerngagtrakul

Issue Date : 26 March 2021

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 3 : Equipment Calibration and Testing Services.

A 0026344

Cert.No.: 21CH432
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	46530031	130RC098	20E3666	14 Oct 2021
2) Ref. Standard Thermometer	2188080	130RC044	20I1389	19 Nov 2021

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	706694	06 Sep 2022
pH 6.985	CPA chem	722285	19 Dec 2021
pH 10.012	CPA chem	722287	19 Dec 2021

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	Coverage factor
	pH	mV	mV	pH	(±mV)	k
pH Meter	4.000	177.48	177.4	4.000	0.058	2.00
S/N.: C104059460	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.6	10.000	0.058	2.00

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a 1048440

Cert.No.: 21CH432
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 (±)	Coverage factor k
pH Electrode	4.008	4.012	177.3	0.0045	2.00
S/N.: 0485148	6.985	6.995	3.5	0.0078	2.00
	10.012	10.005	-171.8	0.013	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;
- Model : InLab Expert Pro-ISM
- Serial No. : 0485148

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 (±°C)	Coverage factor k
25.0	25.003	25.1	0.097	0.20	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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Malee

a 1048439

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

NSC-TISI-TIS17025 CALIBRATION 0006

Certificate of Calibration

Certificate No. : 21E1084
Page : 1 of 2

Equipment :	pH Meter
Manufacturer:	Mettler Toledo
Model :	SevenCompact S220
Serial No.:	C104059460
ID No.:	RYG_EN0183
Condition As-Received:	Used Item
Received Date:	19 March 2021
Calibration Date:	30 March 2021
Reference:	2103-0903DSC
Ambient Temperature:	(23 ± 2) °C
Relative Humidity:	(50 ± 10) %
Submitted by:	ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch 616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand

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.

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 instuments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6440007	20E1574	07 May 2021

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)

Calibrated by : Pongsagorn Boonyaporn
Issue Date : 01 April 2021

Approved Signatory :
[ ] Phalinee Prabpaipal
[✓] Nuntawat Khamchai
[ ] Pornthippa Tameyakul

B 0257856

Result of calibration :- (*) Without adjustment ( ) After adjustment

Function: DC voltage measurement **Range:** 2000 mV

Standard Value (mV)	UUC* Reading (mV)	Error (mV)	Uncertainty (± µV)
-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.

-o0o-

a 1049303

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484

NSC-TISI-TIS17025 CALIBRATION 8908

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

REVIEW BY N.Bamrit
APPROVED BY
NEXT CAL. DATE 17/3/23

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

Calibrated by : Warakorn Lerngagtrakul

Approved by : Approved Signatory

(✓) Malee Butkruea
( ) Saithip Meangmai
( ) Warakorn Lerngagtrakul

Issue Date : 22 March 2022

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 3 : Equipment Calibration and Testing Services.

A 0037307

Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	21E2682	25 Aug 2022
2) Ref. Standard Thermometer	4982054	110RC044	21I1201	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		
pH Meter	4.000	177.48	177.4	4.000	0.058	2.00
S/N.: C104059460	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

Malu.

a 1100955

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 (±)	Coverage factor k
pH Electrode	4.008	4.010	177.7	0.0046	2.00
S/N.: 1453404	6.982	6.988	3.6	0.0084	2.00
	10.015	10.010	-172.9	0.0073	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 (± °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 %.

-o0o-

Malu.

a 1100954

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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NSC-TISI-TIS17025
CALIBRATION 0008

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
Condition As-Received: Used Item
Received Date: 16 March 2022
Calibration Date: 21 March 2022

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: 2203-0611DSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 10) %

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-E17 According to direct measurement method with Multi-Product Calibrator.

Condition of this result of calibration

1.Reference standards instuments :

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 N.Bankit
APPROVED BY D.
NEXT CAL. DATE 21/3/23

Calibrated by : Pongsagorn Boonyaporn
Issue Date : 22 March 2022

Approved Signatory :
[✓] Phalinee Prabpaipal
[ ] Nuntawat Khamchai
[ ] Pornthippa 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 (mV)	UUC* Reading (mV)	Error (mV)	Uncertainty (± µV)
-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.**

-o0o-

a 1101070

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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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

REVIEW BY N.Bankit
APPROVED BY D.
NEXT CAL. DATE 3/8/22

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

Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %

Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Calibrated by : Walalak Sirithean

Approved by : Malu.
Approved Signatory

(✓) Malee Butkruea
( ) Saithip Meangmai
( ) Warakorn Lemgagtrakul

Issue Date : 3 February 2021

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

-o0o-

Malu.

a 1038971

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NSC-TISI-TIS17025 CALIBRATION 0008

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

Cert. No.: 21TM271
Page.: 2 of 2

Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2101-0817DSC-2

Procedure Used :-

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	20I1389	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 %.

-o0o-

a 1038626

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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NSC-TISI-TIS17025 CALIBRATION 0008

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

REVIEW BY
APPROVED BY
NEXT CAL. DATE 21/10/23

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

Cert. No.: 22TM317
Page.: 2 of 3

Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2204-0146OC-1

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

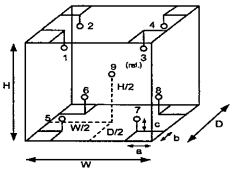
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

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

Probe Installation Details :

a =	10	cm
b =	10	cm
c =	10	cm

Dimension of Chamber :

D =	0.60	m
W =	1.0	m
H =	1.2	m
Capacity =	0.75	m³

a 1106485

Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2204-0146OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 22TM317
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*
20.0	20.0	20.0	0.022	0.20	0.22	0.30	2

Calibration Point (°C)	Measured Temperature (°C) Position								
	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 %.

-o0o-

a 1106484

RYG_EN0002

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www.pentacal.com

Certificate of Calibration

NSC-TISI-TIS17025 CALIBRATION 0324

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-DU	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 Thanitall.
APPROVED BY D.
NEXT CAL. DATE 23/03/23

Environment Condition: Temperature 23.9 °C ± 0.3 °C
Humidity 58.1 %RH ± 4.4 %RH
Air density 1.17 kg/m^3

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. Rungroje Metakul

PENTA CALIBRATION CO.,LTD.

(Mr.Kriangsak Kalasri)
Reviewed by

Approved By :
(Mr. Keattisak Kerdto)
Laboratory Manager

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 recognised 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). The effect that the results relate only to the items calibrated.
This calibration certificate shall not be reproduced except in full only, without written approval from penta calibration co ., ltd

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www.pentacal.com

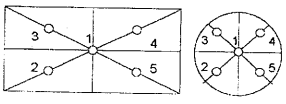
Represent to Certificate of Calibration ,PTC/07/22103
Certificate No.: PTC/07/22103 Page: 2 of 2

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 ≤ L, ≤ 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	5.00001	5.0000	0.0000	0.00010	2.06
10	10.00000	10.0000	0.0000	0.00010	2.06
20	20.00003	19.9999	0.0001	0.00011	2.05
50	50.00004	49.9999	0.0001	0.00012	2.00
100	100.00004	100.0001	-0.0001	0.00017	2.00
200	200.00011	200.0000	0.0001	0.00027	2.00

Note: Weight of adjust - (g)

The End of Certificate

RYG_EN0010

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NSC-TISI-TIS17025 CALIBRATION 0008

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

REVIEW BY Thanitall.
APPROVED BY D.
NEXT CAL. DATE 3/11/22

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 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Khit Ruttanaprapachai

Approved by :
Approved Signatory

( ) Pornthippa Tameyakul
(✓) Malee Butkruea
( ) Suwit Imjai

Issue Date : 14 May 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 0028099

Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-4

Cert. No.: 21TM827
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) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

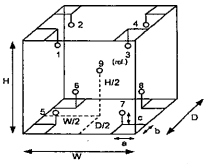
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	21LM3	26 Feb 2022

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



Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	29
REL.Humid. (%)	59	56
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.: @ Calibration Point (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

Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm

Dimension of Chamber :

D = 0.40 m
W = 0.56 m
H = 0.48 m
Capacity = 0.11 m³

Malu .

a 1054287

Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-4

Cert. No.: 21TM827
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*
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

Calibration Point (°C)	Measured Temperature (°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 %.

-o0o-

Malu .

a 1054286

RYG_EN0006

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NSC-TISI-TIS17025 CALIBRATION 0008

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

REVIEW BY Thanatall.
APPROVED BY D.
NEXT CAL. DATE 3/n/22

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 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Khit Ruttanaprapachai

Approved by : Malu .
Approved Signatory

( ) Pornthippa Tameyakul
( ) Malee Butkruea
( ) Suwit Imjai

Issue Date : 14 May 2021

The Uncertainties are for a confidence probability of approximately 95%

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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:-

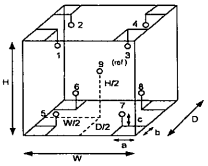
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	21LM3	26 Feb 2022

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



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

Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm

Dimension of Chamber :

D = 0.33 m
W = 0.40 m
H = 0.40 m
Capacity = 0.053 m³

Malu .

a 1054310

Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM829
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*
70.0	70.0	70.0	0.21	1.8	2.0	0.55	2

Calibration Point (°C)	Measured Temperature (°C) Position								
	1	2	3	4	5	6	7	8	9 (ref.)
70.0	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 %.

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a 1054309

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484

NSC-TISI-TIS17025 CALIBRATION 0008

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
Location : Wet Chemistry Lab

REVIEW BY Thanitak
APPROVED BY
NEXT CAL. DATE 3/11/22

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 :
Approved Signatory

( ) Pornthippa Tameyakul
(✓) Malee Butkruea
( ) Suwit Imjai

Issue Date : 14 May 2021

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 3 , Equipment Calibration and Testing Services.

A 0028098

Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2105-0005OC-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 (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

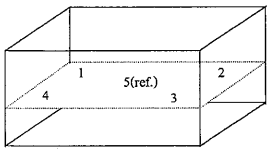
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44060450	21LM4	06 Mar 2022

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

Cert. No.: 21TM673
Page.: 2 of 3

	Environmental (°C)	Environmental (%R.H.)	AC Voltage Supply (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

a 1054289

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

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

NSC-TISI-TIS17025 CALIBRATION 0008

Certificate of Calibration

Certificate No. : 21T1200

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 to 08 July 2021
Reference: 2107-0069DSC
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 instuments :

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 Tanonit.
APPROVED BY Supt S
NEXT CAL. DATE 7/7/22

Calibrated by : Yossapon Poljorn
Issue Date : 09 July 2021

Approved Signatory :
[ ] Phalinee Prabpalpal
[ ] Chatchawan Khunpiluek
[✓] Wanlop Larpkum

B 0265214

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%.

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a 1063351

SPC Calibration Center

SPCRT Part of DKSH Group
RYG_EN0188

Certificate of Calibration

Equipment: Block Digestion Unit
Model: KT-20s
Serial No. (or ID.): 5720210009/5770200073
Manufacturer: Gerhardt
Condition: In Condition

Certificate No.: C29220011
Issued Date: 18 March 2022
Job No.: KSPR2203623
Page: 1 of 3
Digestion Block: 20 holes.

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

REVIEW BY N-Bamit
APPROVED BY D
NEXT CAL. DATE 17/3/23

Environment Condition:
Temperature: 24 °C ± 0.8 °C
Humidity: 67 %RH ± 2.2 %RH
Voltage: 226 VAC ± 1.7 VAC

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. Worachat Hongkaew
Calibration Date: 17 March 2022
The Method used: In house method, base on by comparison with standard
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through N.M. Technical Center Laboratory (NTL) Certificate No.: TC21/0075

SPCRT บริษัท เอสพีซี อาร์ที จำกัด SPC RT Co., Ltd.

(Mr. Worachat Hongkaew)
Person in charge

(Mr. Udon Srichana)
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.

SPC Calibration Center

SPCRT Part of DKSH Group

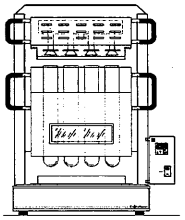
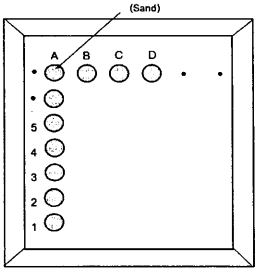


Fig. 1.: Front view



Location of standard

Fig. 2.: Digestion block

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the Digestion block.

Measured Temperature: The average reading of working standard at any positions or location.

