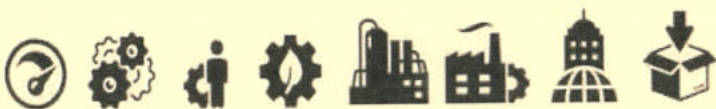


ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์
(Calibration)





Thai Environmental Technic Limited

บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
1.	Stack Air	Particulate	Dry Gas Meter/SK25 EX	S/N 604	08/03/2022	March 2023
			Dry Gas Meter/SK25 EX	S/N 1317	10/03/2022	March 2023
		Digital Humidity/Barometer/Temp/PHB-318	Digital Barometer/PHB-318	S/N B011414	11/05/2022	May 2023
			Digital Humidity/Barometer/Temp/PHB-318	S/N B011412	25/03/2022	March 2023
			Digital Thermometer-Hygrometer/608-H	S/N 34912089	21-22/03/2022	March 2023
		NO _x as NO ₂	Electronic Balance/METTLER TOLEDO	S/N 111692227	22/04/2022	April 2023
			Gas Analyzer (E-instrument)/E4500-S	S/N 2178	05/07/2022	July 2023
			Gas Analyzer (E-instrument)/E4500-S	S/N 4859	06/07/2022	July 2023
		HF	Personal Air Sampler/Gilian	S/N 20151002115	16/11/2022	December 2022
			Personal Air Sampler/Gilian	S/N 20151102105	16/11/2022	December 2022
		NaOH	Ion Chromatograph/ICS-1100	S/N 10010987	30/09/2022	March 2023
			Personal Air Sampler/Gilian	S/N 20151003044	16/11/2022	December 2022
			Personal Air Sampler/Gilian	S/N 2011203069	23/12/2022	January 2023
		H ₂ SO ₄	Personal Air Sampler/Gilian	S/N 20120103092	23/12/2022	January 2023
			Dry Gas Meter/SK25 EX	S/N 1317	10/03/2022	March 2023
			Digital Barometer/PHB-318	S/N B011414	11/05/2022	May 2023
		Xylene	Digital Humidity/Barometer/Temp/PHB-318	S/N B011412	25/03/2022	March 2023
			Personal Air Sampler/Gilian	S/N 20151102093	16/11/2022	December 2022
			Personal Air Sampler/Gilian	S/N 20151102097	16/11/2022	December 2022
		MEK	Gas Chromatograph/GC78908	S/N CN16343040	26/09/2022	September 2023
			Personal Air Sampler/Gilian	S/N 20151102093	16/11/2022	December 2022
			Personal Air Sampler/Gilian	S/N 20151102097	16/11/2022	December 2022
			Gas Chromatograph/GC78908	S/N CN16343040	26/09/2022	September 2023



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์ (ต่อ)

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
2.	Ambient Air	TSP	ORIFICE TRANSFER STANDARD/Tisch	S/N 0068	19/11/2022	November 2023
			High Volume Air Sampler/TET	S/N TSP-No.18	01/08/2022	August 2023
			High Volume Air Sampler/TET	S/N TSP-No.15	01/08/2022	August 2023
			High Volume Air Sampler/TET	S/N TSP-No.22	01/08/2022	August 2023
		PM-10	Electronic Balance/METTLER TOLEDO	S/N 1116392227	22/04/2022	April 2023
			ORIFICE TRANSFER STANDARD/Tisch	S/N 0068	19/11/2022	November 2022
			High Volume Air Sampler/TET	S/N PM10-No.1	01/08/2022	August 2023
			High Volume Air Sampler/TET	S/N PM10-No.8	01/08/2022	August 2023
			High Volume Air Sampler/TET	S/N PM10-No.10	01/08/2022	August 2023
			Electronic Balance/METTLER TOLEDO	S/N 1116392227	22/04/2022	April 2023
3.	Working Air	NO ₂	CERTIFICATE OF Analysis : Line	S/N A008225K	15/06/2021	June 2023
			NO _x Analyzer/API 200E	S/N 737	05/06/2022	December 2022
			NO _x Analyzer/API 200E	S/N 731	02/06/2022	December 2022
			NO _x Analyzer/Teledyne T200	S/N 5160	03/06/2022	December 2022
		Total Dust	Personal Air Sampler/Gilian	S/N 201405076	31/08/2022	September 2022
			Personal Air Sampler/Gilian	S/N 2014705056	31/08/2022	September 2022
			Personal Air Sampler/Gilian	S/N 20120202045	02/09/2022	October 2022
			Personal Air Sampler/Gilian	S/N 20111203071	02/09/2022	October 2022
			Personal Air Sampler/Gilian	S/N 20110505116	02/09/2022	October 2022
			Personal Air Sampler/Gilian	S/N 20151102080	02/09/2022	October 2022
			Electronic Balance/XP 205	S/N 1129273885	22/04/2022	April 2023



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บริษัท เทคนิกสิ่งแวดล้อมไทย จำกัด

ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์ (ต่อ)

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
3.	Working Air (Cont.)	HF	Personal Air Sampler/Gilian	S/N 20140605001	31/08/2022	September 2022
			Personal Air Sampler/Gilian	S/N 20140705060	31/08/2022	September 2022
		Al	Personal Air Sampler/Gilian	S/N 20120103069	07/10/2022	November 2022
			Personal Air Sampler/Gilian	S/N 20140505013	31/08/2022	September 2022
			Personal Air Sampler/Gilian	S/N 21040605017	31/08/2022	September 2022
			ICP394/PerkinElmer/OPTIMA8000	S/N 07851310024C	04/10/2022	April 2023
		H ₂ SO ₄	Personal Air Sampler/Gilian	S/N 20140504112	02/09/2022	October 2022
			Personal Air Sampler/Gilian	S/N 20111203066	07/10/2022	November 2022
		NaOH	Ion Chromatograph/CS-1100	S/N 10010987	30/09/2022	March 2023
			Personal Air Sampler/Gilian	S/N 20111203056	02/09/2022	October 2022
		Xylene	Personal Air Sampler/Gilian	S/N 20120103073	07/10/2022	November 2022
			Personal Air Sampler/Gilian	S/N 20140605016	02/09/2022	October 2022
		Toluene	Personal Air Sampler/Gilian	S/N 20140706029	01/09/2022	October 2022
			Gas Chromatograph/GC7890B	S/N CN16343040	26/09/2022	September 2023
		Benzene	Personal Air Sampler/Gilian	S/N 20140605016	02/09/2022	October 2022
			Personal Air Sampler/Gilian	S/N 20140706029	01/09/2022	October 2022
		CO	Gas Chromatograph/GC7890B	S/N CN16343040	26/09/2022	September 2023
			Personal Air Sampler/Gilian	S/N 20140605016	02/09/2022	October 2022
		CO ₂	Personal Air Sampler/Gilian	S/N 20140706029	01/09/2022	October 2022
			Gas Chromatograph/GC7890B	S/N CN16343040	26/09/2022	September 2023
		NH ₃	Personal Air Sampler/Gilian	S/N 20120202031	31/08/2022	September 2022
			Gas Detector/BW Technologies	S/N KA415-1047024	01/09/2022	September 2023
		Spectrophotometer/BlueStar A	Gas Meter/Testo 535	S/N 02151252	10/12/2021	December 2022
			Personal Air Sampler/Gilian	S/N 20120103064	07/10/2022	November 2022
			Spectrophotometer/BlueStar A	S/N 1666UV1507	03/11/2021	November 2022



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ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์ (ต่อ)

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
4.	Sound Level	Leq 24 hr	Sound Level Calibrator/TENMARS TM-100	S/N 181203570	26/01/2022	January 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 100101	24/10/2022	31/11/2022
			Integrated Sound Level/ACO TYPE 6226	S/N 160095	24/10/2022	31/11/2022
			Integrated Sound Level/ACO TYPE 6226	S/N 160203	24/10/2022	31/11/2022
			Integrated Sound Level/ACO TYPE 6226	S/N 160212	24/10/2022	31/11/2022
5.	Occupational Safety and Health	Leq 8 hr	Sound Level Calibrator/TENMARS TM-100	S/N 181203570	26/01/2022	January 2023
			Integrated Sound Level/ACO TYPE 6236	S/N 152073	24/08/2022	30/09/2022
			Integrated Sound Level/ACO TYPE 6236	S/N 152074	24/08/2022	30/09/2022
			Integrated Sound Level/ACO TYPE 6236	S/N 152076	24/08/2022	30/09/2022
			Integrated Sound Level/ACO TYPE 6236	S/N 150142	24/08/2022	30/09/2022
		Noise Dose	Integrated Sound Level/ACO TYPE 6226	S/N 160211	24/08/2022	30/09/2022
			Integrated Sound Level/ACO TYPE 6226	S/N 152077	24/08/2022	30/09/2022
			Integrated Sound Level/ACO TYPE 6236	S/N 160212	24/08/2022	30/09/2022
			Integrated Sound Level/ACO TYPE 6226	S/N 160097	25/09/2022	31/10/2022
			Integrated Sound Level/ACO TYPE 6226	S/N 160143	29/09/2022	31/10/2022
		Heat	Noise Dose Meter/Tenmars ST-130	S/N 170400163	04/03/2022	March 2023
			Noise Dose Meter/Tenmars ST-130	S/N 170400165	04/03/2022	March 2023
			Noise Dose Meter/Tenmars ST-130	S/N 170400177	08/01/2022	January 2023
			Noise Dose Meter/Tenmars ST-130	S/N 170800191	08/01/2022	January 2023
			WET BULB GLOBE TEMPERATURE (WBGT) METER	S/N 3522210140	07/03/2022	March 2023
			WET BULB GLOBE TEMPERATURE (WBGT) METER	S/N 3522210141	07/03/2022	March 2023
			WET BULB GLOBE TEMPERATURE (WBGT) METER	S/N 3522210144	07/03/2022	March 2023
			WET BULB GLOBE TEMPERATURE (WBGT) METER	S/N 3522210149	07/03/2022	March 2023
			WET BULB GLOBE TEMPERATURE (WBGT) METER	S/N 3522210147	07/03/2022	March 2023
			WET BULB GLOBE TEMPERATURE (WBGT) METER	S/N 3522210142	07/03/2022	March 2023



Thai Environmental Technic Limited
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ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดแลร่วเคราะห์

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
6.	Wastewater	pH	pH Meter/Horiba	S/N B06D0012	16/07/2021	July 2022
		Temperature	pH Meter (Temperature)/Horiba	S/N B06D0012	16/07/2021	July 2022
		SS	Electronic Balance/METTLER TOLEDO	S/N 1116392227	22/04/2022	April 2023
		TDS	Electronic Balance/METTLER TOLEDO	S/N 1116392227	22/04/2022	April 2023
		BOD	BOD Incubator	ID/N TET.LAB.BOD 03	03/11/2021	November 2022
		Cyanide	Spectrophotometer/BlueStar A	S/N 1606UV1507	03/11/2021	November 2022
		Sulfate	Spectrophotometer/BlueStar A	S/N 1606UV1507	03/11/2021	November 2022
		Formaldehyde	Spectrophotometer/BlueStar A	S/N 1606UV1507	03/11/2021	November 2022
		Phenol	Spectrophotometer/BlueStar A	S/N 1606UV1507	03/11/2021	November 2022
		Oil & Grease	Electronic Balance/METTLER TOLEDO	S/N 1116392227	22/04/2022	April 2023
		Cr ⁶⁺	Spectrophotometer/BlueStar A	S/N 1606UV1507	03/11/2021	November 2022
		Co, Al, Ba, Cd	ICP394/PerkinElmer/OPTIMA8000	S/N 078S1310024C	05/04/2022	October 2022
		Cu, Pb, Mn, Ni	ICP394/PerkinElmer/OPTIMA8000	S/N 078S1310024C	05/04/2022	October 2022
		Zn	Atomic Absorption Spectrophotometer	S/N 040S0110503	04/04/2022	October 2022
		Hg, Se	PerkinElmer/AAnalyst 100			
		Cr ³⁺	ICP394/PerkinElmer/OPTIMA8000	S/N 078S1310024C	05/04/2022	October 2022
			Spectrophotometer/BlueStar A	S/N 1606UV1507	03/11/2021	November 2022



THAI ENVIRONMENTAL TECHNIC LIMITED
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

CONTROL UNIT CALIBRATION

(Metric units , mm)

Date **10-Mar-22**

	Initial	Final	Average	
Barometric press, Pb	755.0	756.0	755.5	mmHg

Dry Gas Meter Data

Console No. **M50-07**

Metering System ID

DGM Number **1317**

DGM Model **SK25EX**

Reference Dry Gas Meter Data

Serial No. **913428**

Model **S-110**

Correction factor(Vr) **0.982**

Last Calibration Date **01-Jun-21**

Orifice manometer setting ΔH mm H ₂ O	Ref .	DGM Volume V _m Liters	Temperature (° C)				Time min	DGM Correction factor (V)	ΔH@ mm H ₂ O
	DMG		Ref DGM T _r	Dry Gas Meter					
	Volume V _r Liters			Inlet T _i	Outlet T _o	Avg T _m			
15.00	100.00	99.91	28.00	28.00	28.00	28.00	8.17	0.9815	47.8158
25.00	100.00	99.82	28.00	28.00	28.00	28.00	6.32	0.9814	47.7345
50.00	100.00	99.56	28.00	28.00	28.00	28.00	4.45	0.9816	47.4461
80.00	100.00	99.42	28.00	28.00	29.00	28.50	3.50	0.9817	47.0193
100.00	100.00	99.22	28.00	28.00	29.00	28.50	3.13	0.9818	47.0952

Average **0.9816** **47.4222**

Dued Date of Calibrate **10-Mar-23**

Calibrated by :

Approved :



THAI ENVIRONMENTAL TECHNIC LIMITED
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

CONTROL UNIT CALIBRATION

(Metric units , mm)

Date **8-Mar-22**

	Initial	Final	Average	
Barometric press, Pb	758.00	757.00	757.50	mmHg

Dry Gas Meter Data

Console No. **M50-06**

Metering System ID

DGM Number **604**

DGM Model **SK25EX**

Reference Dry Gas Meter Data

Serial No. **913428**

Model **S-110**

Correction factor(Yr) **0.982**

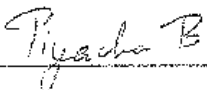
Last Calibration Data **01-Jun-21**

Orifice manometer setting ΔH mm H ₂ O	Ref . DMG Volume V _r Liters	DGM Volume V _m Liters	Temperature (°C)				Time min	DGM Correction factor (Y)	$\Delta H @$ mm H ₂ O
			Ref DGM T _r	Dry Gas Meter					
				Inlet T _i	Outlet T _o	Avg T _m			
15.00	100.00	100.01	28.00	28.00	29.00	28.50	8.17	0.9821	47.6103
25.00	100.00	99.98	28.00	28.00	29.00	28.50	6.31	0.9814	47.3789
50.00	100.00	99.76	28.00	28.00	29.00	28.50	4.44	0.9812	47.0297
80.00	100.00	99.47	28.00	28.00	29.00	28.50	3.51	0.9813	47.1425
100.00	100.00	99.21	28.00	28.00	29.00	28.50	3.14	0.9819	47.2703

Average **0.9816** **47.2903**

Dued Date of Calibrate **8-Mar-23**

Calibrated by : 

Approved : 



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 22P1746

Page : 1 of 2

Equipment : Digital Barometer
Manufacturer: Lutron
Model : PHB-318
Serial No.: B011414
ID No.: No.7

Condition As-Received: Used Item
Received Date: 06 May 2022
Calibration Date: 11 May 2022

Reference: 2205-0152WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1008 mbar

Submitted by: Thai Environmental Technic Limited

1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung,
Bangkok 10240

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges, Edition 03/2014 " as a guidelines.