บริษัท เอสพีซี อาร์ที จำกัด
SPC RT CO., LTD.
สำนักงานใหญ่ 00003 1194 ซอยวชิรธรรมสาธิต 57 ถนนสุขุมวิท 101/1 แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
Branch 00003 1194 Soi Wachiratharnsadhit 57, Sukhumvit 101/1 Road, Bangchak, Phrakhanong, Bangkok 10260 Thailand
Tel: 0 2185 4333 Fax: 3300-3308, Fax: 0 2185 4424 E-mail: info.spcc@spc-rt.com Website: www.spc-rt.com
SPCC-FM-C29-06: 23 Nov 2020

Calibration Results:
Without adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
A1	380	380	380	378.6	-1.4	1.5
A2				382.2	2.2	1.5
A3				380.2	0.2	1.5
A4				381.5	1.5	1.5
A5				381.2	1.2	1.5
B1				378.8	-1.2	1.5
B2				381.8	1.8	1.5
B3				379.4	-0.6	1.5
B4				382.1	2.1	1.5
B5				380.9	0.9	1.5
C1				378.2	-1.8	1.5
C2				380.0	0.0	1.5
C3				377.4	-2.6	1.5
C4				381.8	1.8	1.5
C5				382.3	2.3	1.5
D1				379.7	-0.3	1.5
D2				378.3	-1.7	1.5
D3				378.8	-1.2	1.5
D4				379.0	-1.0	1.5
D5				379.4	-0.6	1.5

The End of Certificate

บริษัท เอสพีซี อาร์ที จำกัด
SPC RT CO., LTD.
สาขาที่ 00003 1194 ซอยวิชระรรมสาธิต 57 ถนนสุขุมวิท 101/1 แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
Branch 00003 1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Road, Bangchak, Phrakhanong, Bangkok 10260 Thailand
Tel: 0 2185 4333 Ext: 3300-3308 Fax: 0 2185 4424 E-mail: info.spcc@spc-rt.com Website: www.spc-rt.com

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2203623

ชนิดเครื่องมือ: Block Digestion Unit รุ่น: KT-20s

หมายเลขเครื่อง: 5720210009/5770200073

ตรวจสอบ (รับ) 17 Mar 2022 ปกติ	ตรวจสอบ (รับ) 17 Mar 2022 ไม่ปกติ	รายการตรวจเช็ค	ตรวจสอบ (ส่ง) 17 Mar 2022 ปกติ	ตรวจสอบ (ส่ง) 17 Mar 2022 ไม่ปกติ	หมายเหตุ
		General			
☑	☐	1. สายไฟ	☑	☐	
☑	☐	2. การทำงาน Main Switch	☑	☐	
☑	☐	3. การทำงาน Selector Key	☑	☐	
☑	☐	4. การแสดงผล Display	☑	☐	
☑	☐	5. สภาพ Hole	☑	☐	
☐	☐	6. สภาพฝาปิด	☐	☐	ไม่มี
☑	☐	7. สภาพตัวเครื่อง	☑	☐	
☑	☐	8. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	☑	☐	

ข้อแนะนำ : _____

Mr. Worachat Hongkaew
Service Engineer

บริษัท เอสพีซี อาร์ที จำกัด
SPC RT CO., LTD.
สาขาที่ 00003 1194 ซอยวิชระรรมสาธิต 57 ถนนสุขุมวิท 101/1 แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
Branch 00003 1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Road, Bangchak, Phrakhanong, Bangkok 10260 Thailand
Tel: 0 2185 4333 Ext: 3300-3308 Fax: 0 2185 4424 E-mail: info.spcc@spc-rt.com Website: www.spc-rt.com

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TEL. 0-2717-3000-27 FAX. 0-2719-9484

NSC-TISI-TIS17025 CALIBRATION 0006

Cert.No.: 21CH1733
Page.: 1 of 3

Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	SevenExcellence
Serial No. :	B834291445
ID No. :	RYG_EN0152
Condition As-Received:	Used Item
Received Date :	22 December 2021
Calibration Date :	23 December 2021
Reference :	2112-0636DSC-2
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.Bangmai
APPROVED BY D.
NEXT CAL. DATE 23/12/22

Calibrated by : Warakorn Lerngagtrakul

Approved by : Malee
Approved Signatory

(✓) Malee Butkruea
( ) Saithip Meangmai
( ) Warakorn Lerngagtrakul

Issue Date : 24 December 2021

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced either than in full, except with the prior written Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	21E2682	25 Aug 2022
2) Ref. Standard Thermometer	4982054	110RC044	21I1201	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	761016	02 Aug 2023
pH 6.982	CPA chem	761017	02 Aug 2022
pH 10.015	CPA chem	761018	02 Aug 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	Coverage factor
	pH	mV	mV	pH	(±mV)	k
pH Meter	4.000	177.48	177.3	4.000	0.058	2.00
S/N.: B834291445	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

Malee

Cert.No.: 21CH1733
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 (±)	Coverage factor *k*
pH Electrode	4.008	4.011	180.6	0.0049	2.05
S/N.: 1475518	6.982	6.984	5.3	0.0077	2.00
	10.015	10.014	-171.3	0.0065	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab Expert Pro-ISM
- Serial No. : 1475518

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 (±°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 1087180

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

NSC-TRSI-TS517025 CALIBRATION 0008

Certificate of Calibration

Certificate No. : 21E4151
Page : 1 of 2

Equipment : pH Meter
Manufacturer: Mettler Toledo
Model : SevenExcellence
Serial No.: B834291445
ID No.: RYG_EN0152
Condition As-Received: Used Item
Received Date: 22 December 2021
Calibration Date: 28 December 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: 2112-0636DSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 10) %

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-E17 According to direct measurement method with Multi-Product Calibrator.

Condition of this result of calibration

1.Reference standards instuments :

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)

Calibrated by : Wutchareeporn Wongchutikrane
Issue Date : 07 January 2022
Approved Signatory :
[✓] Phalinee Prabpaipal
[ ] Nuntawat Khamchal
[ ] Pornthippa Tameyakul

B 0278122

Cert. No.: 21E4151
Page.: 2 of 2

Result of calibration :- (*) Without adjustment ( ) After adjustment

Function: DC voltage measurement **Range:** 2000 mV

Standard Value (mV)	UUC* Reading (mV)	Error (mV)	Uncertainty (± µV)
-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	199.9	-0.1	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.**

-o0o-

a 1088610

Automation Service Co.,Ltd.
929,929/1 Soi Pattanakarn 30. Pattanakarn Rd., Suanluang, Suanluang, Bangkok 10250
Head Office : Tel. 02-319-9994 ext.1 Fax.02-318-4961 E-mail : atsc@automation.co.th
Rayong Branch : 1/15 Huaypong Rd., A. Muang, Rayong 21150 Tel. 038-692-152 Fax. 038-692-345
Lamphun Branch : 122/5 M.4, T.Ban Klang, A.Muang, Lamphun 51000 Tel/Fax. 053-581-876
website : www.automation.co.th

MTOC : L-1010/2021

Report No. : ALS-799

ASI Maintenance Report

Instrument	: Automatic Sample Injector	Measuring	: Vial 40 mL
Model	: ASI-L	Place of Installation	: -
Serial No.	: H57415200799	Department	: LABOLATORY
Manufacture	: Shimadzu		

Customer: ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaen Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand

Date of Maintenance : 25 / 10 / 2021

Ambient Condition : Temperature 22.6 ± 5 °C
: Humidifier 65 ± 15 %RH

REVIEW BY Siriluk P.
APPROVED BY
NEXT CAL. DATE 25/10/2022

Maintenance By : T.Somsi
(Mr. Tawatchai Somsi)
Technician

Approved By :
(Mr. Nipon Phungsomsak)
Technician Manager

User Name : Siriluk P.
(~~Mr.~~ Miss Siriluk Pueangpeang)

SHIMADZU ANALYZER
1/3

Automation Service Co.,Ltd.
929,929/1 Soi Pattanakarn 30, Pattanakarn Rd., Suanluang, Suanluang, Bangkok 10250
Head Office : Tel. 02-319-9994 ext.1 Fax.02-318-4961 E-mail : atsc@automation.co.th
Rayong Branch : 1/15 Huaypong Rd., A. Muang, Rayong 21150 Tel. 038-692-152 Fax. 038-692-345
Lamphun Branch : 122/5 M.4, T.Ban Klang, A.Muang, Lamphun 51000 Tel/Fax. 053-581-876
website : www.automation.co.th

MTOC : L-1010/2021 Report No. : ALS-799

Maintenance Sheet

Customer : ALS Laboratory Date : 25 / 10 / 2021

Model : ASI-L Serial No. H57415200799

Item	Carry out maintenance work	Result	Exchange	Comment
1.	Arm Drive section	O.K.		
	Check Arm Drive Belt for wear and tension	O.K.		
	Check grease of Screw Arm Drive	O.K.		
2.	Rinse pump (only ASI-V 24ml, 40ml)	O.K.		
	Check pump rate(>40mL/min)	O.K.		
	Check pump and tube connection for leakage	O.K.		
	Check if outlet flow is in proper condition	O.K.		
3.	Check and if necessary exchange consumable, Maintenance parts	O.K.		See appropriate list of maintenance parts
4.	Check Stirrer [When installed]	O.K.		
5.	Verify ASI function via mechanical check	O.K.		

Inspection by : T.Somsi
(Mr. Tawatchai Somsi)
Technician

Automation Service Co.,Ltd.
929,929/1 Soi Pattanakarn 30, Pattanakarn Rd., Suanluang, Suanluang, Bangkok 10250
Head Office : Tel. 02-319-9994 ext.1 Fax.02-318-4961 E-mail : atsc@automation.co.th
Rayong Branch : 1/15 Huaypong Rd., A. Muang, Rayong 21150 Tel. 038-692-152 Fax. 038-692-345
Lamphun Branch : 122/5 M.4, T.Ban Klang, A.Muang, Lamphun 51000 Tel/Fax. 053-581-876
website : www.automation.co.th

MTOC : L-1010/2021 Report No. : ALS-799

List of Consumable, Maintenance parts

Pos.	Part Number	Part Name	Result	Exchange	Recommended Interval
1.	017-27021-01	Grease Paste, Lubricant 100g	O.K.	√	1 time per year
2.	032-22661-02	Belt, 60S2m596, Arm Drive	O.K.		1 time per year Depending on condition
3.	034-03067-02	Spring, F-642, Arm Drive	O.K.		Depending on condition
4.	042-00405-11	Pump Head, for ASI Rinse Pump (only ASI-V 24mL, 40mL)	O.K.		After 300 h of operating
5.	638-41448-01	Std. Needle Type1 24mL, 40mL* (for tube 2, 1x1, 6),[Sparge needle]	N/A		Depending on condition
6.	638-41448-02	Std. Needle Type1 125mL* (for tube 2, 1x1, 6)	N/A		Depending on condition
7.	631-41660-03	Flare Pipe 2x1,5x700mm* (for Standard Needle Type1 24mL,40mL, 125mL)	N/A		Depending on condition (may cut to origin length 600mm)
8.	638-41450-01	Needle for Suspended Particles,* 0,8mm (only ASI-V 24mL, 40mL)	N/A		Depending on condition
9.	638-41450-01	Std. Needle Type2 125mL* (for tube 1,4x0,9)	N/A		Depending on condition
10.	638-41472-01	Std. Needle Type2 24mL, 40mL* (for tube 1,4x0,9)	O.K.		Depending on condition
11.	631-41660-02	Flare Pipe 1,4x0,9x600mm* (for Suspended + Needle Type2)	O.K.		Depending on condition
12.	638-41449-01	Double Needle , only 24mL,40mL (simultaneous sparge type)*	N/A		Depending on condition
13.	631-41660-01	Flare Pipe 1,1x0,6x600mm* (for Double Needle 24mL,40mL)	N/A		Depending on condition

*Note: needed parts depending on installed needle types!