Condition of this result of calibration

1. Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Digital Manometer	767367	91R724799	22P396	08 Feb 2023

2. This result of calibration was made on requested at the point specified by customer.

3. Scale and conversion factor is 1 kPa = 7.50062 mmHg

4. This result of calibration instrument was in absolute pressure.

5. This instrument was used clean air as pressure media.

6. This instrument was installed in vertical orientation and center of connector was used as the reference level.

7. The certificate is valid only to the item calibrated on date and place of calibration.

8. This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew
Issue Date : 12 May 2022

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

B 0287406



Cert.No.: 22P1746

Page: 2 of 2

Result of calibration:- Without adjustment

Range : 730 mmHg to 790 mmHg

Function:- Absolute Pressure Measurement

Resolution : 0.1 mmHg

Increasing Pressure

Applied Pressure (mmHg)	730.85	740.85	750.85	760.85	770.85	780.85	790.85
UUC* Indication (mmHg)	731.8	741.9	751.8	761.9	771.8	781.8	791.9
Error (mmHg)	0.95	1.05	0.95	1.05	0.95	0.95	1.05

Decreasing Pressure

Applied Pressure (mmHg)	790.85	780.85	770.85	760.85	750.85	740.85	730.85
UUC* Indication (mmHg)	791.9	781.9	771.8	761.9	751.9	741.9	731.9
Error (mmHg)	1.05	1.05	0.95	1.05	1.05	1.05	1.05

The uncertainty of measurement was ± 0.27 mmHg

* 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 %.

-o0o-

Attapol P.

a 1106634



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 22P1085

Page : 1 of 2

Equipment : Humidity/Barometer/Temp.

Manufacturer: Lutron

Model : PHB-318

Serial No.: B011412

ID No.: NO.5

Condition As-Received: Used Item

Received Date: 17 March 2022

Calibration Date: 25 March 2022

Reference: 2203-0728WSC

Submitted by: Thai Environmental Technic Limited

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1006 mbar

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Corporate Services 3: Equipment Calibration and Testing Services.

1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung,
Bangkok 10240

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to in-house calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure
Gauges, Edition 03/2014 " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Standard Barometer	DPI142	1422505046	MP-0053-21	08 Apr 2022

2.This result of calibration was made on requested at the point specified by customer.

3.Scale and conversion factor is 1 kPa = 7.50062 mmHg

4.This result of calibration instrument was in absolute pressure.

5.This instrument was used clean air as pressure media.

6.This instrument was installed in vertical orientation and center of connector was used as the reference level.

7.The certificate is valid only to the item calibrated on date and place of calibration.

8.This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Pongsak Siangsang

Issue Date : 30 March 2022

Approved Signatory :

☐ Phalinee Prabpaipal

☒ Sura Suwannasri

☐ Attapol Panurach

B 0283842



Cert.No.: 22P1085

Page: 2 of 2

Result of calibration:- Without adjustment

Range : 730 mmHg to 770 mmHg

Function:- Absolute Pressure Measurement

Resolution : 0.1 mmHg

Increasing Pressure

Applied Pressure (mmHg)	729.95	739.95	749.95	759.95	769.95
UUC* Indication (mmHg)	731.0	741.0	751.0	761.0	770.9
Error (mmHg)	1.05	1.05	1.05	1.05	0.95

Decreasing Pressure

Applied Pressure (mmHg)	769.95	759.95	749.95	739.95	729.95
UUC* Indication (mmHg)	770.9	761.0	751.0	741.0	731.0
Error (mmHg)	0.95	1.05	1.05	1.05	1.05

The uncertainty of measurement was ± 0.23 mmHg

* 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 %.

-o0o-

Signature

a 1101506



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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Certificate of Calibration

Certificate No. : 22H634

Page : 1 of 2

Equipment : Digital Thermo-Hygrometer

Manufacturer: Testo

Model : 608-H1

Serial No.: 34912089

ID No.: NO.2

Condition As-Received: Used Item

Received Date: 17 March 2022

Calibration Date: 21 March 2022
to 22 March 2022

Reference: 2203-0728WSC

Ambient Temperature: (25 \pm 3) °C

Relative Humidity: (50 \pm 20) %

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except with the prior written approval of the head of
Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: Thai Environmental Technic Limited

1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung,
Bangkok 10240

Procedure used: Calibration were conducted using in-house calibration procedure CP-H03 according to comparison with standard capacitive probe and chilled miller sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Hygro-M2 Dew Point Monitor	5112	2360195	19457	17 Jun 2022
2) Standard Humidity/Temperature Meter	400	10240757	TH-0125-21	13 Dec 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 Standards and Technology (NIST) , The United States of America
- National Institute of Metrology Thailand (NIMT)

Calibrated by : Viporn Tantiyawutti
Issue Date : 24 March 2022

Approved Signatory :

☒ Chakrit Waewanjua

☐ Pornthippa Tameyakul

☐ Pitak Srimongkol

B 0284536



Cert. No.: 22H634

Page.: 2 of 2

Result of Calibration:-

Without Adjustment

Function:

Humidity measurement.

<u>Reference</u> <u>Temperature</u> (°C)	<u>Standard</u> <u>Humidity</u> (%R.H.)	<u>UUC*</u> <u>Reading</u> (%R.H.)	<u>Error</u> (%R.H.)	<u>Uncertainty</u> <u>of Measurement</u> (±%R.H.)
25.0	30.1	35.1	5.0	1.3
25.0	40.1	44.5	4.4	1.3
25.0	50.1	54.0	3.9	1.6

Result of Calibration:-

Without Adjustment

Function:

Temperature measurement.

<u>Standard</u> <u>Temperature</u> (°C)	<u>UUC*</u> <u>Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> <u>of Measurement</u> (±°C)
20.02	20.0	-0.02	0.42
30.02	30.0	-0.02	0.42
40.01	40.0	-0.01	0.42

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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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



Cert.No.: 22MM27

Page.: 1 of 3

Certificate of Calibration

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204
Serial No. : 1116392227
ID No. : TET.LAB.BAL01
Submitted by : Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240
Location : Balance Room
Received order : 20 April 2022
Calibration Date : 22 April 2022
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Uthen Kankawi
Approved by : Malee Butkruea
Approved Signatory
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 6 May 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 0040784



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2204-0369OC-16

Cert.No.: 22MM27

Page: 2 of 3

Procedure used :-

Calibration were conducted using in-house calibration procedure CP-OB01 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:-

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Test report No.</u>	<u>Due date</u>
1) Standard Weight Set (E2)	15884	-	70RC138	MM-0009-21	3 Feb 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This result of calibration was made on requested at the point specified by customer.

4. This certificate is not certified for any commercial transaction.

5. This certification is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by External Calibration

Range capacity : 0 g to 210 g Resolution 0.0001 g

Before Adjustment :

<u>Applied Weight</u>	<u>Balance Reading</u>	<u>Correction</u>	<u>Measurement Uncertainty</u>	<u>Coverage Factor</u>
(g)	(g)	(g)	(\pm mg)	(k)
100	99.9981	+0.0019	0.22	2.00
200	199.9957	+0.0043	0.35	2.00

After Adjustment :

1. Determination of the standard deviation of weighing machine (n = 10)

<u>Applied Weight</u>	<u>Standard Deviation</u>
(g)	of Reading (g)
100	0.00006
200	0.00007

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Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2204-0369OC-16

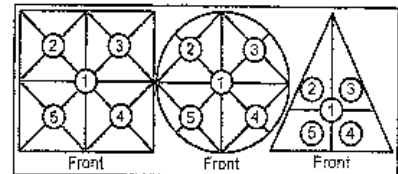
Cert.No.: 22MM27

Page: 3 of 3

Result of calibration

2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.
The weighing machine reading error obtained is given in the table



Maximum difference between
off-center and central loading
(g)
0.0003

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
-0.0003	-0.0003	-0.0003	-0.0004	0.0000

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (\pm mg)	Coverage Factor (k)
Unload	0.0000	0.0000	0.13	2.09
0.01	0.0099	+0.0001	0.13	2.09
0.1	0.0999	+0.0001	0.13	2.09
0.5	0.5000	0.0000	0.13	2.09
1	1.0001	-0.0001	0.13	2.09
5	5.0001	-0.0001	0.13	2.09
10	10.0000	0.0000	0.13	2.09
25	24.9998	+0.0002	0.15	2.06
50	49.9998	+0.0002	0.15	2.05
100	99.9998	+0.0002	0.22	2.00
200	199.9997	+0.0003	0.35	2.00

Note : This instrument was adjusted before calibration by weight of Mettler Toledo F1 200. g S/N.: 11119517
Certificate No.: 21M1956

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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Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

Portable Gas Calibration Report

Date of Calibration: 5-Jul-22
 Manufacturer : E-instruments
 Instrument Model : 4500-S
 Instrument serial no. : 2178
 Instrument ID : 8
 Ambient Condition
 Temperature (23±5 °C) : 26.0 °C
 Humidity (55±15 % RH) : 50.0 % RH
 Barometer (mmHg) : 758.0 mmHg

Standard gas References

Standard gas	Cylinder No.	Traceability	Due date
Oxygen (O ₂)	27960	Linde	August 4, 2023
Nitric Oxide(NO)	D025806	Linde	August 18, 2023
	D271295	Linde	October 12, 2022
Sulfur Dioxide (SO ₂)	D824500	Linde	October 11, 2024
	D271305	Linde	October 11, 2024
Carbon Monoxide(CO)	D824500	Linde	October 11, 2024
	D271305	Linde	October 11, 2024

Calibration Results

Parameter	Standard gas	Reading	Actual Error	Test Limit	Results
O ₂ (%vol)	0.0	0.0	0.0	±0.2 % vol	PASS
	13.9	13.9	0.0		
NO (ppm)	0.0	0.0	0.0	±5.0 ppm 0...100 ppm ±5% measured Value 101....5000 ppm	PASS
	199.0	201.0	2.0		
	393.0	395.0	2.0		
SO ₂ (ppm)	0.0	0.0	0.0		PASS
	406.0	404.0	-2.0		
	804.0	802.0	-2.0		
CO (ppm)	0.0	0.0	0.0		PASS
	404.0	403.0	-1.0		
	793.0	794.0	1.0		

Calibrate by:

Approved by:



Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

Portable Gas Calibration Report

Manufacturer : E-instruments
Instrument Model : 4500-S
Instrument serial no. : 4859
Instrument ID : 10

Date of Calibration: 6-Jul-22
Ambient Condition
Temperature (23±5 °C) : 27.0 °C
Humidity (55±15 % RH) : 50.0 % RH
Barometer (mmHg) : 758.0 mmHg

Standard gas References

Standard gas	Cylinder No.	Traceability	Due date
Oxygen (O ₂)	27960	Linde	August 4, 2023
Nitric Oxide(NO)	D025806	Linde	August 18, 2023
	D271295	Linde	October 12, 2022
Sulfur Dioxide (SO ₂)	D824500	Linde	October 11, 2024
	D271305	Linde	October 11, 2024
Carbon Monoxide(CO)	D824500	Linde	October 11, 2024
	D271305	Linde	October 11, 2024

Calibration Results

Parameter	Standard gas	Reading	Actual Error	Test Limit	Results
O ₂ (%vol)	0.0	0.0	0.0	±0.2 % vol	PASS
	13.9	13.9	0.0		
NO (ppm)	0.0	0.0	0.0	±5.0 ppm 0...100 ppm ±5% measured Value 101....5000 ppm	PASS
	199.0	198.0	-1.0		
	393.0	392.0	-1.0		
SO ₂ (ppm)	0.0	0.0	0.0		PASS
	406.0	405.0	-1.0		
	804.0	802.0	-2.0		
CO (ppm)	0.0	0.0	0.0		PASS
	404.0	403.0	-1.0		
	793.0	795.0	2.0		

Calibrate by:

Approved by:



Certificate of Calibration

ICS-1100 : Anion (ID#377)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co., Ltd.

ICS-1100 S/N : 10010987

AS-DV S/N : 10010912

for

Thai Environmental Technic Co., Ltd

ARCHEMICA LAB
บริษัท อีเอ็มที เทคโนโลยี จำกัด
ARCHEMICA LAB CO., LTD.

Operator Signature : K. Channarong Khiao-Un Date : Sep 30, 2022

(Mr. Channarong Khiao-Un)

Test Engineer

Qualification Report

PM Check list , CM_OQ and PQ

ICS-1100 : Anion (ID#377)

For

Thai Environmental Technic Co., Ltd.

(2nd Contract)

Preventive Maintenance Check List



Dionex Ion Chromatography Preventive Maintenance Report

Customer Organization	Name/ Department
Thai Environmental Technic Co.,Ltd (2 nd Contract)	Khun.Ketsarin
Engineer	Date
Mr.Channarong Khiao-Un	30-Sep-2022

Instrument Detail

Instrument Model	Application
ICS-1100 (ID#377)	Anion
Instrument components	Serial Number
ICS-1100	10010987
AS-DV	10010912

Consumable Detail

Columns	Guard Columns	Suppressors	Concentrators	Etc.
AS22	AG22	AERS 500	-	-
Remark: Pressure System สูง จาก Column และ Guard Column แต่ยังสามารถใช้งานได้				

Perform By
Archemica Lab Co.,Ltd

K. CHANNARONG

Archemica Lab

Date

30/Sep/2022

บริษัท อาร์เคมีคา แล็บ จำกัด
ARCHEMICA LAB CO.,LTD.