Inspection by : T.Somsi
(Mr. Tawatchai Somsi)
Technician

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website : www.automation.co.th

MTOC : L-1009/2021 Report No. : ALS-416

TOC-L Maintenance Report

Instrument : Total Organic Carbon Analyzer Measuring : TC 0 ~ 30000 mg/L
Model : TOC-LCSH Place of Installation : -
Serial No. : H54425300416 Department : LABORATORY
Manufacture : Shimadzu

Customer ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaen Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand

Date of Maintenance : 25 / 10 / 2021

REVIEW BY Siniluk P.
APPROVED BY K.L. Ad
NEXT CAL. DATE 25/10/22

Ambient Condition : Temperature 22.6 ± 5 °C
: Humidifier 65 ± 15 %RH

Maintenance By : T.Somsi
(Mr. Tawatchai Somsi)
Technician

Approved By : N. Phungsomsak
(Mr. Nipon Phungsomsak)
Technician Manager

User Name : Siniluk P.
(Miss Siniluk Puengpan)

Automation Service Co.,Ltd.
929,929/1 Soi Pattanakarn 30, Pattanakarn Rd., Suanluang, Suanluang, Bangkok 10250
Head Office : Tel. 02-319-9994 ext.1 Fax.02-318-4961 E-mail : atsc@automation.co.th
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website : www.automation.co.th

MTOC : L-1009/2021 Report No. : ALS-416

Maintenance Sheet

Customer : ALS Laboratory Date : 25 / 10 / 2021

Model : TOC-LCSH Serial No. H54425300416

Item	Carry out maintenance work	Result	Exchange	Comment
1.	Check functionality of the device			
	Check furnace temperature (Standard cat. 680 °C / for TN cat. 720 °C)	O.K.		
	Check dehumidifier temperature (1 °C)	O.K.		
	Check the entire flow line related to leakage	O.K.		
	Check baseline status (OK)	O.K.		
	Check carrier gas pressure (200 ±10 kPa)	O.K.		
	Check carrier gas flow rate (150 mL/min)	O.K.		
2.	Tubes			
	Check all tubing for contamination, if necessary clean them	O.K.		
	Check all tubing for tight connection	O.K.		
3.	Container and Drainage			
	Fill up humidifier with pure water to max. level	O.K.		
	Check filling of dilution water and acid container	O.K.		
	Rinse Drain Pot, after wards refill again with pure water	O.K.		
	Check if outlet flow is in proper conditions	O.K.		
4.	TC and IC Injection			
	Clean injector Block	O.K.		
	Check injector Block for wear	O.K.		
	Check injection tube adjustment	O.K.		
	Check injection for leakage	O.K.		
	Check injection for clogging	O.K.		
5.	IC Measurement (N-type)			
	Check acidification in syringe			
	Check sparging in syringe			
6.	Eye check of 8-Port valve, for sample residues or moist spots that indicate possible leakage	O.K.		
7.	Check and if necessary exchange consumable, Maintenance parts	O.K.		See list of consumable, maintenance parts

Inspection by : T.Somsi
(Mr. Tawatchai Somsi)
Technician

Automation Service Co.,Ltd.
929,929/1 Soi Pattanakarn 30, Pattanakarn Rd., Suanluang, Suanluang, Bangkok 10250
Head Office : Tel. 02-319-9894 ext.1 Fax.02-318-4961 E-mail : atsc@automation.co.th
Rayong Branch : 1/15 Huaypong Rd., A. Muang, Rayong 21150 Tel. 038-692-152 Fax. 038-692-345
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website : www.automation.co.th

MTOC : L-1009/2021 Report No. : ALS-416

Item	Carry out maintenance work	Result	Exchange	Comment
8.	Due to instrument condition, clean the instrument inside and outside.	O.K.		
9.	After checking the system and exchanging of consumable and maintenance parts a new 1-3 point calibration have to be done.	O.K.		Addition test 1.
10.	After wards the calibration perform check sample measurement.	O.K.		Addition test 2.

Addition test

Test no.	Test conditions	Meas. value	Result
1.	Calibration TC standard solution at 0, 0.1, 0.5, 1, 5 10, 20 injection volume 50 µL No. of measurement 2 times (Max.3)		Attachment : ALS-416 Page 1/4 -2/4
	Criteria : R^2 = 0.995 or more	1.0000	Pass
2.	Measurement of reagent water and TC standard solution at 5.0 mg/L injection volume 50 µL No. of measurement 2 times (Max.3) and calculate accuracy by Meas. of TC standard – Meas. of Reagent water		Attachment : ALS-416 Page 3/4 - 4/4
	Criteria : Accuracy %Recovery 10% or less	5.222 – 0.1141 = 5.1079 ppm	Pass

Inspection by : T.Somsi

(Mr. Tawatchai Somsi)
Technician

SHIMADZU ANALYZER
3/4

Automation Service Co.,Ltd.
929,929/1 Soi Pattanakarn 30, Pattanakarn Rd., Suanluang, Suanluang, Bangkok 10250
Head Office : Tel. 02-319-9894 ext.1 Fax.02-318-4961 E-mail : atsc@automation.co.th
Rayong Branch : 1/15 Huaypong Rd., A. Muang, Rayong 21150 Tel. 038-692-152 Fax. 038-692-345
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website : www.automation.co.th

MTOC : L-1009/2021 Report No. : ALS-416

List of Consumable, Maintenance parts

Pos.	Part Number	Part Name	Result	Exchange	Recommended Interval
1.	036-11209-84	O-ring, 4D P10A (Viton , for TC,IC Slider)	O.K.	√	1 time per year, Depending on condition
2.	036-11219-84	O-ring, 4D P20 (for sealing TC-Combustion tube)	O.K.	√	1 time per year, Depending on condition
3.	638-15025	O-ring, PIFE (for TC,IC-Slider)	O.K.	√	1 time per year, Depending on condition
4.	630-00105-01	Platinum net, (2pcs-set) (to support catalyst)	O.K.	√	6 month same time as catalyst exchange
5.	630-00557	Silica Wool (to support catalyst)	O.K.	√	6 month same time as catalyst exchange
6.	630-00992	Halogen Scrubber	O.K.	√	6 month
7.	630-00996	High Sensitivity TC Catalyst (When installed)	N/A		Depending on condition
8.	638-60116	Regular Catalyst (33g) (When installed)	O.K.	√	6 month
9.	638-56251-01	8-Port valve rotor	O.K.	√	1 time per year
10.	638-41323	TC-Combustion Tube	O.K.	√	6 month same time as catalyst exchange
11.	631-43404-01	Packing, gasket slider (for TC-injection tube)	O.K.		1 time per year, Depending on condition
12.	638-59296	Syringe 5mL	O.K.		Depending on condition
13.	638-59296-01	Plunger Tip (for syringe 5mL)	O.K.	√	6 month
14.	042-00405-11	IC reagent supply pump head	O.K.		1 time per year
15.	630-00999	CO2-Absorber (for cell space purge)	O.K.	√	1 time per year
16	630-00964	Molecular Sieves 13x	O.K.		1 time per year

Note. Table indicates the guidelines replacement periods when NPOC measurement is performed on sample that are comparatively as clean as tap water ,use standard catalyst and at a rate of about 500 sample per month (operating five days a week)

Inspector By T.Somsi

(Mr. Tawatchai Somsi)
Technician

SHIMADZU ANALYZER
4/4

Attachment : ALS-416 Page 1/4

TOC-Control L Report

System Administrator, ALS LAB
2021_10_25_001_PM.tlx

Instr.Information

Instrument Options	TOC/ASI/IC Unit/
Catalyst	Regular Sensitivity

Cal. Curve

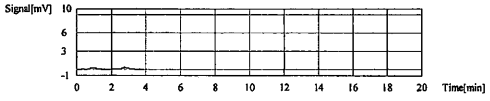
Sample Name:	Untitled
Sample ID:	Untitled
Cal. Curve:	NPOC 0.1-20 ppm.2021_10_25_15_19_29.cal
Status	Completed

Standard	NPOC

Conc: 0.000mg/L

1	0.6035	50uL	1.00	*******		10/25/2021 3:28:02 PM
2	0.7385	50uL	1.00	*******		10/25/2021 3:30:46 PM

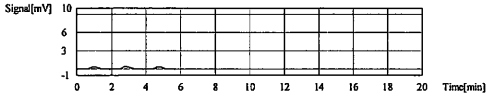
Acid Add.	1.500%
Sparge Gas Flow	80ml
Sp. Time	90.00sec
Mean Area	0.6710
SD Area	0.09546
CV Area	14.23%



Conc: 0.1000mg/L

1	1.067	50uL	10.00	*******		10/25/2021 3:39:54 PM
2	1.265	50uL	10.00	*******	E	10/25/2021 3:44:06 PM
3	1.102	50uL	10.00	*******		10/25/2021 3:48:18 PM

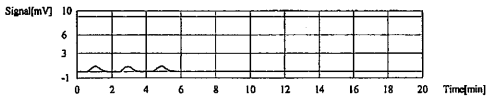
Acid Add.	1.500%
Sparge Gas Flow	80ml
Sp. Time	90.00sec
Mean Area	1.085
SD Area	0.02475
CV Area	2.28%



Conc: 0.5000mg/L

1	2.907	50uL	2.00	*******		10/25/2021 3:55:58 PM
2	3.168	50uL	2.00	*******	E	10/25/2021 3:58:51 PM
3	2.990	50uL	2.00	*******		10/25/2021 4:01:44 PM

Acid Add.	1.500%
Sparge Gas Flow	80ml
Sp. Time	90.00sec
Mean Area	2.949
SD Area	0.05869
CV Area	1.99%



Conc: 1.000mg/L

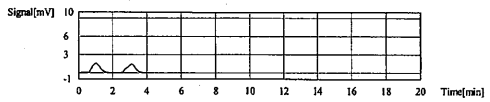
1	5.045	50uL	1.00	*******		10/25/2021 4:08:39 PM
2	5.000	50uL	1.00	*******		10/25/2021 4:11:32 PM

Attachment : ALS-416 Page 2/4

TOC-Control L Report

System Administrator, ALS LAB
2021_10_25_001_PM.tlx

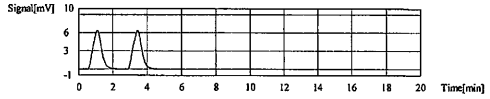
Acid Add.	1.500%
Sparge Gas Flow	80ml
Sp. Time	90.00sec
Mean Area	5.024
SD Area	0.02970
CV Area	0.59%



Conc: 5.000mg/L

1	22.21	50uL	4.00	*******		10/25/2021 4:21:08 PM
2	22.24	50uL	4.00	*******		10/25/2021 4:23:13 PM

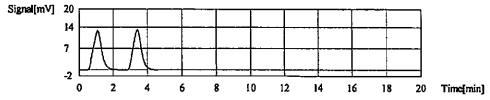
Acid Add.	1.500%
Sparge Gas Flow	80ml
Sp. Time	90.00sec
Mean Area	22.23
SD Area	0.02121
CV Area	0.10%



Conc: 10.00mg/L

1	43.42	50uL	2.00	*******		10/25/2021 4:33:06 PM
2	43.69	50uL	2.00	*******		10/25/2021 4:35:57 PM

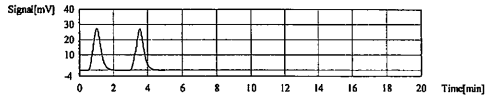
Acid Add.	1.500%
Sparge Gas Flow	80ml
Sp. Time	90.00sec
Mean Area	43.56
SD Area	0.1909
CV Area	0.44%



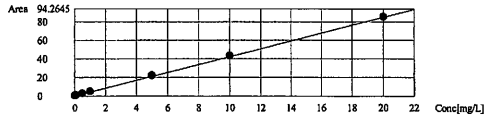
Conc: 20.00mg/L

1	85.35	50uL	1.00	*******		10/25/2021 4:43:21 PM
2	85.64	50uL	1.00	*******		10/25/2021 4:46:10 PM

Acid Add.	1.500%
Sparge Gas Flow	80ml
Sp. Time	90.00sec
Mean Area	85.69
SD Area	0.07778
CV Area	0.09%



Slope:	4.253
Intercept	0.000
r*2	1.0000
r	1.0000
Zero Shift	Yes



TOC-Control L Report

System Administrator, ALS LAB
2021_10_25_001_PM.tx

Instr.Information

Instrument Options	TOC/ASI/IC Unit/
Catalyst	Regular Sensitivity

Sample

Sample Name:	Std TC 5 ppm
Sample ID:	Untitled
Origin:	NPOC 0.1-20 ppm.met
Status	Completed
Chk. Result	

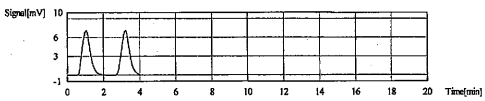
Unknown	NPOC	1.000		NPOC:5.222mg/L

1. Det

Anal.: NPOC

1	22.36	5.257mg/L	50uL	1.000	NPOC 0.1-20 ppm.2021_10_25_15_19_29.cal	10/25/2021 4:55:09 PM
2	22.06	5.187mg/L	50uL	1.000	NPOC 0.1-20 ppm.2021_10_25_15_19_29.cal	10/25/2021 4:57:54 PM

Mean Area	22.21
Mean Conc.	5.222mg/L
SD Area	0.2121
CV Area	0.96%
SD Conc	0.04988
CV Conc	0.96%



1/1 10/25/2021 5:35:08 PM

TOC-Control L Report

System Administrator, ALS LAB
2021_10_25_001_PM.tx

Instr.Information

Instrument Options	TOC/ASI/IC Unit/
Catalyst	Regular Sensitivity

Sample

Sample Name:	water
Sample ID:	Untitled
Origin:	Clean NPOC_normal.met
Status	Completed
Chk. Result	

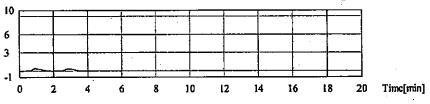
Unknown	NPOC	1.000		NPOC:0.1141ppm

1. Det

Anal.: NPOC

1	1.406	0.1143ppm	150uL	1.000	NPOC normal 0 - 10 ppm.2018_08_23_10_19_52.cal	10/25/2021 5:22:32 PM
2	1.400	0.1138ppm	150uL	1.000	NPOC normal 0 - 10 ppm.2018_08_23_10_19_52.cal	10/25/2021 5:35:31 PM

Mean Area	1.403
Mean Conc.	0.1141ppm
SD Area	0.00424
CV Area	0.30%
SD Conc	0.00034
CV Conc	0.30%



1/1 10/25/2021 5:35:34 PM

RYG_EN0184

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

NSC-TISI-TIS 17025
CALIBRATION 0244

Certificate No.T220384I01 "Substitute for Calibration Certificate Number T220384" Page 1 of 4

Certificate of Calibration

Equipment	:	Chamber (Cold Room)
Manufacturer	:	MODULAR
Model	:	IREVCOHCOO
Serial No.	:	C00351459
Customer Code	:	RYG_EN0184
ID No.	:	T1939A5
Customer	:	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
		616/10 Moo 5 T.Maenam Khu,
		A.Pluakdaeng, Rayong 21140
Customer Location	:	Laboratory
Date of Receipt	:	18 February 2022
Calibrated By	:	Boonchai Suriyawong (Site Calibration Manager)
Approved By	:	_____/ Sujjar Naknakred (Site Calibration Manager)
Date of Issue	:	18 MAR 2022

REVIEW BY Thanitak
APPROVED BY
NEXT CAL. DATE 22 Feb 2023

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.

Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

NSC-TISI-TIS 17025
CALIBRATION 0244

Certificate No. T220384I01 Page 2 of 4

Calibration Report

Equipment	:	Chamber (Cold Room)
Date of Calibration	:	22 February 2022
Environment	:	Temperature : 23.2-24.3 °C
		Line Voltage : 221.8-227.2 V
		Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. Thisequipment 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 (Reapproved 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 :

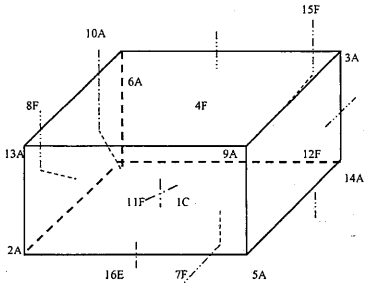
Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN141-TN150	T210743	21 April 2022
TC	TYPE T	TN151-TN160	T210743	21 April 2022
DATA LOGGER	34970A	T150	T210743	21 April 2022

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 - Hour 40 Minute At 3 °C
   Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
   ☐ Close
   ☒ Not Available
5. Adjustment :
   (X) without adjustment ( ) after adjustment

Approved By_____

Certificate No. T220384I01

Calibration Report



C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

1C = TN141	12F = TN152
2A = TN142	13A = TN153
3A = TN143	14A = TN154
4F = TN144	15F = TN155
5A = TN145	16E = TN156
6A = TN146	
7F = TN147	
8F = TN148	
9A = TN149	
10A = TN150	
11F = TN151	

Approved By.

SCG
Metrological Center
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.
NSC-TISI-TIS 17025 CALIBRATION 0244

Certificate No. T220384I01

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	TN141	TN142	TN143	TN144	TN145	TN146	TN147	TN148	TN149	TN150
3.0	2.80	2.96	2.98	2.97	3.16	3.29	2.95	3.14	3.10	3.45
	TN151	TN152	TN153	TN154	TN155	TN156				
	3.04	3.19	3.03	3.34	3.21	3.11				

Chamber (Cold Room)			Temperature Distribution				
Setting (°C)	Reading (°C) Min , Max	Reading (°C) Average	Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage Factor *k*
3.0	2.7 , 4.1	3.5	3.11	1.30	1.30	2.00	2.05

*** The Acuoted 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.

RYG_EN0029

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000 27 FAX. 0-2719-9484

ilac-MRA
NSC-TISI-TIS17025 CALIBRATION 0038

Cert.No.: 22CH283
Page.: 1 of 2

Certificate of Calibration

Equipment :	Conductivity Meter
Manufacturer :	Mettler Toledo
Model :	S230
Serial No. :	B241407147
ID No. :	RYG_EN0029
Condition As-Received:	Used Item
Received Date :	22 February 2022
Calibration Date :	23 February 2022
Reference :	2202-0732DSC-1
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-CH6 : based on direct measurement by using certified reference material (CRM)
Calibrated by :	Walalak Sirithean

REVIEW BY Thawitall.
APPROVED BY
NEXT CAL. DATE 24/8/22

Approved by :

Approved Signatory

(✓) Malee Butkruea
( ) Saithip Meangmai
( ) Warakorn Lerngagtrakul

Issue Date : 25 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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A 0038145

Cert.No.: 22CH283
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	9549224	130RC003	21I451	15 Apr 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 :-
- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Conductivity Solution	Manufacturer	Lot No.	Exp. date
84.000 µS/cm	CPA Chem	754034	28 June 2022
1413.0 µS/cm	CPA Chem	766815	04 Sep 2022
12.880 mS/cm	CPA Chem	761022	02 Aug 2022

- Control Conductivity calibration solution temperature by Water bath (25±0.1) °C

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration results

Function : Conductivity Measurement
(*) After Adjustment at 1413.0 µS/cm
Conductivity Electrode Serial No.: 5821441030

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (±)	Coverage factor k
84.000 µS/cm	82.4 µS/cm	84.4 µS/cm	0.62 µS/cm	2.00
1413.0 µS/cm	1375 µS/cm	1413 µS/cm	9.2 µS/cm	2.00
12.880 mS/cm	12.54 mS/cm	12.81 mS/cm	0.086 mS/cm	2.00

Remark - UUC* = Unit Under Calibration
- Cell constant = 0.555236 cm^{-1}

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 1090534

RYG_EN0002

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

NSC-TISI-TIS-17025 CALIBRATION 0219

SARTORIUS

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

Certificate of Calibration

Model Number :	MSE224S-100-DU	Certificate No. :	21BCI0163
Description :	Analytical Balance	Issued Date :	Monday, May 10, 2021
Serial Number :	26207038 (RYG_EN0002)	Reference No. :	501644
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 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 : 220 g Readability : 0.0001 g

Ambients Conditions:
Temperature : 20.3 °C ± 5.0 °C
Humidity : 49.9 % 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 expended 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 form list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Cetificate 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/Barometer/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.

ISO17025-RF-015 26/03/2020 R2

Mr.Chonchai Inthana(Technical Manager)

STAMP

SARTORIUS (THAILAND) CO., LTD. sartorius ISO/IEC 17025 Cert no. 13001 CAB

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8361-6 Fax: +66 2643-8367, e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number :	MSE224S-100-DU	Certificate No. :	21BCI0163
Description :	Analytical Balance	Issued Date :	Monday, May 10, 2021
Serial Number :	26207038 (RYG_EN0002)	Reference No. :	501644
Manufacturer :	Sartorius	Page No. :	2 of 2

Calibration Results : Without Adjustment

Repeatability

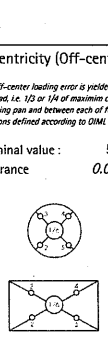
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load) 20 g	20.0000	200.0001
	20.0000	200.0001
Tolerance	20.0000	200.0001
0.0001 g	20.0000	200.0000
	20.0000	200.0000
Nominal Value : (High Load) 200 g	20.0000	200.0001
	20.0001	200.0000
Tolerance	20.0000	200.0000
0.0001 g	20.0000	199.9999
	20.0000	200.0000
Standard Deviation	0.00003	0.00007

Eccentricity (Off-center loading error)

The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximim 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 : 50 g
Tolerance 0.0004 g



	Difference
1	–
2	-0.0001
3	0.0000
4	0.0001
5	0.0000
6	–

Linearity

The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolearance 0.0002 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00016
0.1	0.1000	0.1000	0.0000	0.00016
1	1.0000	1.0000	0.0000	0.00016
2	2.0000	2.0000	0.0000	0.00016
5	5.0000	5.0000	0.0000	0.00016
10	10.0000	10.0000	0.0000	0.00016
20	20.0000	20.0000	0.0000	0.00016
50	50.0001	50.0001	0.0000	0.00017
100	100.0001	100.0000	-0.0001	0.00020
200	200.0001	200.0001	0.0000	0.00030

End of Report.

ISO17025-RF-015 26/03/2020 R2

RYG_EN0006

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TEL. 0-2717-3000-27 FAX. 0-2719-9484

NSC-TISI-TIS17025 CALIBRATION 0508

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 ± 10) °C
Relative Humidity :	(50 ± 30) %
Calibrated by :	Khit Ruttanaprapachai

REVIEW BY Thanitall.
APPROVED BY D.
NEXT CAL. DATE 3/11/22.

Approved by : Approved Signatory
( ) Pornthippa Tameyakul
(✓) Malee Butkruea
( ) Suwit Imjai

Issue Date : 14 May 2021

The Uncertainties are for a confidence probability of approximately 95%

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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.

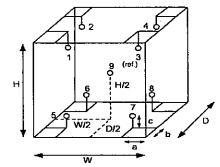
Condition of this result of calibration
1. Reference standard instrument:-

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

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

Probe Installation Details :

a =	5.0	cm
b =	5.0	cm
c =	5.0	cm

Dimension of Chamber :

D =	0.33	m
W =	0.40	m
H =	0.40	m
Capacity =	0.053	m³

Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM829
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
70.0	70.0	70.0	0.21	1.8	2.0	0.55	2

Calibration Point (°C)	Measured Temperature (°C) Position								
	1	2	3	4	5	6	7	8	9 (ref.)
70.0	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-

a 1054309

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NSC-TISI-TISI17025 CALIBRATION 0008

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
Location : Wet Chemistry Lab

REVIEW BY Thanitak
APPROVED BY
NEXT CAL. DATE 3/11/22

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 :
Approved Signatory

( ) Pornthippa Tameyakul
(✓) Malee Butkruea
( ) Suwit Imjai

Issue Date : 14 May 2021

The Uncertainties are for a confidence probability of approximately 95%

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A 0028098

Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2105-0005OC-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 (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

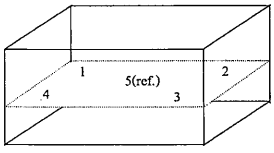
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44060450	21LM4	06 Mar 2022

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

Cert. No.: 21TM673
Page.: 2 of 3

	Environmental (°C)	Environmental (%R.H.)	AC Voltage Supply (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

a 1054289

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

REVIEW BY Sawarat M.
APPROVED BY Nat Sut
NEXT CAL. DATE 3/5/22

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Certificate of System Qualification

GC-OQ

System ID: GC-4
Organization Name: ALS Laboratory Group
Organization Location: 104 Phattanakan 40,Suan Luang Bangkok 10250

Date: November 4, 2020 4:54:08 PM
EQP Name: AgilentRecommended
EQP Revision: GC.02.50
Overall Qualification Status: Pass

System Inspection and Basic Safety and Operation

Name: 6890

Setpoint Status: **Pass**

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 6890
Front SSL

Setpoint Status: **Pass**
Pressure: 25.0 psi

Pressure Change: -0.2 psi /5 minutes
Agilent Recommended: >= -2.0 and <= 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 6890
Front SSL

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Setpoint Status: **Pass**

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	25.0	psi

Accuracy: 0.0 psi
Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 6890
Front UECD

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 % 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: 6890

Setpoint Status: **Pass**
Zone: Oven
Setpoint/Actual
Temperature: 230.0 231.9 °C

Accuracy: 1.9 °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.

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Reason: Over Temperature Test at 230°C

Setpoint Status: **Pass**
Zone: Oven
Setpoint/Actual
Temperature: 100.0 101.7 °C

Accuracy: 1.7 °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: Over Temperature Test at 100°C

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 6890

Setpoint Status: **Pass**
Setpoint/Average
Temperature: 100.0 101.7167 °C

Stability: 0.1 °C
Agilent Recommended: <= 0.5

Data for this setpoint was entered manually.