Customer

Date



General ICS Maintenance Checklist

Item	Description	Result		Recommended replacement	N.A.
		Check	Fail		
1	Power line 220 Vac	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
2	Pneumatic Line	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
3	Pressure outlet 80-100 psi	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
4	Barbed fitting and tee fitting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
5	Crimped and blocked tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
6	Check Rheodyne Valve for Leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Every 12 months Every 12 months	<input type="checkbox"/>
	• Stator face • Rotor Seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
7	Slider valve for leak	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
8	Inspect slider	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
9	Inspect port face	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
10	Inspect pressure bolt	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
11	Inspect fitting and ferrule	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
12	Suppressor for leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
13	Cell for leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
14	Electronic cable connected	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
15	Column selection valve for leak	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
16	Inspect all fitting and line	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
17	Check Eluent reservoir	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
18	Inspect cap o-ring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
19	Inspect air for leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
20	Pump Piston Rinse Seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Every 6 months	<input type="checkbox"/>
21	Piston Seals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Every 6 months	<input type="checkbox"/>
22	Pump Lubricate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check&Lubricate	<input type="checkbox"/>
23	Front panel test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
24	Low limit alarm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
25	Hi limit alarm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
26	Conductivity electronic test 160+/-1 uS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
27	Check noise for suppressor (pk to pk <0.005uS)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
28	Check column	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Every 6 months	<input type="checkbox"/>
	• Check bed support	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
29	Check pump	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
30	Check suppressor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
31	Check cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
32	Check leak sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
33	Flow rate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
34	System pressure	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
35	Detector background	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>

Chromeleon Operational Qualification (CM_OQ)

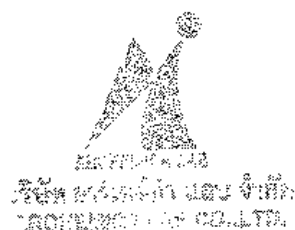
**Chromeleon Operational Qualification****General Information**

Computer Name (Server): TET
Computer Name (Client): TET
Version Number: 6.80 SR8 Build 2623 (156243)
Operator: Mr.Channarong Khiao-Un

General System Suitability Test: *Test passed*

Comparison Formats:

All Parameters: (Exceptions see below)	Significant Digits: (They must match exactly)	10
Time Related Frac. Coll. Parameters: [The parameters are marked with *].	Max. Deviation:	0.02 s



Mr. Channarong Khiao-Un 30/Sep/2022

Reviewer's Signature // Date

Operator's Signature // Date



Chromeleon Operational Qualification, Part 1

Verification of Selected Results

Calibration Type: LOff
 Integration Type: Area
 Standard Method: External
 Calibration Mode: Total
 Auto Recalibrate: ON

<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Offset (c0)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Slope (c1)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Correlation Coeffi.	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Variance	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Std. Deviation	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Rel. Std. Dev.	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Variance Coeff.	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok



Chromeleon Operational Qualification, Part 1

Verification of Selected Results

<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Calibration Point X	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Calibration Point Y	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Amount [ng]	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Resolution (EP)	Methylparabene	ok
	Ethylparabene	ok
Resolution (USP)	Methylparabene	ok
	Ethylparabene	ok
Peak Asymmetry (EP/USP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Peak Asymmetry (AIA)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok



Chromeleon Operational Qualification, Part 1

Verification of Selected Results

Report Variable	Peak Name	Status
Theoretical Plates (EP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Theoretical Plates (USP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Theoretical Plates (JP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok

Test Result: **Passed**



K. Chaninaporn 30 Sep/2022

Reviewer's Signature // Date

Operator's Signature // Date

ThermoFisher

SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Calibration Type: LOff
 Integration Type: Area
 Standard Method: External
 Calibration Mode: Total
 Auto Recalibrate: ON

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Sample	No.		ok
	Name		ok
	Sample Type		ok
	Position		ok
	Status		ok
	Inj.Vol.		ok
	Dil.Fac.		ok
	Weight		ok
	Amount		ok
	Program		ok
	Quantification Method		ok
Chromatogram	Channel		ok
	No. of Peaks		ok
	Start Time		ok
	Signal Min.		ok
	Signal Max.		ok
	Signal Dimension		ok
	Noise 2.1-2.3		ok
Peak Results	No.	Methylparabene	ok
	No.	Ethylparabene	ok
	No.	Propylparabene	ok
	Peak Name	Methylparabene	ok
	Peak Name	Ethylparabene	ok
	Peak Name	Propylparabene	ok
	Ret.Time	Methylparabene	ok
	Ret.Time	Ethylparabene	ok
	Ret.Time	Propylparabene	ok



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Peak Results	Ret.Dev.(abs)	Methylparabene	ok
	Ret.Dev.(abs)	Ethylparabene	ok
	Ret.Dev.(abs)	Propylparabene	ok
	Ret.Dev.(rel)	Methylparabene	ok
	Ret.Dev.(rel)	Ethylparabene	ok
	Ret.Dev.(rel)	Propylparabene	ok
	Area	Methylparabene	ok
	Area	Ethylparabene	ok
	Area	Propylparabene	ok
	Rel.Area (Total)	Methylparabene	ok
	Rel.Area (Total)	Ethylparabene	ok
	Rel.Area (Total)	Propylparabene	ok
	Height	Methylparabene	ok
	Height	Ethylparabene	ok
	Height	Propylparabene	ok
	Rel.Height (Total)	Methylparabene	ok
	Rel.Height (Total)	Ethylparabene	ok
	Rel.Height (Total)	Propylparabene	ok
	Amount	Methylparabene	ok
	Amount	Ethylparabene	ok
	Amount	Propylparabene	ok
	Concentration	Methylparabene	ok
	Concentration	Ethylparabene	ok
	Concentration	Propylparabene	ok
	Rel.Amount	Methylparabene	ok
	Rel.Amount	Ethylparabene	ok
	Rel.Amount	Propylparabene	ok
	Peak Width (0%)	Methylparabene	ok
	Peak Width (0%)	Ethylparabene	ok
	Peak Width (0%)	Propylparabene	ok
	Peak Width (5%)	Methylparabene	ok
	Peak Width (5%)	Ethylparabene	ok
	Peak Width (5%)	Propylparabene	ok
	Peak Width (10%)	Methylparabene	ok
	Peak Width (10%)	Ethylparabene	ok
	Peak Width (10%)	Propylparabene	ok



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Peak Results	Peak Width (50%)	Methylparabene	ok
	Peak Width (50%)	Ethylparabene	ok
	Peak Width (50%)	Propylparabene	ok
	Left Width (0%)	Methylparabene	ok
	Left Width (0%)	Ethylparabene	ok
	Left Width (0%)	Propylparabene	ok
	Right Width (0%)	Methylparabene	ok
	Right Width (0%)	Ethylparabene	ok
	Right Width (0%)	Propylparabene	ok
	Peak Start	Methylparabene	ok
	Peak Start	Ethylparabene	ok
	Peak Start	Propylparabene	ok
	Peak Stop	Methylparabene	ok
	Peak Stop	Ethylparabene	ok
	Peak Stop	Propylparabene	ok
	Peak Start Value	Methylparabene	ok
	Peak Start Value	Ethylparabene	ok
	Peak Start Value	Propylparabene	ok
	Peak Stop Value	Methylparabene	ok
	Peak Stop Value	Ethylparabene	ok
	Peak Stop Value	Propylparabene	ok
	BL-Value Peak Start	Methylparabene	ok
	BL-Value Peak Start	Ethylparabene	ok
	BL-Value Peak Start	Propylparabene	ok
	BL-Value Peak Stop	Methylparabene	ok
	BL-Value Peak Stop	Ethylparabene	ok
	BL-Value Peak Stop	Propylparabene	ok
	Type	Methylparabene	ok
	Type	Ethylparabene	ok
	Type	Propylparabene	ok
	Resolution(EP)	Methylparabene	ok
	Resolution(EP)	Ethylparabene	ok
	Resolution(USP)	Methylparabene	ok
	Resolution(USP)	Ethylparabene	ok
	Asymmetry(EP)	Methylparabene	ok
	Asymmetry(EP)	Ethylparabene	ok
	Asymmetry(EP)	Propylparabene	ok

ThermoFisher

SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Peak Results	Asymmetry(AIA)	Methylparabene	ok
	Asymmetry(AIA)	Ethylparabene	ok
	Asymmetry(AIA)	Propylparabene	ok
	Theoretical Plates(EP)	Methylparabene	ok
	Theoretical Plates(EP)	Ethylparabene	ok
	Theoretical Plates(EP)	Propylparabene	ok
	Theoretical Plates(USP)	Methylparabene	ok
	Theoretical Plates(USP)	Ethylparabene	ok
	Theoretical Plates(USP)	Propylparabene	ok
	Theoretical Plates(JP)	Methylparabene	ok
	Theoretical Plates(JP)	Ethylparabene	ok
	Theoretical Plates(JP)	Propylparabene	ok
Peak Calibration	Cal.Mode	Methylparabene	ok
	Cal.Mode	Ethylparabene	ok
	Cal.Mode	Propylparabene	ok
	Auto.Recal.	Methylparabene	ok
	Auto.Recal.	Ethylparabene	ok
	Auto.Recal.	Propylparabene	ok
	Cal.Type	Methylparabene	ok
	Cal.Type	Ethylparabene	ok
	Cal.Type	Propylparabene	ok
	Weights	Methylparabene	ok
	Weights	Ethylparabene	ok
	Weights	Propylparabene	ok
	Offset	Methylparabene	ok
	Offset	Ethylparabene	ok
	Offset	Propylparabene	ok
	Slope	Methylparabene	ok
	Slope	Ethylparabene	ok
	Slope	Propylparabene	ok
	RF-Value	Methylparabene	ok
	RF-Value	Ethylparabene	ok
	RF-Value	Propylparabene	ok
	No. of Points	Methylparabene	ok
	No. of Points	Ethylparabene	ok



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Peak Calibration	No. of Points	Propylparabene	ok
	No. of Points(disabled)	Methylparabene	ok
	No. of Points(disabled)	Ethylparabene	ok
	No. of Points(disabled)	Propylparabene	ok
	Variance	Methylparabene	ok
	Variance	Ethylparabene	ok
	Variance	Propylparabene	ok
	Var.Coeff	Methylparabene	ok
	Var.Coeff	Ethylparabene	ok
	Var.Coeff	Propylparabene	ok
	Std.Dev.	Methylparabene	ok
	Std.Dev.	Ethylparabene	ok
	Std.Dev.	Propylparabene	ok
	Rel.Std.Dev.	Methylparabene	ok
	Rel.Std.Dev.	Ethylparabene	ok
	Rel.Std.Dev.	Propylparabene	ok
	Corr.Coeff.	Methylparabene	ok
	Corr.Coeff.	Ethylparabene	ok
	Corr.Coeff.	Propylparabene	ok
	Coeff.Det.	Methylparabene	ok
	Coeff.Det.	Ethylparabene	ok
	Coeff.Det.	Propylparabene	ok
	Adj. Coeff.Det.	Methylparabene	ok
	Adj. Coeff.Det.	Ethylparabene	ok
	Adj. Coeff.Det.	Propylparabene	ok
	X	Methylparabene	ok
	X	Ethylparabene	ok
	X	Propylparabene	ok
	Y	Methylparabene	ok
	Y	Ethylparabene	ok
	Y	Propylparabene	ok
	W	Methylparabene	ok
	W	Ethylparabene	ok
	W	Propylparabene	ok
	F(X)	Methylparabene	ok
	F(X)	Ethylparabene	ok
	F(X)	Propylparabene	ok



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Peak Calibration	Residual for Cal.Point X	Methylparabene	ok
	Residual for Cal.Point X	Ethylparabene	ok
	Residual for Cal.Point X	Propylparabene	ok
	Calibration Point Status	Methylparabene	ok
	Calibration Point Status	Ethylparabene	ok
	Calibration Point Status	Propylparabene	ok
	Amount	Methylparabene	ok
	Amount	Ethylparabene	ok
	Amount	Propylparabene	ok
Peak Table	Peak Tab. Cal.Type	Methylparabene	ok
	Peak Tab. Peak Type	Methylparabene	ok
	Peak Tab. Left Limit	Methylparabene	ok
	Peak Tab. Right Limit	Methylparabene	ok
	Peak Tab. Group	Methylparabene	ok
	Peak Tab. Resp.Factor	Methylparabene	ok
	Peak Tab. Amount	Methylparabene	ok
	Peak Tab. Amnt.Dim	Methylparabene	ok

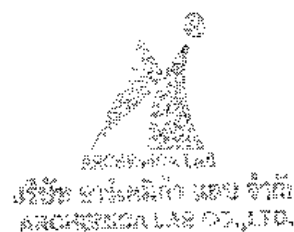


Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Purity	PPI	Methylparabene	ok
	PPI	Ethylparabene	ok
	PPI	Propylparabene	ok
	RSD PPI	Methylparabene	ok
	RSD PPI	Ethylparabene	ok
	RSD PPI	Propylparabene	ok
	Match	Methylparabene	ok
	Match	Ethylparabene	ok
	Match	Propylparabene	ok
	RSD Match	Methylparabene	ok
	RSD Match	Ethylparabene	ok
	RSD Match	Propylparabene	ok
	Rel.Max at	Methylparabene	ok
	Rel.Max at	Ethylparabene	ok
	Rel.Max at	Propylparabene	ok

Test Result: **Passed**



Reviewer's Signature // Date

Operator's Signature // Date



Chromeleon Operational Qualification, Part 3

Post-Acquisition Steps: Comparison with Expected Results

Calibration Type: LOff
 Integration Type: Area
 Standard Method: External
 Calibration Mode: Total
 Auto Recalibrate: ON

<i>Channel Name</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Extract UV Channel:			
EXT230NM	Area	Methylparabene	ok
	Area	Ethylparabene	ok
	Area	Propylparabene	ok
	Height	Methylparabene	ok
	Height	Ethylparabene	ok
	Height	Propylparabene	ok
	Base Peak Width	Methylparabene	ok
	Base Peak Width	Ethylparabene	ok
	Base Peak Width	Propylparabene	ok
EXT290NM	Area	Methylparabene	ok
	Area	Ethylparabene	ok
	Area	Propylparabene	ok
	Height	Methylparabene	ok
	Height	Ethylparabene	ok
	Height	Propylparabene	ok
	Base Peak Width	Methylparabene	ok
	Base Peak Width	Ethylparabene	ok
	Base Peak Width	Propylparabene	ok
Smooth Data:			
UV_VIS_1_MA_005_001	Noise (1.9-2.4 min)		ok
UV_VIS_1_OL_051_001	Noise (1.9-2.4 min)		ok
EXT290NM_SG_005_010	Noise (1.9-2.4 min)		ok



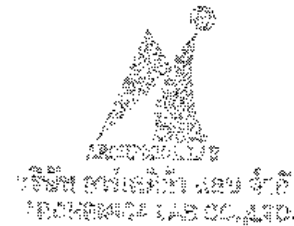
Chromeleon Operational Qualification, Part 3

Post-Acquisition Steps: Comparison with Expected Results

Channel Name	Report Variable	Peak Name	Status
<i>Arith. Comb. of Channels:</i>			
ADD_UV_VIS_1_UV_VIS_1	Area	Methylparabene	ok
ADD_UV_VIS_1_UV_VIS_1	Area	Ethylparabene	ok
ADD_UV_VIS_1_UV_VIS_1	Area	Propylparabene	ok
MUL_UV_VIS_1_UV_VIS_1	Area	Methylparabene	ok
MUL_UV_VIS_1_UV_VIS_1	Area	Ethylparabene	ok
MUL_UV_VIS_1_UV_VIS_1	Area	Propylparabene	ok

Test Result:

Passed



K. Chinnawong 30 Sep 2022

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System Suitability Test: Comparison with Expected Results