Reason: Over Temperature Test at 100°C about 6 times

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1 Front SSL / Front UECD
Injection Tower
Name: 7683B

Setpoint Status: **Completed**

Injection Volume on Column: 1.0 uL

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Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1 Front SSL / Front UECD
Name: 6890

Setpoint Status: **Pass**

Base Signal: 252.80 Hz

	ASTM Noise		Drift	
	Hz		Hz/Hr	
	1.38		14.08	
Agilent Recommended:	<=	3.00	<=	15.00
Status:	Pass		Pass	

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front UECD
Name: 7683B

Setpoint Status: **Pass**

Injection Volume on Column: 1.0 uL

Area RSD: 2.68 % Retention Time RSD: 0.01 %
Agilent Recommended: <= 3.00 <= 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination1 Front SSL / Front UECD
Injection Tower
Name: 6890

Setpoint Status:	Pass	
Signal to Noise:		4173
Agilent Recommended:	>=	1500

Overall Signal to Noise Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System	
System ID	GC-4
Manufacturer	Agilent Technologies
Name	6890
Tested Combination1	
Injection Technique	Injection Tower
Inlet	Front
Detector	Front
LTM Included?	No
Sampler 1	
Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7683B
Model Number	G2913A
Serial Number	CN82859515
Firmware Revision	A.11.03
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10
Sampler 2	
Manufacturer	Agilent Technologies
Type	Tray
Name	7683A
Model Number	G2614A
Serial Number	CN64742029
Firmware Revision	A.02.01

Mainframe 1	
Manufacturer	Agilent Technologies
Name	6890
Model Number	G1540N
Serial Number	US10344045
Firmware Revision	N.05.06
Oven Type	Standard
Inlet 1	
Manufacturer	Agilent Technologies
Name	6890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes
Detector 1	
Manufacturer	Agilent Technologies
Name	6890
Type	UECD
Serial Number	U11374
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Electronic Signature

Purpose

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Details

Full Name of Signer:	Saenguthai Tarak
Logged On User Name:	saenguthai.tarak@non.agilent.com
Signature Creation Date:	November 4, 2020
Reason for Signature:	Executed protocol and published this original version of document

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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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User Name: saenguthai.tarak
Hostname: DESKTOP-79IABVP

System Id: GC-4
Print Date: November 4, 2020 4:54:11 PM

OQ_GC-4 ALS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 4, 2020 3:17:14 PM	Audit	SessionCreated	Session	None
November 4, 2020 3:17:14 PM	Start	Configuration	Session	None
November 4, 2020 3:17:15 PM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
November 4, 2020 3:17:30 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.50/Gc.02.50.eqp], EQP File Name: [Gc.02.50.eqp], EQP Name: [AgilentRecommended]
November 4, 2020 3:17:32 PM	End	Configuration	Session	None
November 4, 2020 3:17:36 PM	Start	Qualification	Session	OQ
November 4, 2020 3:17:36 PM	Start	Execution	System Inspection and Basic Safety and Operation - 6890: - Qualitative Test - No setpoints associated	None
November 4, 2020 3:17:55 PM	End	Execution	System Inspection and Basic Safety and Operation - 6890: - Qualitative Test - No setpoints associated	Run Count : 1
November 4, 2020 3:18:12 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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User Name: saenguthai.tarak
Hostname: DESKTOP-79IABVP

System Id: GC-4
Print Date: November 4, 2020 4:54:11 PM

OQ_GC-4 ALS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 4, 2020 3:18:23 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
November 4, 2020 3:18:26 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
November 4, 2020 3:18:35 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
November 4, 2020 3:18:37 PM	Start	Execution	Detector Flow Accuracy - Front UECD: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
November 4, 2020 3:19:03 PM	End	Execution	Detector Flow Accuracy - Front UECD: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
November 4, 2020 3:19:11 PM	Start	Execution	GC Oven Temperature Accuracy - 6890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
November 4, 2020 3:20:23 PM	Audit	Data	GC Oven Temperature Accuracy - 6890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
November 4, 2020 3:20:25 PM	End	Execution	GC Oven Temperature Accuracy - 6890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
November 4, 2020 3:20:27 PM	Start	Execution	GC Oven Temperature Accuracy - 6890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None

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User Name: saenguthai.tarak
Hostname: DESKTOP-79IABVP

System Id: GC-4
Print Date: November 4, 2020 4:54:11 PM

OQ_GC-4 ALS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 4, 2020 3:21:04 PM	Audit	Data	GC Oven Temperature Accuracy - 6890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
November 4, 2020 3:21:07 PM	End	Execution	GC Oven Temperature Accuracy - 6890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
November 4, 2020 3:21:09 PM	Start	Execution	GC Oven Temperature Stability - 6890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
November 4, 2020 3:22:37 PM	Audit	Data	GC Oven Temperature Stability - 6890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
November 4, 2020 3:22:40 PM	End	Execution	GC Oven Temperature Stability - 6890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
November 4, 2020 3:22:43 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front UECD: - Part of System Preparation - No limits associated	None
November 4, 2020 3:23:09 PM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front UECD - Part of System Preparation - No limits associated	Data files Path : E:\OQGC-4_2020\SC_D0000 .D\ECD1A.CH
November 4, 2020 3:23:29 PM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Front UECD - Part of System Preparation - No limits associated	Run Count : 1
November 4, 2020 3:23:32 PM	Start	Execution	Noise and Drift - Front UECD - Detector UECD - L (Noise): <= 3.00 Hz - L (Drift): <= 15.00 Hz/hour	None

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User Name: saenguthai.tarak
Hostname: DESKTOP-79IABVP

System Id: GC-4
Print Date: November 4, 2020 4:54:11 PM

OQ_GC-4 ALS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 4, 2020 3:23:49 PM	Audit	Data	Noise and Drift - Front UECD - Detector UECD - L (Noise): <= 3.00 Hz - L (Drift): <= 15.00 Hz/hour	Data files Path : E:\OQGC-4_2020\ND_D012. D\ECD1A.CH
November 4, 2020 3:24:10 PM	End	Execution	Noise and Drift - Front UECD - Detector UECD - L (Noise): <= 3.00 Hz - L (Drift): <= 15.00 Hz/hour	Run Count : 1
November 4, 2020 4:34:25 PM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front UECD - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None
November 4, 2020 4:35:06 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front UECD - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\OQGC-4_2020\INJ_PRE4. D\ECD1A.CH
November 4, 2020 4:35:06 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front UECD - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\OQGC-4_2020\INJ_PRE5 D\ECD1A.CH
November 4, 2020 4:35:06 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front UECD - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\OQGC-4_2020\INJ_PRE6 D\ECD1A.CH
November 4, 2020 4:35:06 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front UECD - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\OQGC-4_2020\INJ_PRE7 D\ECD1A.CH
November 4, 2020 4:35:06 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front UECD - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\OQGC-4_2020\INJ_PRE8. D\ECD1A.CH

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User Name: saenguthai.tarak
Hostname: DESKTOP-79IABVP

System Id: GC-4
Print Date: November 4, 2020 4:54:11 PM

OQ_GC-4 ALS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 4, 2020 4:35:06 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front UECD - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : E:\OQGC-4_2020\INJ_PRE9. D\ECD1A.CH
November 4, 2020 4:35:29 PM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front UECD - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count : 1
November 4, 2020 4:35:33 PM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front UECD - Detector UECD - L: >= 1500	None
November 4, 2020 4:36:07 PM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front UECD - Detector UECD - L: >= 1500	None
November 4, 2020 4:36:32 PM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front UECD - Detector UECD - L: >= 1500	Data files Path : E:\OQGC-4_2020\SN_D0000 .D\ECD1A.CH
November 4, 2020 4:36:42 PM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front UECD - Detector UECD - L: >= 1500	Run Count : 1
November 4, 2020 4:36:54 PM	End	Qualification	Session	OQ
November 4, 2020 4:36:54 PM	Start	Reporting	Session	None
November 4, 2020 4:51:26 PM	Audit	Reporting	Session	Report Generated : Certificate

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Date: November 4, 2020 4:54 08 PM
System ID: GC-4

Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor7 Rama4 Road
Silom Bangrak Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com

Bara Scientific

NSC-TISI-TIS 17025 CALIBRATION 0059

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 traceble to SI unit through Starna Scientific Ltd. (UKAS accredited calibration laboratory NO. 0659)
Calibrated by	Mr.Wanchana Janloey

Sinlok P.
15 Oct 21

Approved by

Mr.Kanchit Choothep
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor7 Rama4 Road
Silom Bangrak Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com

Bara Scientific

NSC-TISI-TIS 17025 CALIBRATION 0059

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	0.0000	0.0000	0.0075
	0.7174	0.7198	0.0024	0.0075
257	0.0000	-0.0001	-0.0001	0.0075
	0.8362	0.8377	0.0015	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2778	0.2803	0.0025	0.0075
350	0.0000	-0.0001	-0.0001	0.0075
	0.6202	0.6221	0.0019	0.0075

*CNR = Customer not request

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Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor7 Rama4 Road
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Tel : 02-6324300 Fax : 02-6375496-7
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Bara Scientific

NSC-TISI-TIS 17025 CALIBRATION 0059

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	0.0000	0.0000	0.0042
	0.5631	0.5570	-0.0061	0.0042
	0.7390	0.7334	-0.0056	0.0042
	1.0863	1.0816	-0.0047	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5524	0.5469	-0.0055	0.0042
	0.7217	0.7166	-0.0051	0.0042
	1.0606	1.0570	-0.0036	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5018	0.4966	-0.0052	0.0042
	0.6657	0.6610	-0.0047	0.0042
	0.9775	0.9740	-0.0035	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5147	0.5113	-0.0034	0.0042
	0.6743	0.6705	-0.0038	0.0042
	0.9909	0.9890	-0.0019	0.0042
590.0	0.0000	0.0000	0.0000	0.0042
	0.5427	0.5394	-0.0033	0.0042
	0.7037	0.7001	-0.0036	0.0042
	1.0338	1.0323	-0.0015	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5268	0.5235	-0.0033	0.0042
	0.6720	0.6685	-0.0035	0.0042
	0.9864	0.9847	-0.0017	0.0042

*CNR = Customer not request

4.Stray Light*

Standard cut-off wavelenght (nm)	Unit Under Calibration(UUC)		
	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

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Certificate of System Qualification

ICPMS-OQ

REVIEW BY Charatt L.

APPROVED BY Sauntra N.

NEXT CAL. DATE 24 May 22

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:	AgilentRecommended
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

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Background (No Gas Mode)

Setpoint Status: Pass

Masses (AMU):		7		89		205	
Measured Value:		2.500		2.700		5.000	cps
Agilent Recommended:	<=	10	<=	10	<=	30	
Status:	Pass		Pass		Pass		

Overall Background (No Gas Mode) Test Status

Pass

Background (Gas Mode)

Gas Mode: Helium

Setpoint Status: Pass

Mass (AMU):		78	
Measured Value:		60.1000	cps
Agilent Recommended:	<=	460	
Status:	Pass		

Overall Background (Gas Mode) Test Status

Pass

20-Minute Stability (No Gas Mode)

Masses (AMU):		7		89		205	
Stability RSD:		0.76059		1.31334		1.69158	%
Agilent Recommended:	<=	3.45	<=	3.45	<=	3.45	
Status:	Pass		Pass		Pass		

Overall 20-Minute Stability (No Gas Mode) Test Status

Pass

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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

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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 logon 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:	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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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 1:36:34 PM	Audit	SessionCreated	Session	None
November 26, 2020 1:36:35 PM	Start	Configuration	Session	None
November 26, 2020 1:36:35 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
November 26, 2020 1:49:03 PM	Audit	EqpLoaded	Session	EQP details for primary technique [icpMs] - File path: [ProtocolPacks/icpMs/Configurations/02.50/icpMs.02.50.eqp], EQP File Name: [icpMs.02.50.eqp], EQP Name: [AgilentRecommended]
November 26, 2020 1:49:14 PM	End	Configuration	Session	None
November 26, 2020 1:49:17 PM	Start	Qualification	Session	OQ
November 26, 2020 1:49:17 PM	Start	Execution	Autosampler Check : ASX-520: Autosampler Check	None
November 26, 2020 1:49:24 PM	End	Execution	Autosampler Check : ASX-520: Autosampler Check	Run Count : 1
November 26, 2020 1:49:31 PM	Start	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS2: Integrated Sample Introduction System (ISIS) Check	None
November 26, 2020 1:49:37 PM	End	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS2: Integrated Sample Introduction System (ISIS) Check	Run Count : 1

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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 1:49:41 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 :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
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 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_kurasathain@agilent.com Full Name of Signer: Panthep Kurasathain Reason for signature: Executed protocol and published this original version of document

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Agilent CrossLab Compliance Services

Agilent CrossLab

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.

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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

Service Details

Purpose

This section includes local contact and delivery details for this service.

General Details

Service Order No./Request:	6004257565
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:	Chatchanai
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

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

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

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

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

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		0.733	AMU
Agilent Recommended:	>=	0.65	
	<=	0.80	
Status:	Pass		
Peakwidth Mass 89		0.716	AMU
Agilent Recommended:	>=	0.65	
	<=	0.80	
Status:	Pass		
Peakwidth Mass 205		0.720	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		89.00	AMU
Agilent Recommended:	>=	88.9	
	<=	89.1	
Status:	Pass		
Mass Axis 205		205.00	AMU
Agilent Recommended:	>=	204.9	
	<=	205.1	
Status:	Pass		

Mass 7 Sensitivity No Gas		47.62	Mcps/ppm
Agilent Recommended:	>=	25.5	
Status:	Pass		
Mass 89 Sensitivity No Gas		161.21	Mcps/ppm
Agilent Recommended:	>=	85	
Status:	Pass		
Mass 205 Sensitivity No Gas		120.27	Mcps/ppm
Agilent Recommended:	>=	51	
Status:	Pass		
Mass 59 Sensitivity He		58.47	Mcps/ppm
Agilent Recommended:	>=	20.4	
Status:	Pass		
Oxide Ratio 156/140		0.955	%
Agilent Recommended:	<=	1.38	
Status:	Pass		
Doubly Charged Species Ratio 70/140		1.900	%
Agilent Recommended:	<=	2.3	
Status:	Pass		

Setpoint Status: Pass Runs: 1

Overall Autotune Test Status

Pass

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

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:		0.76059		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 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

Location	Category	Document Name	Page
EQR	General	Certificate of System Qualification	1
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

General

Document Name: Certificate of System Qualification

Agilent Technologies

Agilent Compliance Engine Self Qualification

Date: October 14, 2020 10:27:56 AM

Drive Serial #: ACA025C9 **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	6	Conforms
Emission Spectroscopy	3	Conforms
Gas Chromatography - GCMS	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 - LCMS	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

General

Document Name: Operator's training certificate and qualifications

Agilent Technologies

Certificate of Completion

Learner Name: Panthep Kurasathain

Title Of Course: AN-CE-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, 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: Certificate of Qualification for ACE

Agilent Technologies

Certificate of Completion

Learner Name: Panthep Kurasathain

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 limitions.

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: Certificate of Qualification for ACE

Agilent Technologies

Certificate of Completion

Learner Name: Panthep Kurasathain

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.

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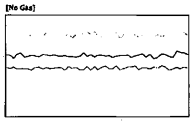
General

Document Name: Tune reports

Tune Report

Batch Folder C:\Agilent\ICPMS\1\User Tune.b
Acq. Date-Time 11/26/2020 12:51
Report Comment OQ 26 Nov 2020
Instrument Name G3281A JP12091612

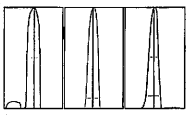
[No Gas]



Mass	Range	Count	RSD%	Background
7	10000	4762	2.594	2.500
89	20000	16321	1.976	2.700
205	20000	12027	2.531	5.000

Ratio 156/140 0.955 % Ratio 70/140 1.902 %

Integration Time [sec] 0.1 Sampling Period [sec] 0.311



Mass	Peak Height	Axis	W-50%	W-10%
7	4021.26	7.05	0.66	0.733
89	16252.60	89.00	0.54	0.716
205	12035.99	205.00	0.47	0.720

Integration Time [sec] 0.1 Acquisition Time [sec] 22.74 Y Axis Linear

Tune Parameters
Plasma Parameters

RF Power	1550 W	Nebulizer Pump	0.10 rps
RF Matching	1.90 V	S/C Temp	2 °C
Smpl Depth	8.0 mm	Gas Switch	Makeup Gas
Carrier Gas	0.80 L/min	Makeup/Dilution Gas	0.10 L/min
Option Gas	0.0 %		

Lenses Parameters

Extract 1	0.0 V	Cell Entrance	-30 V
Extract 2	-125.0 V	Cell Bet.	-50 V

Agilent Technologies Page 1 of 3 Generated at: 12:51 PM on:11/26/2020

Document Name: Tune reports

Tune Report

Omega Bias	-65 V	Deflect	13.4 V
Omega Lens	8.9 V	Plate Bias	-40 V

Cell Parameters

Use Gas	false	OctP Bias	-8.0 V
He Flow	0.0 mL/min	OctP RF	180 V
H2 Flow	0.0 mL/min	Energy Discrimination	5.0 V
3rd Gas Flow	0 %		

[He]

Mass	Range	Count	RSD%	Background
59	10000	5847	2.091	2.000
89	10000	6330	2.067	2.900
205	20000	13951	2.192	3.400

Ratio 156/140 0.561 % Ratio 70/140 1.741 %

Integration Time [sec] 0.1 Sampling Period [sec] 0.31

Tune Parameters
Plasma Parameters

RF Power	1550 W	Nebulizer Pump	0.10 rps
RF Matching	1.80 V	S/C Temp	2 °C
Smpl Depth	8.0 mm	Gas Switch	Makeup Gas
Carrier Gas	0.90 L/min	Makeup/Dilution Gas	0.10 L/min
Option Gas	0.0 %		

Lenses Parameters

Extract 1	0.0 V	Cell Entrance	-90 V
Extract 2	-175.0 V	Cell Exit	-70 V
Omega Bias	-90 V	Deflect	4.6 V
Omega Lens	6.9 V	Plate Bias	-115 V

Cell Parameters

Use Gas	true	OctP Bias	-21.0 V
He Flow	4.5 mL/min	OctP RF	200 V
H2 Flow	0.0 mL/min	Energy Discrimination	3.0 V
3rd Gas Flow	0 %		

[MEHe]

Mass	Range	Count	RSD%	Background
59	5000	2893	3.155	0.900
89	10000	4919	2.599	0.700
205	10000	5845	2.757	1.400

Ratio 156/140 0.919 % Ratio 70/140 1.326 %

Integration Time [sec] 0.1 Sampling Period [sec] 0.31

Tune Parameters
Plasma Parameters

Agilent Technologies Page 2 of 3 Generated at: 12:51 PM on:11/26/2020

Document Name: Tune reports

Tune Report

RF Power	1550 W	Nebulizer Pump	0.10 rps
RF Matching	1.80 V	S/C Temp	2 °C
Smpl Depth	8.0 mm	Gas Switch	Makeup Gas
Carrier Gas	0.90 L/min	Makeup/Dilution Gas	0.10 L/min
Option Gas	0.0 %		

Lenses Parameters

Extract 1	0.0 V	Cell Entrance	-120 V
Extract 2	-185.0 V	Cell Exit	-150 V
Omega Bias	-90 V	Deflect	-73.0 V
Omega Lens	5.3 V	Plate Bias	-150 V

Cell Parameters

Use Gas	true	OctP Bias	-100.0 V
He Flow	9.9 mL/min	OctP RF	200 V
H2 Flow	0.0 mL/min	Energy Discrimination	5.0 V
3rd Gas Flow	0 %		

Agilent Technologies Page 3 of 3 Generated at: 12:51 PM on:11/26/2020

General

Document Name: Test BG

Batch Summary Report

Batch Folder: D:\Agilent\OQ 26 Nov 2020\BG He.b\
Analysis File: BG He.batch.bin
Tune Step: #1 He

	Rpt	Acq. Date-Time	Data File	Sample Name	Type	Level	Dilution
1		11/26/2020 9:53:33 AM	001SMPL.d	BG He	Sample		1.0000

Page 1 / 2 11/26/2020 9:55:05 AM

Document Name: Test BG

Batch Summary Report

Analyte Table

	Sample Name	78 Se : He 1 CPS
1	BG He	60.1000

Page 2 / 2 11/26/2020 9:55:05 AM

General

Document Name: Test Stability

Batch Summary Report

Batch Folder: D:\Agilent\OQ 26 Nov 2020\20 min.b\
Analysis File: 20 min.batchdata
Tune Step: #2 No Gas

	Rjct	Acq. Date-Time	Data File	Sample Name	Type	Level	Dilution
1		11/26/2020 9:19:57 AM	001SMPL.d	20 Min	Sample		1.0000

Document Name: Test Stability

Batch Summary Report

Analyte Table

	7 Li (No Gas)		9 Be (No Gas)		59 Co (No Gas)		89 Y (No Gas)		140 Ce (No Gas)	
Sample Name	CPS	CPS RSD	CPS	CPS RSD	CPS	CPS RSD	CPS	CPS RSD	CPS	CPS RSD
1 20 Min	86455.7505	0.76059	97.8580	3.45902	121373.7730	0.63257	193389.2485	0.95998	207425.4915	1.31334

	205 Tl (No Gas)	
Sample Name	CPS	CPS RSD
1 20 Min	144959.4140	1.09158

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 logon 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:	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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User Name: panthep_kurasathain
Hostname: 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	SessionCreated	Session	None
November 26, 2020 1:36:35 PM	Start	Configuration	Session	None
November 26, 2020 1:36:35 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
November 26, 2020 1:49:03 PM	Audit	EqpLoaded	Session	EQP details for primary technique [IcpMs] - File path: [ProtocolPacks/IcpMs/Configurations/02.50/icpMs.02.50.eqp], EQP File Name: [IcpMs.02.50.eqp], EQP Name: [AgilentRecommended]
November 26, 2020 1:49:14 PM	End	Configuration	Session	None
November 26, 2020 1:49:17 PM	Start	Qualification	Session	OQ
November 26, 2020 1:49:17 PM	Start	Execution	Autosampler Check : ASX-520: Autosampler Check	None
November 26, 2020 1:49:24 PM	End	Execution	Autosampler Check : ASX-520: Autosampler Check	Run Count : 1
November 26, 2020 1:49:31 PM	Start	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS2: Integrated Sample Introduction System (ISIS) Check	None
November 26, 2020 1:49:37 PM	End	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS2: Integrated Sample Introduction System (ISIS) Check	Run Count : 1

User Name: panthep_kurasalhain
Hostname: 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 1:49:41 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 1:54:38 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 1:55:45 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

Page 2 / 3

User Name: panthep_kurasalhain
Hostname: 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 2:00:19 PM	Audit	Reporting	Session	Report Generated : Raport

Page 3 / 3

SCG CEMENT-BUILDING MATERIALS
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.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

REVIEW BY Chanatt L.
APPROVED BY Sawrita N
NEXT CAL. DATE 18/05/22

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.

SCG CEMENT-BUILDING MATERIALS
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. 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.

Metrological Center

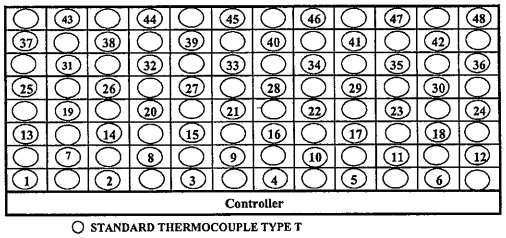
SCI ECO Services Company Limited

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

Calibration Report



○ 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.

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

Calibration Report

Measurement Results

Calibration Point		Average Standard Reading at each position (°C)									
		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		

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Calibration Report

Measurement Results

Calibration Point		Average Standard Reading at each position (°C)									
		TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30
105	Max	105.68	105.33	105.67	105.39	106.20	106.04	106.14	105.91	105.85	105.30
	Min	105.40	105.12	105.48	105.20	105.94	105.69	105.84	105.73	105.64	105.15
	Average	105.54	105.22	105.57	105.29	106.07	105.86	105.99	105.82	105.74	105.23
		TN31	TN32	TN33	TN34	TN35	TN36	TN37	TN38	TN39	TN40
	Max	105.82	106.16	106.09	105.87	105.70	105.27	105.77	106.00	105.50	105.00
	Min	105.43	105.82	105.91	105.68	105.49	105.05	105.36	105.66	105.24	104.83
	Average	105.62	105.99	106.00	105.78	105.60	105.16	105.57	105.83	105.37	104.92
		TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30
	Max	105.82	105.67	106.18	105.67	106.27	105.77	106.33	106.50	106.49	106.45
	Min	105.60	105.52	106.01	105.47	106.13	105.65	106.16	106.34	106.32	106.29
	Average	105.71	105.59	106.09	105.57	106.20	105.71	106.25	106.42	106.40	106.37
		TN31	TN32	TN33	TN34	TN35	TN36	TN37	TN38	TN39	TN40
	Max	105.70	105.81	106.66	106.40	106.38	105.97	105.50	105.39	105.45	105.32
	Min	105.51	105.66	106.36	106.22	106.17	105.75	105.32	105.25	105.26	105.15
	Average	105.60	105.73	106.51	106.31	106.28	105.86	105.41	105.32	105.36	105.24
		TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28		
	Max	106.49	106.45	105.70	105.81	106.66	106.40	106.38	105.97		
	Min	106.32	106.29	105.51	105.66	106.36	106.22	106.17	105.75		
	Average	106.40	106.37	105.60	105.73	106.51	106.31	106.28	105.86		

Approved By.

Metrological Center

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Calibration Report

Hot Block			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (±°C)	Uncertainty (±°C)
	Min , Max	Average		
100.0	100.3 , 100.5	100.4	0.20	1.12
105.0	105.1 , 105.3	105.2	0.21	1.04

* The quoted uncertainty exclude "stability" and "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=2 , providing a level of confidence of approximately 95 % .

Approved By.

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

NSC-TISI-TIS 17025 CALIBRATION 0244

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 Sirilak P.
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.

Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

NSC-TISI-TIS 17025 CALIBRATION 0244

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. Thisequipment 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 (Reapproved 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

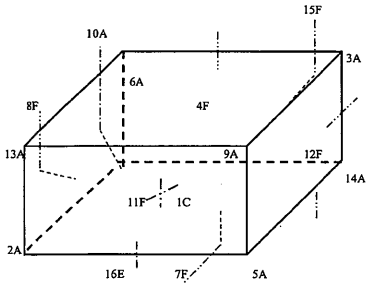
Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

NSC-TISI-TIS 17025 CALIBRATION 0244

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

Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

NSC-TISI-TIS 17025 CALIBRATION 0244

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) Min , Max	Reading (°C) Average	Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage Factor k
3.0	2.7 , 3.4	3.0	3.34	1.00	1.10	1.46	2.00

* The Acuoted 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

analytikjena
An Endress+Hauser Company

REVIEW BY Thanatt L.
APPROVED BY Sawitri N.
NEXT CAL. DATE 11/09/2022

Maintenance Protocol

Atomic Fluorescence Spectrometer

mercur DUO / mercur DUO plus

analytikjena

Serial-No.: K170 A0143 Customer-No.: C04-002.
Date: 11/5/2021. Carried out by: Analytik Jena.