Calibration Type:	LOff
Integration Type:	Area
Standard Method:	External
Calibration Mode:	Total
Auto Recalibrate:	ON

Variable Category	Report Variable	Status
SST	Test No.	ok
	Test Name	ok
	Sample Condition	ok
	Sample Condition Result	ok
	Test Condition	ok
	Peak Condition	ok
	Aggregate Condition	ok
	Compare Operator	ok
	Compare Value	ok
	Result of Compare Value	ok
	Channel	ok
	Aggregated Samples	ok
	List of Aggr. Smp.	ok
	Result List for Aggr. Smp.	ok
	Result of Test Condition or Aggregate	ok
	N.A.	ok
Test Result	ok	
Fail-Action	ok	

Test Result: Passed

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K. HANNAH 30/Sep/2022

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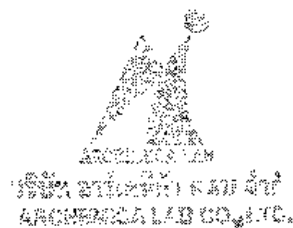
Chromeleon Operational Qualification, Part 5

Fraction Collection: Comparison with Expected Results

Calibration Type: LOff
 Integration Type: Area
 Standard Method: External
 Calibration Mode: Total
 Auto Recalibrate: ON

Variable Category	Report Variable	Status
Fraction Report	Fract. No.	ok
	Fract. Starttime *)	ok
	Fract. Endtime *)	ok
	No. of Tubes	ok
	Position	ok
	Peak Name	ok
	No. of Peaks	ok
Tube Report	Position	ok
	Tube Starttime *)	ok
	Tube Endtime *)	ok
	Max. Tube Volume	ok
	Peak Name	ok
	No. of Peaks	ok
	Fract. No.	ok
	Fract. Starttime *)	ok
	Fract. Endtime *)	ok
	No. of Tubes	ok
	No. of Peaks	ok

Test Result: **Passed**



K. Chomakong 30/Sep/2022

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Operator's Signature // Date

Performance Qualification (PQ)
(Anion)



Performance Qualification Rev. 6.10

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1.1.0
Detector	ICS-1100	Dionex	10010987	1.1.0
Autosampler	AS-DV	Dionex	10010912	1.5.0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1.1.0
Chromeleon	6.80 SR8 Build 2623 (156243)	Dionex	62483	n.a.

• Accessories

Name	Description		Lot / Serial	Exp. Date
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (5'12")	n.a.	n.a.	n.a.
Blank	Water	n.a.	n.a.	n.a.
Sample 1	Nitrate, 5 ppm	Thermo	220208	Feb-2023
Sample 2	Nitrate, 10 ppm	Thermo	220208	Feb-2023
Sample 3	Nitrate, 25 ppm	Thermo	220208	Feb-2023
Sample 4	Nitrate, 50 ppm	Thermo	220208	Feb-2023
Sample 5	Nitrate, 100 ppm	Thermo	220208	Feb-2023
Sample 6	Nitrate, 1000 ppm	Thermo	220208	Feb-2023
Eluent	Water	Water	n.a.	n.a.
Autosampler Reservoir A	Water	Water	n.a.	n.a.
Balance	Mettler Toledo	AB204	1116392227	n.a.
Temperature Probe	-	-	-	-
IC Validation Test Box	-	-	-	-
Ammeter / Multimeter	-	-	-	-



Customer Signature _____ Date _____

Chromeleon (c) DIONEX 2011
6.80 SR8 Build 2623 (156243)

K. Khammarong 30/9/2022
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OQ_PQ_Integrated_Validation / Specification

• Limits

Test	Customized Limits	Dionex Recommended Limits
ICS-1100 Conductivity Noise (nS)	≤ 2.0	≤ 2.0
ICS-1100 Conductivity Drift (nS/hr)	≤ 20	≤ 20
Injector Precision (Area %RSD)	≤ 1.0	≤ 1.0
Injector Carryover (Area %)	≤ 0.1	≤ 0.1
ICS-1100 Detector Linearity (Corr.)	≥ 0.999	≥ 0.999
ICS-1100 Detector Linearity (%RSD)	≤ 5.0	≤ 5.0
ICS-1100 Pump Flow Rate Accuracy (mL/min)	≤ 0.05	≤ 0.05
ICS-1100 Pump Flow Rate Precision (%RSD)	≤ 2.0	≤ 2.0

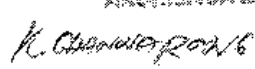
• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	30-Sep-2022
Qualification Executor/Company:	Mr. Channarong / Archemica	Period between Qualifications:	6 months
		Next Qualification:	Mar-2023

Customer Signature _____ Date _____

Chromeleon (c) DIONEX 2011
6.80 SR8 Build 2623 (156243)


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ARCHEMICA LAB CO.,LTD.

 30/Sept/2022
Executor Signature _____ Date _____

OQ_PQ_Integrated_Validation / Specification



Performance Qualification Rev. 6.10

Detector Noise and Drift:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1.1.0
Detector	ICS-1100	Dionex	10010987	1.1.0
Autosampler	AS-DV	Dionex	10010912	1.5.0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1.1.0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Eluent	Water	n.a.

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	30-Sep-2022
Qualification Executor/Company:	Mr. Channarong / Arche mica	Next Qualification:	Mar-2023

• Test Results Summary

Test	Result
ICS-1100 Conductivity Noise (nS)	PASS
ICS-1100 Conductivity Drift (nS/hr)	PASS



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ARCHEMICA LAB CO.,LTD.

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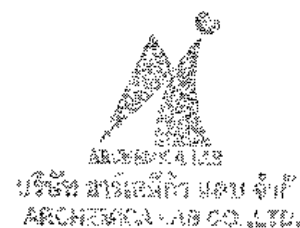
K. Channarong 30/9/2022
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• Data for detector noise

Segment number	Noise, nS
1	0.32
2	0.31
3	0.44
4	0.33
5	0.31
6	0.25
7	0.43
8	0.26
9	0.29
10	0.35
11	0.33
12	0.31
13	0.39
14	0.32
15	0.33
16	0.36
17	0.36
18	0.30
19	0.23
20	0.23
Average, nS	0.3
Limit, nS	2.0
Result	PASS

• Data for detector drift

20 Minute drift, nS	Drift, nS/hr	Limit, nS/hr	Result
-5.5	16.4	20.0	PASS



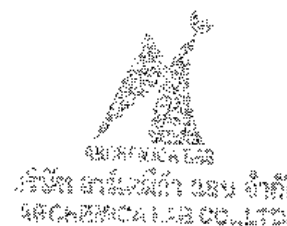
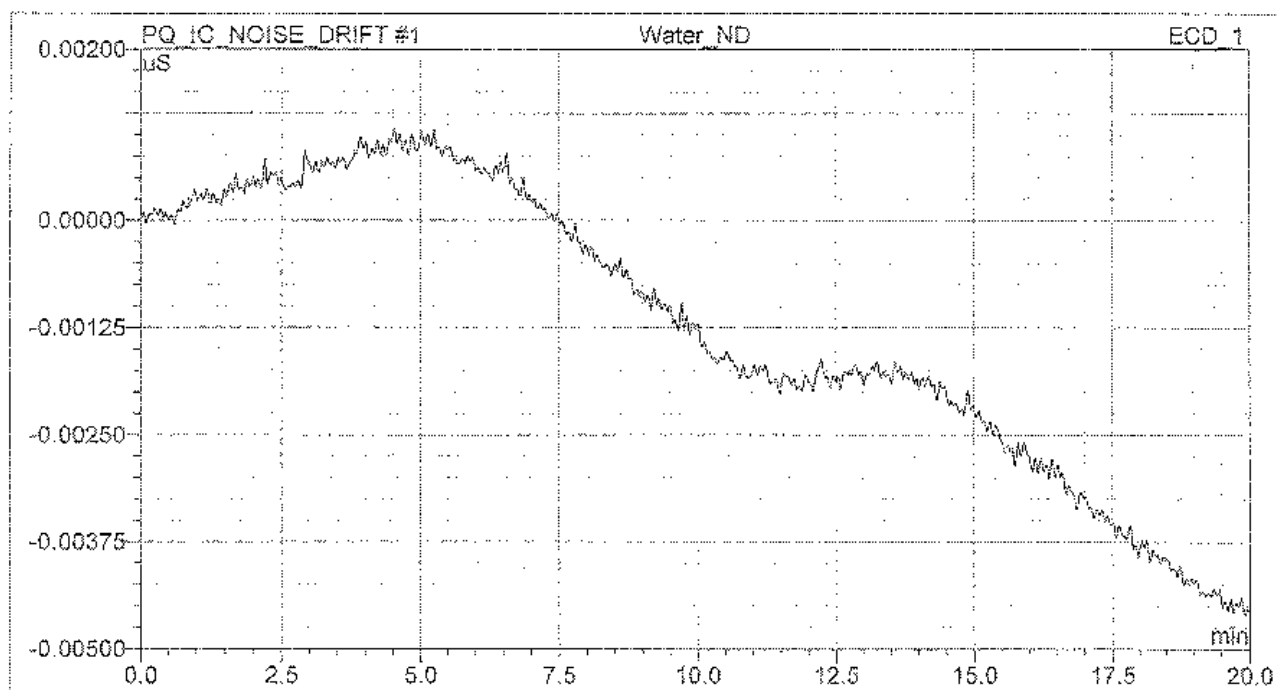
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Chromleon (c) DIONEX 2011
6.80 SR8 Build 2623 (156243)

K. Chaiyaporn 30/Sep/2022

Executor Signature Date

• **Chromatogram of Detector Noise and Drift**



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Chromeleon (c) DIONEX 2011
6.80 SR8 Build 2623 (156243)

[Signature] 30/09/2022

Executor Signature Date



Performance Qualification Rev. 6.10

Injector Precision:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1.1.0
Detector	ICS-1100	Dionex	10010987	1.1.0
Autosampler	AS-DV	Dionex	10010912	1.5.0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1.1.0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Sample 4	Nitrate, 50 ppm	220208
Eluent	Water	n.a.

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	30-Sep-2022
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Mar-2023

• Test Results Summary

Test	Result
Injector Precision (Area %RSD)	PASS


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K. Channarong
30/Sep/2022
EXECUTOR SIGNATURE
Date

Executor Signature _____ Date _____

Page 2 of 2
Date: 30/9/2022

Name	Area uS*min Nitrate ECD_1
Inj Precision_1	2.810
Inj Precision_2	2.809
Inj Precision_3	2.814
Inj Precision_4	2.808
Inj Precision_5	2.810
Inj Precision_6	2.799
Inj Precision_7	2.804
Inj Precision_8	2.799
Inj Precision_9	2.799
Inj Precision_10	2.796
Average:	2.805
Std. Dev:	0.006
% RSD:	0.2
Limit (%)	1.0
Result:	PASS


COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF REVENUE

K. LIAO / VERONIC 26/Sep/2022

Executor Signature Date



Performance Qualification Rev. 6.10

Injector Carryover:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1.1.0
Detector	ICS-1100	Dionex	10010987	1.1.0
Autosampler	AS-DV	Dionex	10010912	1.5.0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1.1.0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Sample 6	Nitrate, 1000 ppm	220208
Blank	Water	n.a.
Eluent	Water	n.a.


• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	30-Sep-2022
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Mar-2023

• Test Results Summary

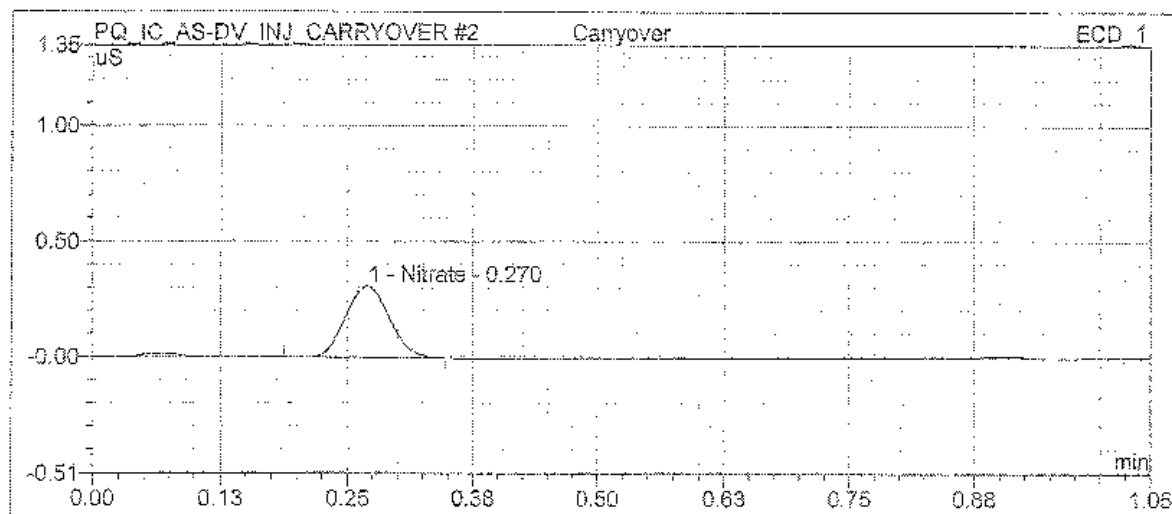
Test	Result
Injector Carryover (Area %)	PASS

Customer Signature _____ Date _____


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ARCHEMICA CO., LTD.

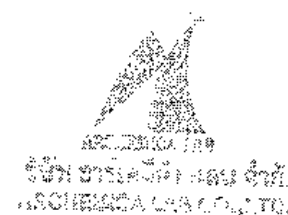
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• **Chromatogram for Carryover test**



• **Data for Carryover test**

Name	Ret.Time (detected) min Nitrate ECD_1	Area uS*min Nitrate ECD_1
High Level	0.27	52.964
Carryover	0.27	0.015
Water	0.27	0.015
Carryover (%):		0.001
Limit (%):		0.100
Result:		PASS



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K. Chuanrueang 30 Sep 2022

Executor Signature Date



Performance Qualification Rev. 6.10

Detector Linearity:

• Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1.1.0
Detector	ICS-1100	Dionex	10010987	1.1.0
Autosampler	AS-DV	Dionex	10010912	1.5.0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1.1.0

• Accessories

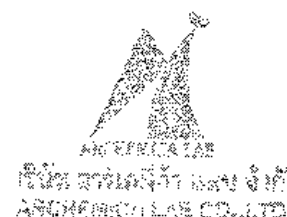
Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Sample 1	Nitrate, 5 ppm	220208
Sample 2	Nitrate, 10 ppm	220208
Sample 3	Nitrate, 25 ppm	220208
Sample 4	Nitrate, 50 ppm	220208
Sample 5	Nitrate, 100 ppm	220208
Eluent	Water	n.a.

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	30-Sep-2022
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Mar-2023

• Test Results Summary

Test	Result
ICS-1100 Detector Linearity (Corr.)	PASS
ICS-1100 Detector Linearity (%RSD)	PASS

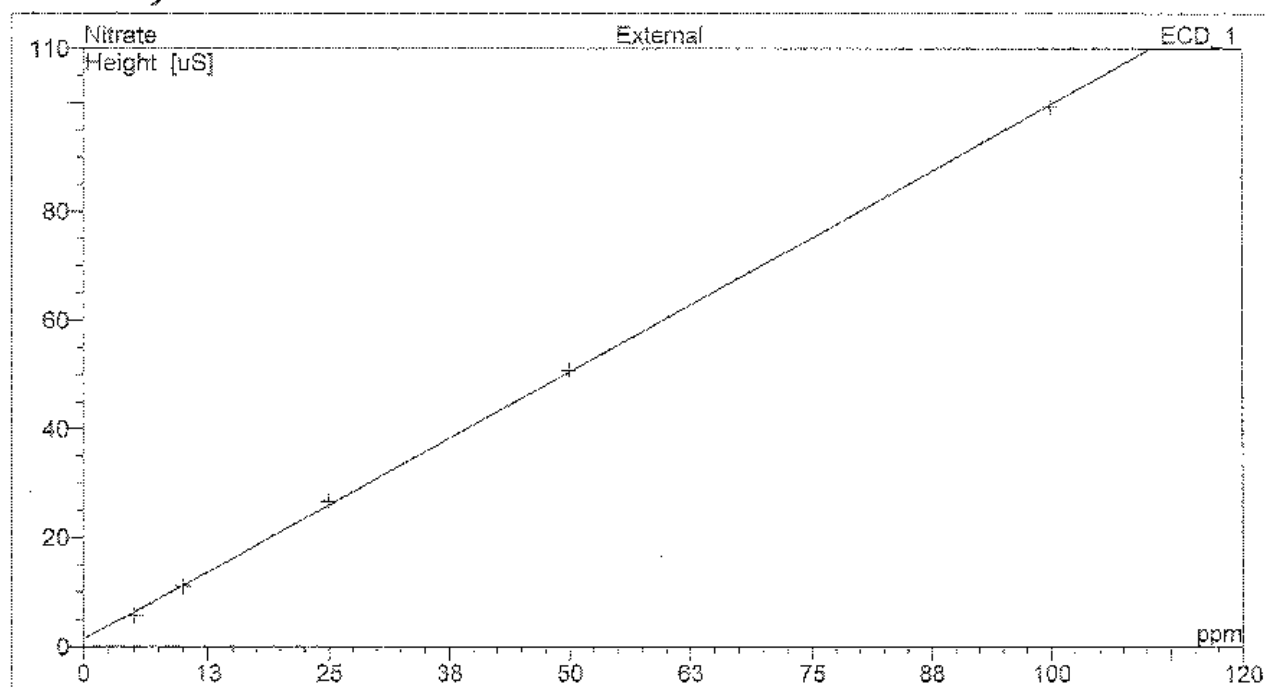


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• **Data for Detector Linearity**

Name	Amount ppm Nitrate ECD_1	Height uS Nitrate ECD_1
Detector linearity_1	5.000	5.653
Detector linearity_2	10.000	11.059
Detector linearity_3	25.000	26.696
Detector linearity_4	50.000	50.796
Detector linearity_5	100.000	99.314

• **Linearity Plot**

Calibration Type	Number of Points	Offset	Slope
LOff	5	1.373	0.982

	Correlation Coefficient	% RSD
Linearity:	1.000	1.6
Limit:	0.999	5.0
Result:	PASS	PASS


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 30/09/2022
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Performance Qualification Rev. 6.10

Pump Flow Rate Accuracy and Precision Test:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1.1.0
Detector	ICS-1100	Dionex	10010987	1.1.0
Autosampler	AS-DV	Dionex	10010912	1.5.0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1.1.0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Eluent	Water	n.a.
Balance	Mettler Toledo	AB204
		1116392227

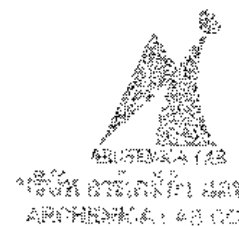
• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,L	Date:	30-Sep-2022
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Mar-2023

• Test Results Summary

Test	Result
ICS-1100 Pump Flow Rate Accuracy (mL/min)	PASS
ICS-1100 Pump Flow Rate Precision (%RSD)	PASS

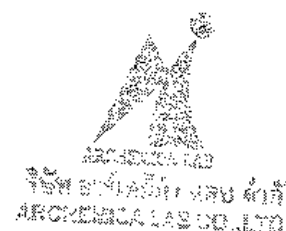
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• Data for Pump Flow Rate Accuracy and Precision Test

Ambient Temperature (°C)	24
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Segment	Measured Eluent Weight (g)	Calculated Eluent Flow Rate (mL/min)	Deviation from 1.00 mL/min	Limit (mL/min)	Result
0	32.776	-	-	-	-
1	37.590	0.965	0.035	0.05	PASS
2	42.401	0.965	0.035	0.05	PASS
3	47.206	0.964	0.036	0.05	PASS
4	51.963	0.954	0.046	0.05	PASS
5	56.735	0.957	0.043	0.05	PASS
Average		0.961		Overall	PASS
Standard Deviation		0.005			
% RSD		0.5			
Limit (%)		2.0			
Result		PASS			



Customer Signature _____ Date _____

Chromeleon (c) DIONEX 2011
6.80 SR8 Build 2623 (156243)

K. CHAN 10/09/16 30/09/2022
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OQ_PQ_Integrated_Validation / Pump Flow Rate

CERTIFICATE

Certificate of Analysis

Better Separations Through
Better Chemistry

Dionex Nitrate OQ/PQ IC Standards Kit (Set of 6)

Product Number 060254
Certificate of Analysis

Lot Number 220208

Expiration of Certification
February 2023

The Dionex Nitrate Standard was developed to aid the analysis of anions by Ion Chromatography (IC). The single-ion standard was prepared by the dissolution of high-purity salt in ≥ 18.2 megohm deionized water, which was tested by IC for ionic contaminants. The bottle label states the nominal concentration value of the ionic component for informational purposes only. The actual ion concentration value was determined by Ion Chromatography. The IC system was standardized using the National Institute of Standards & Technology (NIST), Standard Reference Material, SRM 3185 (Nitrate Standard Solution). Actual concentration values determined for the single-ion is listed below.

Dionex Nitrate Standard

Vial #	Concentration (mg/L)
1	5.07 \pm 0.03
2	10.09 \pm 0.04
3	24.97 \pm 0.13
4	49.83 \pm 0.13
5	99.6 \pm 1
6	996 \pm 3

ANALYST: K. GUNAWARONG
DATE: 20/SEP/2022
SIGNATURE: K. GUNAWARONG

The concentration value is based a proven reliable method of analysis. The estimated uncertainties are two standard deviations of the concentration value. The concentration value is warranted to be stable for one year from the date of manufacture.

The preparation and analyses of the Dionex Nitrate Standard was performed with extreme care by Thermo Scientific Corporation Consumables Manufacturing Department in Sunnyvale California.

Document No. 070690-01

20-Dec-2011

thermo.com/dionex

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Thermo Fisher Scientific
Sunnyvale, CA USA is
ISO 9001 Certified.

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Certificate of Completion

This certifies that

Channarong Khiao-Un

Has successfully completed

eLearn: RPG IC-Specific Qualification Service Training

Valid for 3 years from:

Nov/19/2021



Channarong 30/Sep/2022

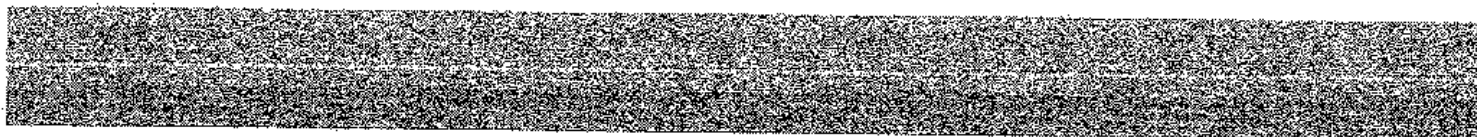
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TFS - Learning Management
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and Certification Group
tmc.training@thermofisher.com

Agilent CrossLab Start Up Services

Agilent 7890 Gas Chromatograph

Preventive Maintenance Checklist



Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the preventive maintenance activities.

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Important Customer Web Links

- For more information about **Agilent Technologies services**, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful **Agilent Resource Center** web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>.
- Need technical support, FAQs, supplies? – visit our **Support Home page** <http://www.agilent.com/search/support>.
- **Videos** about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>.
- **7890B Manuals** are also available on Agilent.com:
 - **Safety**
https://www.agilent.com/cs/library/usermanuals/public/7890B_Safety.pdf
 - **Installation and First Startup**
https://www.agilent.com/cs/library/usermanuals/Public/7890B_Installation.pdf
 - **Operation Manual**
https://www.agilent.com/cs/library/usermanuals/Public/7890B_Operation.pdf
 - **Maintaining Your GC**
https://www.agilent.com/cs/library/usermanuals/public/G3430-90052%207890B_Maintaining%20Guide.pdf

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- ***Ask the customer to sign the Service Completion section including the customer's and your signature.***

Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service.
- Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.

System Information

- ☒ Check this box if an instrument configuration report is attached instead of completing the table below.

Instrument System Name and ID	GC7890 B	CN16343040
Instrument System Site and Location	TET	Laboratory

List System Component Product Numbers	List the Serial Numbers of each Component
1. G3440B	CN16343040
2. G4513A	CN16350082
3. G4514A	CN16400014
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components, settings as defined by current Service Notes.
- ☒ Check for required firmware updates and verify with customers if they would like them installed.
- ☒ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

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Agile Document Number: D0013618

DE number: 44166.759722222

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Preventive Maintenance Procedure

Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/removes any dust/debris. Pay particular attention to cooling fans.
- ☒ Inspect internal connectors for proper contact and placement.
- ☒ Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.
- ☒ Verify oven motor spins freely and turns on with the oven door closed; off when the door is opened.
- ☒ Verify operation of all other fans - the inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

Inlet and detector consumable replacement

- ☒ For the inlets installed, perform inlet maintenance as defined in the 7890 manual – "Maintaining Your GC" - for the inlet(s) installed.
- ☒ Replace the split vent trap cartridge filter on units with these inlets: Split/Splitless Capillary (SSL), Multi-Mode Inlet (MMI), Programmed Temperature Vaporizer (PTV), Volatiles Interface (VI).
- ☒ If the inlet system is used in Split Mode with viscous samples, inspect and clean the split vent tube on the inlet and flush or replace the tubing between the inlet and the split vent trap.
- ☒ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any buildup of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination – clean as necessary.

Zero Sensors and Leak test

- ☒ Zero all pressure sensors per the procedure in the 7890 "Advanced User Guide".
- ☒ Perform inlet pressure decay test(s) as defined in the 7890 "Troubleshooting Manual".
If the PM is done in preparation for an Operational Qualification, then the pressure decay test defined within that protocol can be used for the PM.
- ☒ Record if test passed or failed in the results table.

ALS Maintenance

- ☐ Section NOT applicable
- ☒ Check all cabling and configuration settings between GC, tray, and injectors.
- ☒ Vacuum or remove any dust, especially around fans.
- ☒ Check operation of all fans.
- ☒ Check syringe for smooth plunger operation.
- ☒ Check for smooth operation of the needle support – clean if necessary

Restore Instrument

- ☒ Restore the normal operating conditions or customer method using the Data System.
- ☒ Purge the system with carrier flow for 15 minutes
- ☒ Bake out the system, then restore the normal operating conditions
- ☒ After equilibration, check and record the post PM detector signal output values.
Results should be similar or lower than the detector outputs recorded prior to PM.
- ☒ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Note: If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Signature Page

Service Review

- ☐ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review with the customer this service, parts replaced, and test results obtained.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.
- ☒ Supply the customer with a copy of the Smart Alerts flyer.
- ☐ Describe Smart Alerts to the customer.
- ☐ Install Smart Alerts if requested.

7890 GC Test Results Table

Detector Signal Outputs	Before PM Service	After PM Service
Front detector output	N/A	24.7
Back detector output	N/A	3223 (high)
AUX detector output	N/A	SN 172.6
Pressure decay test	Expected test result	Actual test result
Front inlet pressure decay test	Pass	Pass
Back inlet pressure decay test	Pass	Pass

7890 Parts List Table

The following kits are recommended for capillary and purged packed inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

Part description	Part number	Product or model where used	Quantity consumed
SSL Capillary Inlet PM kit, Splitless	5188-6497	7890A/B	1
SSL Capillary Inlet PM kit, split	5188-6496	7890A/B	1
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool	5190-2295	7890A/B	N/A
PP Inlet PM kit	5188-6498	7890A/B	N/A
Split vent trap PM kit, single cartridge (for MMI, PTV & VI)	5188-6495	7890A/B	N/A
MMI Cleaning Kit	G3510-60820	7890A/B	N/A
PTV Septumless Head Rebuild Kit	5182-9747	7890A/B	N/A
PTV Septumless Head Teflon Guide	5182-9748	7890A/B	N/A
Ignitor (glow plug) assembly with O-ring	19231-60680	7890A/B	1
FID Collector Rebuild/Cleaning Kit	G1531-67000	7890A/B	N/A
Standard .011-inch FID Jet for capillary FID base	G1531-80560	7890A/B	N/A
High Temperature .018-inch FID Jet for capillary FID base	G1531-80620	7890A/B	N/A
Standard .018-inch FID Jet for packed column with packed FID base	12710-20119	7890A/B	N/A
Standard .011-inch FID Jet for capillary column with packed/adaptable FID base	19244-80560	7890A/B	N/A
High Temperature .018-inch FID Jet for capillary column with packed/adaptable FID base	19244-80620	7890A/B	N/A
NPD Jet, universal fit, .011-inch ID	G1534-80580	7890A/B	N/A
NPD Jet, universal fit, .011-inch ID Extended tip	G1534-80590	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	N/A
**FID Collector Replacement Kit, if needed	G1531-67001	7890A/B	N/A

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Service Engineer Comments

If there are any specific points you wish to note as part of performing the service or other items of interest for the customer, please write include them in this box.

Need to condition *uECD*. for high baseline.
and injection Hexane..