Maintenance with following Operational Qualification (OQ) ☐
(requires a separate OQ protocol)

Company	บริษัท เอเชียน เคมิคอลส์ กรุ๊ป (ประเทศไทย) จำกัด.
User	คุณศรีจิต ตรีวิง
Department	Lab.
Street	104 ซอยสุขุมวิท 40 ถนนสุขุมวิท แขวงพระโขนงเหนือ เขตวัฒนา
Zip Code, City	กรุงเทพมหานคร 10250
Country	ประเทศไทย
Phone	
Fax	
E-mail	

analytikjena
An Endress+Hauser Company

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	☑

analytikjena
An Endress+Hauser Company

Device parameter		nominal value	actual value
visual check general tightness inside the Mercur		o.k.: ☑	changed: ☐
visual check Goldtraps (Goldtrap 2 / Not ok)		o.k.: ☑	changed: ☐
visual check spectrometer			
	Fluorescence cell	o.k.: ☑	changed: ☐
	Absorption cell, incl. window	o.k.: ☑	changed: ☐
	lens	o.k.: ☑	changed: ☐
	Swivel drive (SEV)	o.k.: ☑	changed: ☐
check pump hoses		o.k.: ☑	changed: ☐
check hoses and hose connectors		o.k.: ☑	changed: ☐
check and clean reactor		o.k.: ☑	changed: ☐
check drying hose output Gas-liquid-seperator		o.k.: ☑	changed: ☐
check bubble-sensor		o.k.: ☑	not o.k.: ☐
Check gasflow			
	Argon pressure valve 4	1.2 – 1.5 bar	1.5 bar.
	Valve 1	10 Nl/h or 0.166 NL/min	0.167
	Valve 2	50 Nl/h or 0.833 NL/min	0.830
	Valve 3	5 Nl/h or 0.083 NL/min	0.080
	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	0
	400	1	1
	450	3	3
	500	9	9
	550	16	16
	575	22	23
	600	31	31

analytikjena
An Endress+Hauser Company

Device parameter	nominal value	actual value
Analytical parameters Fluorescence cell		
Conditions.: max.conc.: 10µg/L PMT-voltage: 369 V		
Blank-solution		Int 0.0011
without enrichment / FBR 30 ng/L	Int > 0.0015 RSD < 3 %	Int_1 0.0114 RSD 1.835 %
Conditions.: max.conc.: 1.7µg/L PMT-voltage: - V		
Blank-solution		Int -
with enrichment / FBR 30 ng/L	Int > 0.008 RSD < 3 %	Int_2 - RSD - %
Fok.- factor (Int_2 / Int_1)	> 3.5	
Analytical parameters Absorption cell		
Blank-solution		Ext. 0.0009
without enrichment / FBR 100 ng/L	Ext. > 0.0012 RSD < 5 %	Ext. 0.0030 RSD 4.029 %
Comments		
Reference Material Control. Mercury Calibration Std. Part #: 8500-6941 Lot #: 12-20HG42A.		

Mr. Srichai Paik-on
Signature Technician

11/05/2021.
Place, Date (DD/MM/YYYY)

ศิริชา ลิ้มทอง
Signature Customer

11/05/2021
Place, Date (DD/MM/YYYY)

ภาคผนวก จ

สำเนาหนังสือใบอนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๙

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ เขตราชเทวี
กรุงเทพมหานคร ๑๐๔๐๐

๒๘ มกราคม ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๓๐ กรกฎาคม ๒๕๖๓

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น
๓. ชอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย ตามสิ่งที่ส่งมาด้วย ๒

ค. ชอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๕๙ รายการ น้ำใต้ดิน จำนวน ๑๒๖ รายการ อากาศเสีย ๑๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๓๕ รายการ และดิน จำนวน ๑๒๕ รายการ รวมทั้งสิ้นจำนวน ๓๖๑ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กันยายน ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายศิระ จันทร์เฉิด)
นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาราชการแทน
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน
กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ
โทร. ๐ ๒๒๐๒ ๔๑๔๖ ๐ ๒๒๐๒ ๕๐๐๒
โทรสาร ๐ ๒๓๕๔ ๓๒๐๘ ๐ ๒๓๕๔ ๓๔๑๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

๑) นางสาวยุพาพร จันทร์เปล่ง	ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๐
๒) นางสาวชัชนัย โกมารกุล ณ นคร	ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๑
๓) นายศรายุทธ จิตรานนท์	ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๒
๔) นางสาวกนกกร เอนก	ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๑
๕) นายสุริยา สอนแก้ว	ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๒
๖) นายวิชาญ ชุณหรัต	ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๓

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ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย

๑) นางสาวจินดา โชจุลธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๘
๒) นางสาวสาวิตรี น้อยเสงี่ยม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๙
๓) นางสาวชณัฐกาญจน์ อิ่มชม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๐
๔) นางสาวบรินทร์ สายเสิง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๕
๕) นางสาวนันทวดี สมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๖
๖) นางสาวศรัณยา เฉลิมอำรงค์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๗
๗) นางสาวสรารัศมิ์ มงคลจิรวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๙
๘) นางสาวศิริลักษณ์ พึ่งแพง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๒๐
๙) นายนพพงศ์ จันทรุพันธุ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๐๘
๑๐) นายนรเศรษฐ์ โกมาลย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๑
๑๑) นายธันวา จริยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๔
๑๒) นางสาวเกศรินทร์ แก้วมั่น	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๖
๑๓) นางสาวสุวิมล ชัยเรืองวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๗
๑๔) นางสาวสุชาดา ธรรมถาวร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๑
๑๕) นางสาวเปมิกา ชัยเดชธนกุล	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๓
๑๖) นางสาวศศิธร หมูสวัสดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๔
๑๗) นางสาวเสาวลักษณ์ ภู่นภาอำพร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๕
๑๘) นายอภิสิทธิ์ สิงหา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๖
๑๙) นายศักดิ์สิทธิ์ ไพศาลหิสุทธิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๗
๒๐) ว่าที่ร้อยตรีหญิง พรรณิภา ขำเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๘
๒๑) นางจิลดา คำภูแก้ว	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๓๑
๒๒) นางสาวอรวรรณ รักยง	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๕
๒๓) นางสาวนพรัตน์ แย้มกรานต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๙
๒๔) นายจุลเดช วารินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๐
๒๕) นางสาวดายุรัตน์ ร้องคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๑
๒๖) นายนคร สุขเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๒
๒๗) นายบัญชา นามเขตต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๓
๒๘) นายพรมมี ศรีปัตเนตร	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๕
๒๙) นายฤทิศ อุ่นสิม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๖
๓๐) ว่าที่ร้อยตรี เฉลิมเกียรติ อมรศรีเสริม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๘
๓๑) นางสาววริยา สร้างนา	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๙
๓๒) นายอนุพงศ์ รัตนศรีประเสริฐ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๓๐
๓๓) นางสาวจุฑารัตน์ โอนสันเทียะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๒๔๒
๓๔) นางสาวจารุวรรณ พิมพ์อภิรฤดิยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๖

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๓๕) นางสาวปรางค์ทิพย์...

๓๕) นางสาวปรางค์ทิพย์ กิจไพศาลศักดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๙
๓๖) นางสาวเตือนใจ ทางกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๐
๓๗) นางสาวจิราพร ศิริเวช	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๒
๓๘) นายวรากร ผูกรักษ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๓
๓๙) นายทนง วิริยะสหกิจ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๔
๔๐) นายธนิต เจนจบ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๕
๔๑) นายคณิศร ขำเพชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๖
๔๒) นายอรรคพล นิยมวิทยาพัน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๗
๔๓) นายภูวิช พรหมสะอาด	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๘
๔๔) นายธนเดช โภคาพิพัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๙
๔๕) นายชวฤทธิ์ วงษ์จันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๐
๔๖) นายอาทิตย์ ศรีเสน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๑
๔๗) นายเจษดินทร์ คงศักดิ์ไทย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๒
๔๘) นายจรัส บุญยิ่ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๕
๔๙) นายธนาณัติ เอนก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๖
๕๐) นายอภิวัฒน์ ทุมหนู	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๗
๕๑) นางสาวสุภาพวัญ มาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๘
๕๒) นางสาวทัตพร ชวาลสมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๐
๕๓) นางสาวธิติมา บุญเพ็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๑
๕๔) นางสาวกนกอร เข็มเพ็ชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๒
๕๕) นางสาวพัชรียา หงษ์สมดี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๓
๕๖) นางสาวภานิดา สุรวงศ์ตระกูล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๔
๕๗) นางสาวภานุมาศ นามวัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๕
๕๘) นางสาวอุไรรัตน์ หึงสร้างแป้น	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๖
๕๙) นายธีรวัฒน์ ปวงสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๗
๖๐) นายอิทธิพล ยะโส	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๘
๖๑) นายประพจน์ วรรณชูชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๙
๖๒) นายชยธร พวงทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๐
๖๓) นางสาวกนกวรรณ จันทบาล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๑
๖๔) นางสาวเกษร หลักบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๒
๖๕) นายสิทธิโชค ธงเงิน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๓
๖๖) นางศิลาวรรณ ใจบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๕
๖๗) นางสาวพรรณธิดา หุ่มคง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๘
๖๘) นางสาวศรวณีย์ ยิ่งดี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๙
๖๙) นายนวภัทร ศรีวิริยะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๐
๗๐) นายสุวิชา ทองอ่อน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๑
๗๑) นายวิญญู บุญยตะนัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๓

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๗๒) นายสมบูรณ์...

๗๒) นายสมบูรณ์ บุตรจันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๔
๗๓) นายวิรัตน์ ไชยนะรา	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๕
๗๔) นายนฤเบศน์ เพิ่มพูน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๖
๗๕) นายจิรณัฐ ขาวละออ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๗
๗๖) นายสมโภช วันสา	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๙
๗๗) นายอัสรี นามบุรี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๑๗
๗๘) นายณัฐนันท์ ปานประเสริฐ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๑๙
๗๙) นายอัศวเรศ จ่อสาว	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๒๐
๘๐) นายประเสริฐ สุระขันธ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๒๑
๘๑) นายนุกูล จันทร์เนียม	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๒๒
๘๒) นายพีรพงษ์ ทองคูณปรีดา	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๒๓
๘๓) นายฤพล ทองนุช	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๒๔
๘๔) นายอนุวัฒน์ ม่วงแพร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๒๕
๘๕) นายเจตศราวุฒิ ปัตตะมะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๒๖
๘๖) นายกฤษณะ สายวรรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๒๗
๘๗) นายพิชัย บุญยงค์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๒๘
๘๘) นายภานุพงศ์ โฮมวงศ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๒๙
๘๙) นายสามารถ คุ้มปลี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๓๐
๙๐) นายสัญชัย โกศรีนาม	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๓๑
๙๑) นายณัฐวุฒิ ศรีประเสริฐ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๓๒
๙๒) นายขวัลธัช นาคพนม	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๓๓
๙๓) นายพงศธร ชัยทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๓๕
๙๔) ว่าที่ร้อยตรี ภานุพงศ์ แสนศรี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๓๖
๙๕) นายสิทธิโชค ทาสีดา	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๓๗
๙๖) นายธนากร อินสุดา	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๓๘
๙๗) นางสาววรณิชชา ชาติวันชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๓๙
๙๘) นางสาวพิมพ์ตะวัน มินากูล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๔๑
๙๙) นางสาวเพชรัตน์ สิงห์สมบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๔๒
๑๐๐) นางสาวชญานิน พรหมจันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๔๓
๑๐๑) นายกีรติ ทวีราช	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๘๖
๑๐๒) นายจักริน หมั่นวิชา	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๘๗
๑๐๓) นายฉัตรชัย สุขเปีย	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๘๘
๑๐๔) นายณรนนท์ ตัะทองคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๘๙
๑๐๕) นายดุลยพล สนนอก	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๐
๑๐๖) นายทักษ์ตนัย อุบลศรี	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๑
๑๐๗) นายธนศวร นามะกุณฑา	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๒
๑๐๘) นายธิติพงศ์ บัวแดง	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๓

(นายศิระ จันทร์เฉิด)
นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาราชการแทน
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๑๐๙) นายนนทชัย...