Service Completion

Service request number 6005612986 Date service completed 26 Sep 2022
 Agilent signature *SW* Customer signature _____
 Total number of pages in this document 9 pages



Certificate of Calibration

Calibration Certification Information

Cal. Date:	November 19, 2021	Rootsmeter S/N:	438320	Ta:	294	°K
Operator:	Jim Tisch			Pa:	763.5	mm Hg
Calibration Model #:	TE-5025A	Calibrator S/N:	0068			

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4160	3.2	2.00
2	3	4	1	0.9970	6.4	4.00
3	5	6	1	0.8890	7.8	5.00
4	7	8	1	0.8490	8.7	5.50
5	9	10	1	0.6990	12.8	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
1.0140	0.7161	1.4271	0.9958	0.7033	0.8776
1.0098	1.0128	2.0182	0.9916	0.9946	1.2411
1.0079	1.1337	2.2564	0.9898	1.1134	1.3875
1.0067	1.1858	2.3666	0.9886	1.1644	1.4553
1.0012	1.4324	2.8542	0.9832	1.4066	1.7551
QSTD	m=	1.99331	QA	m=	1.24818
	b=	-0.00049		b=	-0.00030
	r=	0.99999		r=	0.99999

Calculations

Vstd=	$\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$	Va=	$\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$
Qstd=	Vstd/ΔTime	Qa=	Va/ΔTime
For subsequent flow rate calculations:			
Qstd=	$1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$	Qa=	$1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$

Standard Conditions

Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootsmeter manometer reading (mm Hg)
Ta:	actual absolute temperature (°K)
Pa:	actual barometric pressure (mm Hg)
b:	intercept
m:	slope

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30



Thai Environmental Technic Limited
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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech

Site ID : Bangkok

Date : 1-Aug-22

ITEM : TSP

Serial No : (No.18)

Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00

Temperature (°C) : 25.0

Average Press. (mm Hg) : 754.5

Average Temp (°C) : 32.1

Corrected Pressure (mm Hg) : 760.0

Temperature (deg K) : 298.0

Corrected Average (mm Hg) : -

Average Temp (Deg K) : -

Calibration Orifice

Make : Tisch

Model : TB-5025A

Serial# : 0068

Qstd Slope : 1.99331

Qstd Intercept : -0.00049

Calibration Due Date : 19-Nov-22

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 34.7546 Intercept : 1.0714 Corr. Coeff : 0.9897 # of Observations: 5
1	12.00	1.738	60.0	60.00	
2	9.20	1.522	54.0	54.00	
3	7.00	1.328	50.0	50.00	
4	5.00	1.122	40.0	40.00	
5	3.00	0.869	30.0	30.00	

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(P_a/P_{std})(T_{std}/T_a)) - b]$$

$$IC = I[\text{Sqrt}(P_a/P_{std})(T_{std}/T_a)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I[\text{Sqrt}(298/T_{av})(P_{av}/760)] - b)$$

NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope

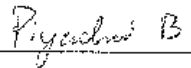
b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Calibrate By : 

Approve By : 



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech

Site ID : Bangkok

Date : 1-Aug-22

ITEM : TSP

Serial No : (No.15)

Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 754.5
Average Temp (°C) : 31.8

Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) : -
Average Temp: (Deg K) : -

Calibration Orifice

Make : Tisch
Model : TE-5025A
Serial# : 0068

Qstd Slope : 1.99331
Qstd Intercept : -0.00049
Calibration Due Date : 19-Nov-22

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.00	1.738	60.0	60.00	Slope : 34.7546
2	9.20	1.522	54.0	54.00	Intercept : 1.0714
3	7.00	1.328	50.0	50.00	Corr. Coeff : 0.9897
4	5.00	1.122	40.0	40.00	
5	3.00	0.869	30.0	30.00	# of Observations: 5

Calculations

$Qstd = 1/m[\text{Sqrt}(H_2O(Pa/Pstd)(Tstd/Ta)) - b]$
 $IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$

Qstd = standard flow rate
IC = corrected chart response
I = actual chart response

m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

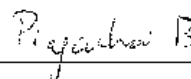
For subsequent calculation of sampler flow:

$1/m\{[I][\text{Sqrt}(298/Tav)(Pav/760)] - b\}$

NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Calibrate By : 

Approve By : 



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech

Site ID : Bangkok

Date : 1-Aug-22

ITEM : TSP

Serial No : (No. 22)

Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00

Temperature (°C) : 35.0

Average Press. (mm Hg) : 754.5

Average Temp (°C) : 31.8

Corrected Pressure (mm Hg) : 760.0

Temperature (deg K) : 298.0

Corrected Average (mm Hg) : -

Average Temp: (Deg K) : -

Calibration Orifice

Make : Tisch

Model : TE-5025A

Serial# : 8068

Qstd Slope : 1.39331

Qstd Intercept : -0.00049

Calibration Due Date : 19-Nov-22

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 34.5708 Intercept : 1.0693 Corr. Coeff : 0.9926 # of Observations: 5
1	12.00	1.738	60.0	63.00	
2	9.40	1.538	54.0	54.00	
3	7.20	1.346	50.0	50.00	
4	5.00	1.122	40.0	40.00	
5	3.00	0.869	30.0	30.00	

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope

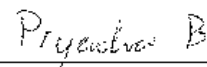
b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Calibrate By : 

Approve By : 

**TET**

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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech

Site ID : Bangkok

Date : 1-Aug-22

ITEM : PM10

Serial No : (No. 1)

Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00

Temperature (°C) : 25.0

Average Press. (mm Hg) : 754.5

Average Temp (°C) : 30.6

Corrected Pressure (mm Hg) : 760.0

Temperature (deg K) : 298.0

Corrected Average (mm Hg) : -

Average Temp: (Deg K) : -

Calibration Orifice

Make : Tisch

Qstd Slope : 1.99331

Model : TE-5025A

Qstd Intercept : -0.00049

Serial# : 0068

Calibration Due Date : 19-Nov-22

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 33.5522 Intercept : 2.1026 Corr. Coeff : 0.9906 # of Observations: 5
1	12.20	1.753	60.0	60.00	
2	9.80	1.571	54.0	54.00	
3	7.20	1.346	50.0	50.00	
4	5.00	1.122	40.0	40.00	
5	3.00	0.869	30.0	30.00	

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(Pa/Pstd)(Tstd/Ta)) - b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)] - b)$$


m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Calibrate By : Approve By : 

NOTE: Ensure calibration orifice has been certified within 12 months of use



Thai Environmental Technic Limited

บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech

Site ID : Bangkok

Date : 1-Aug-22

ITEM : PM10

Serial No : (No. 8)

Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00

Temperature (°C) : 25.0

Average Press. (mm Hg) : 754.5

Average Temp (°C) : 30.6

Corrected Pressure (mm Hg) : 760.0

Temperature (deg K) : 298.0

Corrected Average (mm Hg) : -

Average Temp: (Deg K) : -

Calibration Orifice

Make : Tisch

Model : TS-5025A

Serial# : 0068

Qstd Slope : 1.99331

Qstd Intercept : -0.00049

Calibration Due Date : 19-Nov-22

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 34.3707 Intercept : 2.2511 Corr. Coeff : 0.9934 # of Observations: 5
1	12.30	1.760	62.0	62.00	
2	10.00	1.587	56.0	56.00	
3	7.60	1.383	52.0	52.00	
4	5.20	1.144	42.0	42.00	
5	3.20	0.898	32.0	32.00	

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(Pa/Pstd)(Tstd/Ta)) - b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I[\text{Sqrt}(298/Tav)(Pav/760)] - b)$$

NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope

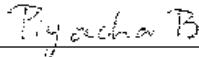
b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Calibrate By : 

Approve By : 



Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech

Site ID : Bangkok

Date : 1-Aug-22

ITEM : PM10

Serial No : (No. 10)

Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00

Temperature (°C) : 25.0

Average Press. (mm Hg) : 754.5

Average Temp (°C) : 30.8

Corrected Pressure (mm Hg) : 760.0

Temperature (deg K) : 298.0

Corrected Average (mm Hg) : -

Average Temp: (Deg K) : -

Calibration Orifice

Make : Tisch

Model : TE-5025A

Serial# : 0068

Qstd Slope : 1.99331

Qstd Intercept : -0.00049

Calibration Due Date : 19-Nov-22

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 33.5815 Intercept : 1.2417 Corr. Coeff : 0.9997 # of Observations: 5
1	12.30	1.760	60.0	60.00	
2	9.80	1.571	54.0	54.00	
3	8.40	1.454	50.0	50.00	
4	5.20	1.144	40.0	40.00	
5	3.00	0.869	30.0	30.00	

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(P_a/P_{std}))(T_{std}/T_a)] - b]$$

$$IC = I[\text{Sqrt}(P_a/P_{std}))(T_{std}/T_a)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/T_{av})(P_{av}/760)] - b)$$

NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope

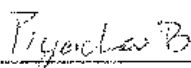
b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Calibrate By : 

Approve By : 

Certificate Of Analysis
Special Gases Mixture

Customer Details

Name:

Thai Environmental Technic Ltd.

Address:

1/6 Soi Ramkhamhaeng 145,
Saphansoong, Saphansoong, Bangkok
10240

Customer Tag No.:

Certificate Details

Number: 2422/21

Date of Issue: 15-Jun-2021

Expiry date: 15-Jun-2023

Material Details

Production Order: 90166058

Material Code: 472400-SK-34

Cylinder No.: A00822SK

Gas content: 5.23 M³

Filling pressure: 137.0 bar

Valve: CGA 660 SS

Cylinder Owner: LINDE

Cylinder Material: Spectra seal

Cylinder Size: 40 L

Laboratory Report

Analytical Result

Component	Nominal Concentration	Analysis Result ¹	Uncertainty ²	Method of Analysis ³	Assay Date
Sulphur Dioxide	45.0 ppm	45.1 ppm	± 1% relative	(6) I-PB-352	7-Jun & 14-Jun-21
Nitric Oxide	45.0 ppm	47.5 ppm	± 1% relative	(6) I-PB-352	7-Jun & 14-Jun-21
Other NOx impurity		Less than 2.3 ppm			
Carbon Monoxide	100 ppm	99.8 ppm	± 1% relative	(6) I-PB-352	7-Jun & 14-Jun-21
In Nitrogen					

Reference Standard used in Assay

Reference Standard	Cylinder number	Concentration	Expiry date:
Sulphur Dioxide	D619726	69.2 ± 0.2 ppm	2-Dec-2022
Nitric Oxide	D619726	71.4 ± 0.2 ppm	2-Dec-2022
Carbon Monoxide	D619726	70.5 ± 0.2 ppm	2-Dec-2022
In Nitrogen			

Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
FTIR Spectrometers Nicolet iS50	FTIR-SO2	7-Jun-2021
FTIR Spectrometers Nicolet iS50	FTIR-NO	7-May & 11-Jun-21
FTIR Spectrometers Nicolet iS50	FTIR-CO	13-May & 14-Jun-21

Recommend usage condition

Minimum utilization: 5% of actual content or before expiry date whichever comes first.

Storage condition: Keep in well ventilation and secure area.

Comments

When reordering, please quote the material number

Note:

- All results expressed in this report are on mole/mole basis, unless otherwise specified. The Assay of this Standard has been performed in accordance with the EPA Traceability Protocol EPA-600/R-12/531 for the Assay and Certification of Gaseous Calibration Standards using procedure G1.
- 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%. The measurement of this material is traceable to the SI through the reference gas standard which is traceable to Swiss National Standard of Mass or other recognised national metrology institutes.
- (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Moisture Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

Sukanya Parinyasoonorn

Signatory for and on behalf of Linde (Thailand) Co., Ltd.

PB-002/E006

Page 1 of 1

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บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

เลขที่ใบอนุญาต ๑๐๖๖๖๐๖๖

ชั้น 15 อาคารทาวเวอร์ เอ 2/3 หมู่ 14 ถนนพหลโยธิน แขวงจตุจักร กรุงเทพฯ 10140

เบอร์โทรศัพท์ 02-2338-6100 โทรสาร (66) 2338-6333

โรงงานผลิต: 105 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10540

โทรสาร (66) 38.570-479-93

โทรสาร (66) 38.570-323

Linde (Thailand) Public Company Limited

Issd/2, 01 April 2021

PLC Registration no. 010/2537-001789

15th Floor, Bangna Tower A, 2/3 Moo 14, Bangna Trad Kh. 6.5 Road, Bangnaew

Bangplee, Samutprakarn 10540, Tel (66) 2338-6100 Fax (66) 2338-6333

Wellgrow Plant: 105 Moo 5, T.Bangsamak, A.Bangpakong, Chachoengsao 24180

Thailand, Tel (66) 38.570-479-93

Fax (66) 38.570-323



Thai Environmental Technic Limited
บริษัท เทคนิควิเสณแวดล้อมไทย จำกัด

NOx Analyzer Calibration Report

Calibrate Date : 5-Jun-22
Analyzer Type : NOx
Brand : API
Model : 200 E
Serial Number : 737 (No. 27)
Range : 500 ppb

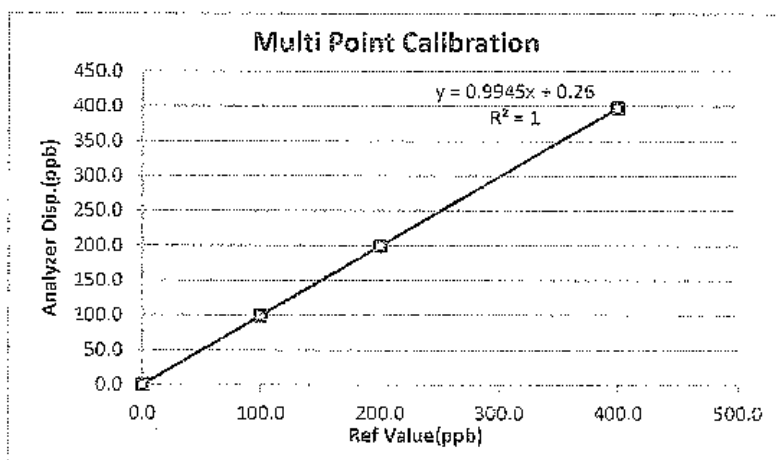
Temperature (°C) : 25°C
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.0%RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00822SK

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span.(ppb)			After of Span.(ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	1.1	0.8	0.2	0.0	0.0	0.0	0.0
Span	400.0	397.0	397.0	0.1	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (%) Diff
0.0	0.4	0.3	0.1	0.30	0.001	0.08
100.0	99.7	99.5	0.2	-0.50	-0.005	0.50
200.0	199.6	199.4	0.2	-0.60	-0.003	0.30
400.0	398.0	398.0	0.0	-2.00	-0.005	0.50
Average Diff (%)						0.43



Calibrate by:

[Signature]

Approved by:

[Signature]



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

NOx Analyzer Calibration Report

Calibrate Date : 2-Jun-22
Analyzer Type : NOx
Brand : API
Model : 200 E
Serial Number : 731 (No. 28)
Range : 500 ppb

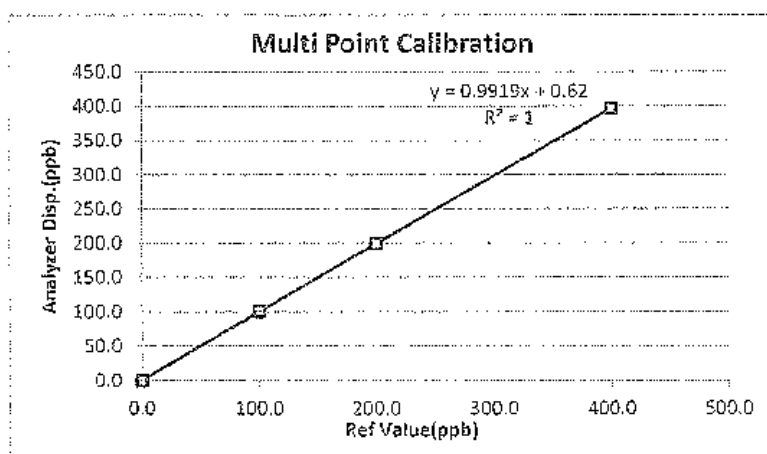
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0%RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00822SK