๑๐๙) นายนนทชัย อุปถัมภ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๔
๑๑๐) นายนัฐพล คุณสุทธิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๕
๑๑๑) นายนันทวัฒน์ สาริน	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๖
๑๑๒) นายปิยะนัฐ พลมะศรี	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๗
๑๑๓) นายพงศ์สิริ โสมเขียว	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๘
๑๑๔) นายพีรพัฒน์ กำคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๙
๑๑๕) นายภาณุพงศ์ มานิตย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๐
๑๑๖) นายมงคล ผลาทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๑
๑๑๗) นายมุนินทร์ พูลศิริ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๒
๑๑๘) นายสิรินนท์ ทองอิ่น	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๓
๑๑๙) นายอเนชา ทันสมัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๔
๑๒๐) นายอดิศักดิ์ ผมไผ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๕
๑๒๑) นายอนันตชัย วีสม	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๖
๑๒๒) นายณัฐดนัย เจ๊อละออง	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๗
๑๒๓) นายวรวุธ ดีนัก	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๘
๑๒๔) นายแสงตะวัน นะตะสัต	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๙
๑๒๕) นายยุทธพงศ์ รัตนะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๐
๑๒๖) นายชยัณวุฒิ ไชยชะนิจ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๑
๑๒๗) นายวิศรุต ศรีธรรมมา	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๒
๑๒๘) นายนนทกร เผือกผ่อง	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๓
๑๒๙) นายกำชัย สุทธะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๔
๑๓๐) นางสาวณัฐภรณ์ รักทะเล	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๑๙
๑๓๑) นางสาวประภาภรณ์ บุตรพรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๐
๑๓๒) นางสาวนิลาวัลย์ นามพรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๑
๑๓๓) นางสาวพัชรินทร์ แสนสร้อย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๒
๑๓๔) นายไพรวัลย์ เปรื่องพิมาย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๓
๑๓๕) นางสาวศุภมาศ ทองมาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๔
๑๓๖) นางสาวลลิตา จิตรสว่าง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๕
๑๓๗) นางสาวชไมพร เสิกกู่เขียว	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๖
๑๓๘) นางสาวกฤติมาพร คำมีแก่น	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๗
๑๓๙) นางสาวสกุลรัตน์ ภาคภูมิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๘
๑๔๐) นางสาวกาญจนา คงคูณ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๙
๑๔๑) นางสาวไพรินทร์ ศรีรูปี	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๐
๑๔๒) นางสาวทิพเนตร ผุยปัญญา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๑
๑๔๓) นางสาวสาธิลา ปานทอง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๒
๑๔๔) นางสาวอริสา ทองนวล	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๓
๑๔๕) นางสาวอรยา ค้าคล่อง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๔

(นายศิระ จันทร์เฉิด)
นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาราชการแทน
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

๑๔๖) นางสาวชุดาภรณ์...

๑๔๖) นางสาวชุดาภรณ์ สุนทรสนาน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๕
๑๔๗) นางสาวสุดารัตน์ นนท์ประสาท	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๖
๑๔๘) นางสาวรัชนีกร เนียมกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๗
๑๔๙) นางสาวกัญญารัตน์ ศรีนิลทา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๘
๑๕๐) นางสาวอัญชลี คำจันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๙
๑๕๑) นายบุญฤทธิ์ เอี่ยมเทศ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๐
๑๕๒) นายศิริวัฒน์ พานิชย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๑
๑๕๓) นางสาวศุภรดา ปั้นมยุรา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๒
๑๕๔) นางสาวพาฤดี คุณนาน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๓
๑๕๕) นางสาวจิราเจต พ่องตา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๔
๑๕๖) นางสาวกนกภรณ์ อุระ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๕
๑๕๗) นางสาวอารยา มีชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๖
๑๕๘) นางสาวจิตสุภา ประเทืองสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๗
๑๕๙) นางสาวอรีสา วิริยชันติธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๘
๑๖๐) นางสาววิชชุตา นาคผจญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๙
๑๖๑) นางสาวพนิตา ยอดอินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๐
๑๖๒) นางสาวนันทิยา จันทะลุน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๑

(นายศิระ จันทร์เฉิด)
นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาราชการแทน
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๒๐๔
ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕ ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๖๑ รายการ

น้ำเสีย จำนวน 59 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldicarb	High-Performance Liquid Chromatographic Method[4]
2	Aldicarb Sulfone	High-Performance Liquid Chromatographic Method[4]
3	Aldicarb Sulfoxide	High-Performance Liquid Chromatographic Method[4]
4	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method[4]
5	Arsenic	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
6	Barium	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
7	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method[4]
8	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method[4]
9	δ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method[4]
10	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method[4]
11	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method[4] 2) 5-Day BOD Test, Membrane Electrode Method[4]
12	Carbaryl	High-Performance Liquid Chromatographic Method[4]
13	Carbofuran	High-Performance Liquid Chromatographic Method[4]
14	Cadmium	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
15	Chemical Oxygen Demand	1) Closed Reflux, Colorimetric Method[4] 2) Closed Reflux, Tritimetric Method[4]
16	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method[4]
17	Chromium	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[4]
18	Color	ADMI Weighted-Ordinate Spectrophotometric Method

(นางริกาญจน์ ฉัตรสกุลวิไล)
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

19 Copper...

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[3]
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]

44 Methomyl...

(นางริกาญจน์ ฉัตรสกุลวิไล)
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และควบคุมห้องปฏิบัติการ

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 ^{0}C[4]
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method[4]
56	Total Suspended Solids	Dried at 103-105 ^{0}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]

<u>น้ำใต้ดิน จำนวน 126 รายการ</u>

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]

3 Aldrin...

(นางริกาญจน์ ฉัตรสกุลวิไล)
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และควบคุมห้องปฏิบัติการ

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]

18 Bis(2-ethylhexyl)phthalate...

(นางริกาญจน์ ฉัตรสกุลวิไล)
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

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] Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method[4]
22	Butyl Benzyl Phthalate	Liquid-Liquid Extraction, 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]

34 Chromium (III)...

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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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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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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-Methylnapthalene	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_5-C_8)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[13,24]
110	TPH ($C_{>8}$-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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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]

อากาศเสีย (ปล่องระบาย) จำนวน 16 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic, Digestion, Inductively Coupled Plasma Method[5]
2	Arsenic	Isokinetic, Digestion, Inductively Coupled Plasma Method[5]

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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	Adsorption Sampling, Gas Chromatographic Method[5]

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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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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[1,19,25] 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[1,6,16,17] 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
		2) Soxhlet Extraction, Gas Chromatographic Method[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method [22,31]
17	Dieldrin	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]
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
		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]
23	Methoxychlor	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]
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',3,4',5,5',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[22,31]

28 Pentachlorophenol...

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	Pentachlorophenol	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]
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[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method[22,31]
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]

4) Digestion...

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
		4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,16]
35	Zinc	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]

<u>ดิน จำนวน 125 รายการ</u>

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]

9 Benz(a)anthracene...

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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[12,24]
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]

26 Carbon tetrachloride...

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[14,24]
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic 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 Method[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[25,31]
39	DDD	1) Soxhlet Extraction, Gas Chromatographic 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 Method[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[25,31]
41	DDT	1) Soxhlet Extraction, Gas Chromatographic Method[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[25,31]
42	Dibenz(a,h)anthracene	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 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 Method[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[25,31]
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic 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 Method[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[25,31]
70	Heptachlor Epoxide	1) Soxhlet Extraction, Gas Chromatographic 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 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 Method[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[25,31]
75	β-HCH	1) Soxhlet Extraction, Gas Chromatographic Method[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[25,31]
76	γ-HCH	1) Soxhlet Extraction, Gas Chromatographic 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]

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2) Thermal...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
		2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry[19] 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method[20]
84	Methanol	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method[12,24]
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic Method[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[25,31]
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[14,24]
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]

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- 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',3,4,4',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',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',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]

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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_5–C_8)	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_{35})	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]

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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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และทะเบียนห้องปฏิบัติการ

ที่ อก ๐๓๑๐(๓)/ **๖๔๗๐**

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๘ มิถุนายน ๒๕๖๔

เรื่อง ขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒๙ เมษายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน พร้อมรายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ และรายการสารมลพิษที่จะทำการวิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน มีเลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่น้ำคู้ อำเภอปลวกแดง จังหวัดระยอง โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

๑) นายเดช ช้างชน	ทะเบียนเลขที่ ว-๓๒๓-ศ-๙๔๔๒
๒) นางวิลาวัณย์ บริรักษ์	ทะเบียนเลขที่ ว-๓๒๓-ศ-๙๔๔๓
๓) นายสุพจน์ สลามเต๊ะ	ทะเบียนเลขที่ ว-๓๒๓-ศ-๙๔๔๔

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

๑) นางสาวนฤมล บรรจงกิจ	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๔๕
๒) นางพจนา สีดา	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๔๖
๓) นางสาวธนิตา กุลสุริวงศ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๔๗
๔) นายพิทยา ทองแดง	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๔๘
๕) นางชลธิชา สุบงกช	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๔๙
๖) ว่าที่ ร.ต.รณชัย ม่วงมา	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๕๐
๗) นายวราวุฒิ พับพา	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๕๑
๘) นายศักดิ์นรินทร์ จรัสกาย	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๕๒
๙) นายสุรศักดิ์ สาขิน	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๕๓
๑๐) นางสาวเพชรคุณ ภวภูตานนท์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๕๔
๑๑) นายสถาพร ถาแก้ว	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๕๕
๑๒) นายสุทธิ์ดำรงค์ โชคปิติบันท์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๕๖

๑๓) นายวัลลภ...

๑๓) นายวัลลภ ทันไชยเนาว์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๕๗
๑๔) นางสาววนาลี เหรียญตระกูล	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๕๘
๑๕) นางสาวนิตา ผดุงจิตต์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๕๙
๑๖) นายธนะสิทธิ์ วงศ์ษาไชย	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๖๐
๑๗) นายชัยนุสรณ์ เลิศนันทกุลชัย	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๖๑
๑๘) นายสังจา เพ็ชรแสวง	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๖๒
๑๙) นายกันตภณ มณีสัมพันธ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๖๓
๒๐) นางสาวจันทนีย์ โกเมนชนะ	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๖๔
๒๑) นายธารินทร์ อ๊อกจินดา	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๖๕
๒๒) นายศุภณัฐ พิสัยพันธ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๖๖
๒๓) นายศุภชัย วงศ์สุริย์ฉาย	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๖๗
๒๔) นายปฐมพงศ์ กรสวัสดิ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๖๘
๒๕) นายไสว ต้นไพธิ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๖๙
๒๖) นางสาวกิตติยา สัญญาอริยาภรณ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๗๐
๒๗) นางสาวเจษฎาพร ศรีบุญเรือง	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๗๑
๒๘) นางสาวมธุรินทร์ สิงห์เงา	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๗๒
๒๙) นางสาวธิดารัตน์ ศิริมังคะโร	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๗๓
๓๐) นายพิพัฒน์ นิภัทร์เศรษฐ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๗๔
๓๑) นายศิริวิทย์ เรืองสม	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๗๕
๓๒) นายปาราเมศ สัตยาคุณ	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๗๖
๓๓) นายณุนาท ธรรมสะโร	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๗๗
๓๔) นางสาวศุภรัตน์ โสจันทร์	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๗๘
๓๕) นายพชรกร อินทรเสนา	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๗๙
๓๖) นายทิวากร เชื้อมาก	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๘๐
๓๗) นายอนุรักษ์ ทองขจรศักดา	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๘๑
๓๘) นายอภิชาติ วิลาศ	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๘๒
๓๙) นายจรัสระวี ศรีรักษา	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๘๓
๔๐) นายประสานมิตร เชื่อนเพชร	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๘๔
๔๑) นายภานุวัฒน์ วังบง	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๘๕
๔๒) นายสันติ ชัยชนะ	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๘๖
๔๓) นายสิทธิชัย แก้วเกตุ	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๘๗
๔๔) นายทินกร กุลชาติ	ทะเบียนเลขที่ ว-๓๒๓-จ-๙๔๘๘

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๑๔ รายการ อากาศเสีย (ปล่องระบาย) จำนวน ๗ รายการ และน้ำใต้ดิน จำนวน ๓ รายการ รวมทั้งสิ้นจำนวน ๒๔ รายการ ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้มีอายุ ๓ ปี นับจากวันที่กรมโรงงานอุตสาหกรรมออกหนังสือ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางจินตา เตชะศรินทร์)
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๒๘ มิ.ย. ๒๕๖๔

กองวิจัยและเตือนภัยมลพิษโรงงาน
ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
โทร. ๐ ๓๘๐๕ ๗๒๖๑-๓
ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๒-๓๒๓
ที่ อก ๐๓๑๐(๓)/ ๖๔๗๐ ลงวันที่ ๒๘ มิถุนายน ๒๕๖๔

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 ^{o}C[2]
13	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method[2]
14	Total Suspended Solids	Dried at 103-105 ^{o}C[2]

อากาศเสีย (ปล่องระบาย) จำนวน 7 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method[5] 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[6] 2) Instrumental Analyzer Method[9]
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method[5] 2) Instrumental Analyzer Method[10]

(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]

น้ำใต้ดิน 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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บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

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