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span.(ppb)			After of Span.(ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	0.7	0.4	0.3	0.0	0.0	0.0	0.0
Span	400.0	391.0	391.0	0.0	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (%) Diff
0.0	0.1	0.0	0.1	0.00	0.000	0.00
100.0	100.3	100.3	0.0	0.30	0.003	0.30
200.0	199.7	199.5	0.2	-0.50	-0.003	0.25
400.0	398.0	397.0	1.0	-3.00	-0.008	0.75
Average Diff (%)						0.32



Calibrate by:

[Signature]

Approved by:

[Signature] B



Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

NOx Analyzer Calibration Report

Calibrate Date : 3-Jan-22
Analyzer Type : NOx
Brand : Teledyne
Model : T200
Serial Number : 5160 (No.33)
Range : 500 ppb

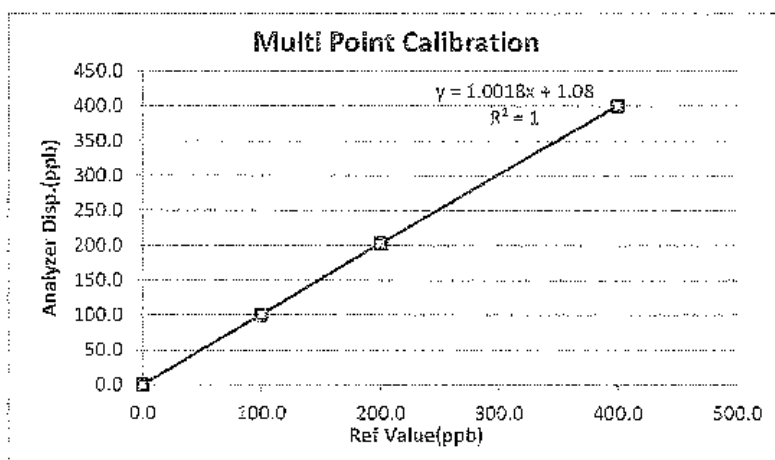
Temperature (°C) : 25°C
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.0%RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00822SK

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span.(ppb)			After of Span.(ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	3.6	3.4	0.2	0.0	0.0	0.0	0.0
Span	400.0	378.0	377.0	1.0	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (%) Diff
0.0	0.5	0.3	0.2	0.30	0.001	0.08
100.0	101.7	101.2	0.5	1.20	0.012	1.20
200.0	203.2	203.1	0.1	3.10	0.016	1.55
400.0	402.0	401.0	1.0	1.00	0.003	0.25
Average Diff (%)						1.00



Calibrate by: [Signature]

Approved by: Piyachon B



Personal Pump Calibration Report

Calibration S/N : 109698

[illegible]

Calibration By 252200 2/10/21

\sqrt{n}
 : SD = Standard deviation
 : \bar{X} = Mean



Personal Pump Calibration Report

Calibration S/N : 109698

[illegible]

Calibration Date 07 / 10 / 65

Calibration By 2/20/2000 ap/ab

Remark : Uncertainty Type A = $\sigma =$ SD

$\sqrt{12}$

: SD = Standard deviation

$$\therefore \bar{X} = \text{Mean}$$



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Personal Pump Calibration Report

Equipment Type : Personal Pump/Parameter
Equipment Range : 0.1-7.0 l/min
Calibration Range : 0.1-4.0 l/min
Calibration Type : Drycal
Calibration S/N : 109698

Item	Personal Pump S/N	Hi Flow/Low Flow	ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	Average	±Uncertainty
1.	2014705060	1.5	1.49550	1.4460	1.4660	1.4560	0.0020
2.	20140605001	1.5	1.4690	1.4990	1.4910	1.4860	0.0017
3.	2014705056	2.0	1.9810	1.9660	1.9640	1.9840	0.0006
4.	20140505013	2.0	1.9960	1.9960	1.9990	1.9970	0.0111
5.	20140505076	2.0	1.9810	1.9660	1.9640	1.9840	0.0047
6.	20140605017	2.0	1.9870	1.9810	1.9810	1.9830	0.0040
7.	20120202031	2.0	1.9870	1.9850	1.9840	1.9860	0.0012

Calibration Date 31 / 08 / 65

Calibration By 2/5/65 2/05/65

Remark : Uncertainty Type A = $\frac{\sigma}{\sqrt{n}}$ SD

: SD = Standard deviation

: \bar{X} = Mean



บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

Personal Pump Calibration Report

Equipment Type : Personal Pump/Parameter

Equipment Range : 0.1-7.0 V/min

Calibration Range : 0.1-4.0 l/min

Calibration Type : Drycal

Calibration S/N : 109698

[illegible]

Calibration Date 16 / 11 / 65

Calibration By 2/5/2020 2/5/2020

Remark : Uncertainty Type A = σ = SD

 \sqrt{n}

: SD

= Standard deviation

 \bar{X}

= Mean



บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Personal Pump Calibration Report

Equipment Type	:	Personal Pump/Parameter
Equipment Range	:	0.1-7.0 l/min
Calibration Range	:	0.1-4.0 l/min
Calibration Type	:	Drycal
Calibration S/N	:	109698

[illegible]

Calibration Date 23 / 12 / 65

Calibration By _____ 2/5/2020 2/5/20

Remark : Uncertainty Type A = $\frac{\sigma}{\sqrt{n}}$ = SD

: SD = Standard deviation

 \bar{X} = Mean




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



Cert.No.: 22MM28

Page.: 1 of 3

Certificate of Calibration

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : XP205DR
Serial No. : 1129273885
ID No. : -
Submitted by : Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240
Location : Balance Room
Received order : 20 April 2022
Calibration Date : 22 April 2022
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Uthen Kankawi
Approved by : 
Approved Signatory
☒ Pornthippa Tameyakul
☒ Malee Butkruea
☐ Suwit Imjai
Issue Date : 6 May 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 0040785



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2204-0369OC-17

Cert.No.: 22MM28

Page: 2 of 3

Procedure used :-

Calibration were conducted using in-house calibration procedure CP-OB01 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:-

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Test report No.</u>	<u>Due date</u>
1) Standard Weight Set (E2)	15884	-	70RC138	MM-0009-21	3 Feb 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This result of calibration was made on requested at the point specified by customer.
4. This certificate is not certified for any commercial transaction.
5. This certification is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity :	0 g to 81 g	Resolution	0.00001 g
	81 g to 220 g	Resolution	0.0001 g

Before Adjustment :

<u>Applied Weight</u> (g)	<u>Balance Reading</u> (g)	<u>Correction</u> (g)	<u>Measurement Uncertainty</u> (\pm mg)	<u>Coverage Factor</u> (k)
80	79.99911	+0.00089	0.15	2.00
200	199.9997	+0.0003	0.35	2.00

After Adjustment :

1. Determination of the standard deviation of weighing machine (n = 10)

<u>Applied Weight</u> (g)	<u>Standard Deviation of Reading (g)</u>
80	0.000008
200	0.00004

Malu



Equipment : Electronic Balance
 Condition As-Received : Used Item
 Reference : 2204-0369OC-17

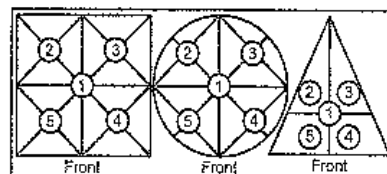
Cert.No.: 22MM28

Page: 3 of 3

Result of calibration

2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.
 The weighing machine reading error obtained is given in the table



Maximum difference between
 off-center and central loading
 (g)
 0.0001

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
-0.0002	-0.0001	-0.0002	-0.0001	-0.0001

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (\pm mg)	Coverage Factor (k)
Unload	0.00000	0.00000	0.016	2.13
0.01	0.01000	0.00000	0.016	2.13
0.05	0.05001	-0.00001	0.016	2.13
1	1.00001	-0.00001	0.019	2.05
2	2.00001	-0.00001	0.020	2.04
5	5.00001	-0.00001	0.026	2.00
10	10.00001	-0.00001	0.033	2.00
20	20.00001	-0.00001	0.049	2.00
50	49.99999	+0.00001	0.080	2.00
80	79.99999	+0.00001	0.15	2.00
200	199.9997	+0.0003	0.35	2.00

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 %.

-o-o-

Make

MAINTENANCE REPORT AND TEST CERTIFICATE OPTIMA 8000

Customer : บริษัท เทคนิกสิ่งแวดล้อมไทย Address : จำกัด 1/6 ซอยรามคำแหง 145 แขวงสะพานสูง เขตสะพานสูง กรุงเทพมหานคร 10240 User Name: Khun Nattapong Phone: 02-3737799 Fax:	Date Tested: October 4, 2022 Recommendation Recertification Period <u>6</u> Months Recertification Due: April 4, 2023 Date Last Certified: April 5, 2022 Visit Number: 2 of 2 PerkinElmer Phone: 02-719-6420 ext 203 PerkinElmer Fax: 02-318-5597
--	---

CONFIGURATION TESTED	ACCESSORIES/COMPONENT NOT INCLUDED	
MODEL	SERIAL NUMBER	
OPTIMA 8000	078N1310024C	
S10		
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
IPV Methods		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Mixed standard 1/10	N069-1579	May 30, 2023
Mixed standard 1/100	N930-0221	November 30, 2023
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
2 % HNO3		
10 % HNO3		

MAINTENANCE REPORT AND TEST CERTIFICATE OPTIMA 8000

SERIAL NUMBER : 078N1310024C

DATE TESTED : October 4, 2022

1. MECHANICAL CHECKS

A. Inspect and clean all fans and filters.

OK

B. Inspect and replace as necessary, all torch components including the RF coil.

OK

C. Inspect all tubing for sign of clacking or leaking.

OK

D. Adjust water and gas pressure regulator settings.

OK

E. Inspect and leak check pneumatics drawers.

OK

F. Clean the exterior of the instrument.

OK

2. OPTICAL CHECKS

A. Inspect and clean all optical components.

OK

B. As required, check and replace all purgefilters.

OK

C. Recheck optical alignment.

OK

3. COOLING SYSTEM CHECKS

A. Perform preventive maintenance on chiller.

OK

B. Flush out the chiller every six months.

OK

4. PERFORMANCE CHECKS

A. Torch View Alignment.

OK

B. Wavelength Calibration.

OK

MAINTENANCE REPORT AND TEST CERTIFICATE OPTIMA 8000

SERIAL NUMBER : 078N1310024C

DATE TESTED : October 4, 2022

PARAMETER	SPECIFICATION		FINAL VALUE
Spectral Resolution : UV	As 193.696 nm	≤ 0.009	0.00726
	Ni 231.604 nm	≤ 0.011	0.00833
	Ni 341.476 nm	≤ 0.015	0.01232
Spectral Resolution : VIS	Ba 455.403 nm	≤ 0.020	0.01577
Precision			
	Zn 206.200 nm	% RSD < 1.0	0.18
	Mg 280.271 nm	% RSD < 1.0	0.46
	Mg 285.213 nm	% RSD < 1.0	0.42
	Ba 455.403 nm	% RSD < 1.0	0.06
Detection Limits : Axial	As 193.696 nm	3(SD) ppb	3.11
	Se 196.026 nm	3(SD) ppb	4.14
	Tl 190.801 nm	3(SD) ppb	2.27
	Pb 220.353 nm	3(SD) ppb	0.96
Detection Limits : Radial	As 193.696 nm	3(SD) ppb	8.84
	Zn 213.857 nm	3(SD) ppb	0.13
	Mn 257.610 nm	3(SD) ppb	0.01
	La 379.478 nm	3(SD) ppb	0.93
	Ba 455.403 nm	3(SD) ppb	0.04
	Ba 493.408 nm	3(SD) ppb	0.12
BEC : Axial (IB X 1000)/(IS-IB)	Mn 257.610 nm	≤ 30 ppb	15.70
BEC : Radial (IB X 1000)/(IS-IB)	Mn 257.610 nm	≤ 30 ppb	9.01



WO-01865299/2022

MAINTENANCE REPORT AND TEST CERTIFICATE OPTIMA 8000

SERIAL NUMBER : 078N1310024C

DATE TESTED : October 4, 2022

Remarks :

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,
including warranty terms.

Service Department PerkinElmer Ltd.

Authorized Representative :

(Wiphan Promlunda)

Service Engineer

Page 4 of 4

=====

Align View XY Axial for analyte Mn 257.610

X-position	Y-position	Intensity
-2.0	15.0	5119763.8
-1.6	15.0	6802430.3
-1.2	15.0	7998705.3
-0.8	15.0	8921036.6
-0.4	15.0	9415249.2
0.0	15.0	9145189.2
0.4	15.0	8561448.2
0.8	15.0	7372556.4
1.2	15.0	5801066.7
1.6	15.0	4360683.6
2.0	15.0	3277941.3
-0.4	10.0	178360.5
-0.4	10.5	270096.8
-0.4	11.0	524775.4
-0.4	11.5	1099741.4
-0.4	12.0	1947168.2
-0.4	12.5	3092168.0
-0.4	13.0	4482627.5
-0.4	13.5	6341583.3
-0.4	14.0	7903988.8
-0.4	14.5	8846944.2
-0.4	15.0	9553876.8
-0.4	15.5	9348844.1
-0.4	16.0	9062049.4
-0.4	16.5	7895237.2
-0.4	17.0	6093533.7
-0.4	17.5	4782901.6
-0.4	18.0	3580353.9
-0.4	18.5	2452502.1
-0.4	19.0	1400321.1
-0.4	19.5	799140.5
-0.4	20.0	420183.9
-1.2	15.0	8553343.7
-0.8	15.0	9414538.4
-0.4	15.0	9524088.0
0.0	15.0	9441307.0
0.4	15.0	8738064.4
-0.4	13.0	4961231.7
-0.4	13.5	6479100.6
-0.4	14.0	8079437.3
-0.4	14.5	9298868.4
-0.4	15.0	9727764.3
-0.4	15.5	9697873.4
-0.4	16.0	8956220.3
-0.4	16.5	7870834.5
-0.4	17.0	6288498.2

=====

4/10/2565 12:38:01 aligned for analyte Mn 257.610

X viewing position set to -0.4 mm having Peak intensity 9727764.3 for Axial viewing

Y viewing position set to 15.0 mm having Peak intensity 9727764.3 for Axial viewing

=====

Align View X Radial for analyte Mn 257.610

X-position	Y-position	Intensity
-7.0	15.0	8334.0
-6.5	15.0	11264.2
-6.0	15.0	16657.9
-5.5	15.0	26028.0
-5.0	15.0	43856.5
-4.5	15.0	74460.2
-4.0	15.0	127306.9
-3.5	15.0	182637.1
-3.0	15.0	243830.8
-2.5	15.0	382351.9
-2.0	15.0	597699.9
-1.5	15.0	874758.9
-1.0	15.0	1163200.5
-0.5	15.0	1333747.2
0.0	15.0	1412726.3
0.5	15.0	1363321.5
1.0	15.0	1228529.7

1.5	15.0	1009252.5
2.0	15.0	762103.9
2.5	15.0	679846.2
3.0	15.0	616511.7
3.5	15.0	449873.5
4.0	15.0	285408.6
4.5	15.0	190949.1
5.0	15.0	109896.6
5.5	15.0	56963.3
6.0	15.0	32251.4
6.5	15.0	22416.7
7.0	15.0	16775.4

4/10/2565 12:41:55 aligned for analyte Mn 257.610

X viewing position set to 0.0 mm having Peak intensity 1412726.3 for Radial viewing
=====

Reprocessing Begun

Logged In Analyst: TET

Technique: ICP Continuous

Results Data Set (original): PM4OCT22

Results Library (original): C:\Users\Public\PerkinElmer\IPV\PM.mdb

Results Data Set (reprocessed):

Results Library (reprocessed):

Sequence No.: 1

Sample ID: Calib Blank 1

Analyst:

Logged In Analyst (Original) : TET

Initial Sample Wt:

Dilution:

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 13:03:09

Data Type: Reprocessed on 4/10/2565 13:10:50

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: Calib Blank 1

Analyte	Back Pressure	Flow
All	189.0 kPa	0.55 L/min

Mean Data: Calib Blank 1

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Calib Conc. Units
Tl 190.801	-188.5			[0.00] µg/L
As 193.696	172.3			[0.00] µg/L
Se 196.026	118.8			[0.00] µg/L
Pb 220.353	780.8			[0.00] µg/L

Sequence No.: 2

Sample ID: DL-Standard

Analyst:

Logged In Analyst (Original) : TET

Initial Sample Wt:

Dilution:

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 13:08:25

Data Type: Reprocessed on 4/10/2565 13:10:50

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: DL-Standard

Analyte	Back Pressure	Flow
All	189.0 kPa	0.55 L/min

Mean Data: DL-Standard

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Calib Conc. Units
Tl 190.801	27521.6			[1000] µg/L
As 193.696	25398.0			[1000] µg/L
Se 196.026	7470.3			[500] µg/L
Pb 220.353	56586.9			[500] µg/L

Calibration Summary

Analyte	Stds.	Equation	Intercept	Slope	Curvature	Corr. Coef.	Reslope
Tl 190.801	1	Lin, Calc Int	0.0	27.52	0.00000	1.000000	
As 193.696	1	Lin, Calc Int	0.0	25.40	0.00000	1.000000	
Se 196.026	1	Lin, Calc Int	0.0	14.94	0.00000	1.000000	
Pb 220.353	1	Lin, Calc Int	0.0	113.2	0.00000	1.000000	

Sequence No.: 3

Sample ID: IDL-XL (2% HNO3)

Analyst:

Logged In Analyst (Original) : TET

Initial Sample Wt:

Dilution: 3X

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 13:04:56

Data Type: Reprocessed on 4/10/2565 13:10:50

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: IDL-XL (2% HNO3)

Analyte	Back Pressure	Flow
All	188.0 kPa	0.55 L/min

Mean Data: IDL-XL (2% HNO3)

Analyte	Mean Corrected Intensity	Calib. Conc. Units	Std.Dev.	Sample Conc. Units	Std.Dev.	RSD
Tl 190.801	10.2	0 µg/L	0.76	1 µg/L	2.27	204.66%
As 193.696	-32.9	-1 µg/L	1.04	-4 µg/L	3.11	80.03%
Se 196.026	-47.2	-3 µg/L	1.38	-9 µg/L	4.14	43.71%
Pb 220.353	132.2	1 µg/L	0.32	4 µg/L	0.96	27.41%

Method Loaded

Method Name: DLRL-Cal

Method Last Saved: 5/4/2565 10:59:28

IEC File:

MSF File:

Method Description: C8000-Calibration for later test

Sequence No.: 1

Sample ID: Calib Blank 1

Analyst:

Logged In Analyst (Original) : TET

Initial Sample Wt:

Dilution:

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 12:54:37

Data Type: Reprocessed on 4/10/2565 13:11:22

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: Calib Blank 1

Analyte	Back Pressure	Flow
All	188.0 kPa	0.55 L/min

Mean Data: Calib Blank 1

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Calib Conc. Units
As 193.696	45.2			[0.00] mg/L
Zn 213.857	5597.3			[0.00] mg/L
Mn 257.610	3627.2			[0.00] mg/L
La 379.478	798.1			[0.00] mg/L
Ba 455.403	7460.0			[0.00] mg/L
Ba 493.408	8076.4			[0.00] mg/L

Sequence No.: 2

Sample ID: Calib Std 1

Analyst:

Logged In Analyst (Original) : TET

Initial Sample Wt:

Dilution:

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 12:45:45

Data Type: Reprocessed on 4/10/2565 13:11:23

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: Calib Std 1

Analyte	Back Pressure	Flow
All	186.0 kPa	0.55 L/min

Mean Data: Calib Std 1

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Calib Conc. Units
As 193.696	15741.9			[5.0] mg/L
Zn 213.857	160791.5			[1.0] mg/L
Mn 257.610	1661581.1			[1.0] mg/L
La 379.478	338793.3			[1.0] mg/L
Ba 455.403	810942.9			[0.1] mg/L
Ba 493.408	622557.7			[0.1] mg/L

Calibration Summary

Analyte	Stds.	Equation	Intercept	Slope	Curvature	Corr. Coef.	Reslope
---------	-------	----------	-----------	-------	-----------	-------------	---------

As 193.696	1	Lin, Calc Int	-0.0	3148	0.00380	1.000000
Zn 213.857	1	Lin, Calc Int	0.0	160800	0.00000	1.000000
Mn 257.610	1	Lin, Calc Int	0.0	1662000	0.00000	1.000000
La 379.478	1	Lin, Calc Int	0.0	338800	0.00000	1.000000
Ba 455.403	1	Lin, Calc Int	0.0	8109000	0.00000	1.000000
Ba 493.408	1	Lin, Calc Int	0.0	6226000	0.00000	1.000000

Sequence No.: 3

Sample ID: IDL-RL (2% HNO3)

Analyst:

Logged In Analyst (Original) : TET

Initial Sample Wt:

Dilution: 3X

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 12:57:21

Data Type: Reprocessed on 4/10/2565 13:11:23

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: IDL-RL (2% HNO3)

Analyte	Back Pressure	Flow
All	187.0 kPa	0.55 L/min

Mean Data: IDL-RL (2% HNO3)

Analyte	Mean Corrected Intensity	Calib. Conc. Units	Std.Dev.	Sample Conc. Units	Std.Dev.	RSD
As 193.696	-43.8	-0.0 mg/L	0.00	-43.6 µg/L	8.84	20.25%
Zn 213.857	-4719.6	-0.0 mg/L	0.00	-88.1 µg/L	0.13	0.15%
Mn 257.610	-3285.9	-0.0 mg/L	0.00	-5.9 µg/L	0.01	0.12%
La 379.478	-316.6	-0.0 mg/L	0.00	-2.8 µg/L	0.93	33.34%
Ba 455.403	-6917.2	-0.0 mg/L	0.00	-2.6 µg/L	0.04	1.39%
Ba 493.408	-5645.3	-0.0 mg/L	0.00	-2.7 µg/L	0.12	4.36%

Reprocessing Begun

Logged In Analyst: TET

Technique: ICP Continuous

Results Data Set (original): PM4OCT22

Results Library (original): C:\Users\Public\PerkinElmer\IPV\PM.mdb

Results Data Set (reprocessed):

Results Library (reprocessed):

Sequence No.: 1

Sample ID: Calib Blank 1

Analyst:

Logged In Analyst (Original) : TET

Initial Sample Wt:

Dilution:

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 13:03:09

Data Type: Reprocessed on 4/10/2565 13:10:50

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: Calib Blank 1

Analyte	Back Pressure	Flow
All	189.0 kPa	0.55 L/min

Mean Data: Calib Blank 1

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Calib Conc. Units
Tl 190.801	-188.5			[0.00] µg/L
As 193.696	172.3			[0.00] µg/L
Se 196.026	118.8			[0.00] µg/L
Pb 220.353	780.8			[0.00] µg/L

Sequence No.: 2

Sample ID: DL-Standard

Analyst:

Logged In Analyst (Original) : TET

Initial Sample Wt:

Dilution:

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 13:08:25

Data Type: Reprocessed on 4/10/2565 13:10:50

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: DL-Standard

Analyte	Back Pressure	Flow
All	189.0 kPa	0.55 L/min

Mean Data: DL-Standard

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Calib Conc. Units
Tl 190.801	27521.6			[1000] µg/L
As 193.696	25399.0			[1000] µg/L
Se 196.026	7470.8			[500] µg/L
Pb 220.353	56586.9			[500] µg/L

Calibration Summary

Analyte	Stds.	Equation	Intercept	Slope	Curvature	Corr. Coef.	Reslope
Tl 190.801	1	Lin, Calc Int	0.0	27.52	0.00000	1.000000	
As 193.696	1	Lin, Calc Int	0.0	25.40	0.00000	1.000000	
Se 196.026	1	Lin, Calc Int	0.0	14.94	0.00000	1.000000	
Pb 220.353	1	Lin, Calc Int	0.0	113.2	0.00000	1.000000	

Sequence No.: 3

Sample ID: IDL-XL (2% HNO3)

Analyst:

Logged In Analyst (Original) : TET

Initial Sample Wt:

Dilution: 3X

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 13:04:56

Data Type: Reprocessed on 4/10/2565 13:10:50

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: IDL-XL (2% HNO3)

Analyte	Back Pressure	Flow
All	188.0 kPa	0.55 L/min

Mean Data: IDL-XL (2% HNO3)

Analyte	Mean Corrected Intensity	Calib. Conc. Units	Std.Dev.	Sample Conc. Units	Std.Dev.	RSD
Ti 190.801	10.2	0 µg/L	0.76	1 µg/L	2.27	204.66%
As 193.696	-32.9	-1 µg/L	1.04	-4 µg/L	3.11	80.03%
Se 196.026	-47.2	-3 µg/L	1.38	-9 µg/L	4.14	43.71%
Pb 220.353	132.2	1 µg/L	0.32	4 µg/L	0.96	27.41%

=====

Method Loaded

Method Name: MnBEC

IEC File:

Method Description: C8000-XL and RL-Spec <or = 30 µg/L, Attn: Spec <or = 50µg/L

Method Last Saved: 15/10/2563 10:51:07

MSF File:

Sequence No.: 1

Sample ID: IB (2% HNO3)

Analyst:

Logged In Analyst (Original) : TET

Initial Sample Wt:

Dilution:

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 13:02:02

Data Type: Reprocessed on 4/10/2565 13:11:50

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: IB (2% HNO3)

Analyte

Back Pressure

Flow

All

189.0 kPa

0.55 L/min

Mean Data: IB (2% HNO3)

Analyte	Mean Corrected Intensity	Calib. Conc. Units	Std.Dev.	Sample Conc. Units	Std.Dev.	RSD
Mn 257 XN	179923.9					
Mn 257 RN	22857.4					

Sequence No.: 2

Sample ID: IS (N069-1579/10)

Analyst:

Logged In Analyst (Original) : TET

Initial Sample Wt:

Dilution:

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 12:47:14

Data Type: Reprocessed on 4/10/2565 13:11:50

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: IS (N069-1579/10)

Analyte

Back Pressure

Flow

All

187.0 kPa

0.55 L/min

Mean Data: IS (N069-1579/10)

Analyte	Mean Corrected Intensity	Calib. Conc. Units	Std.Dev.	Sample Conc. Units	Std.Dev.	RSD
Mn 257 XN	11640650.3					
Mn 257 RN	1784946.6					

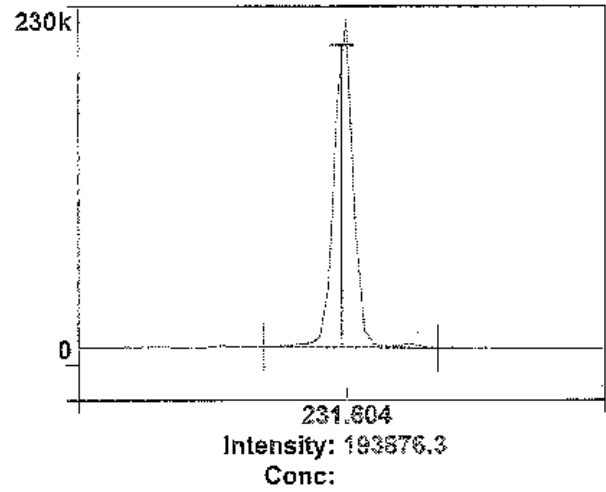
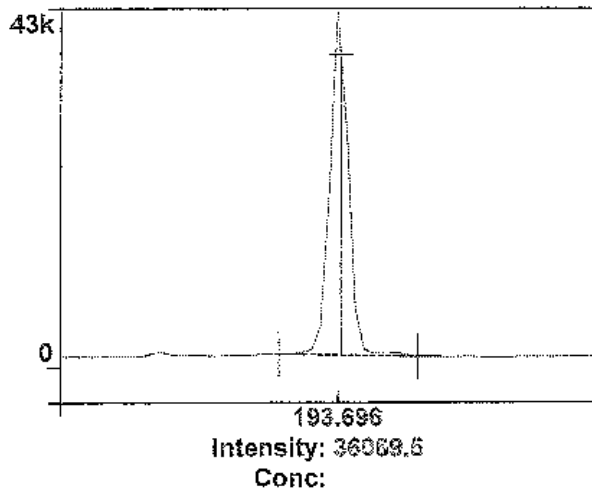
Method: Resolution
Result: PM4OCT22

Sample ID: Res (N069-1579/10)

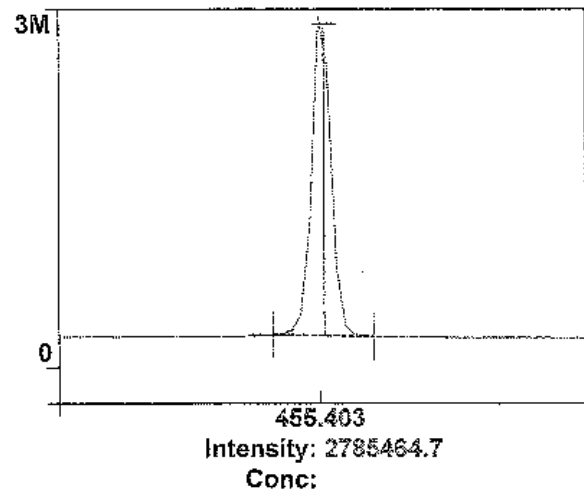
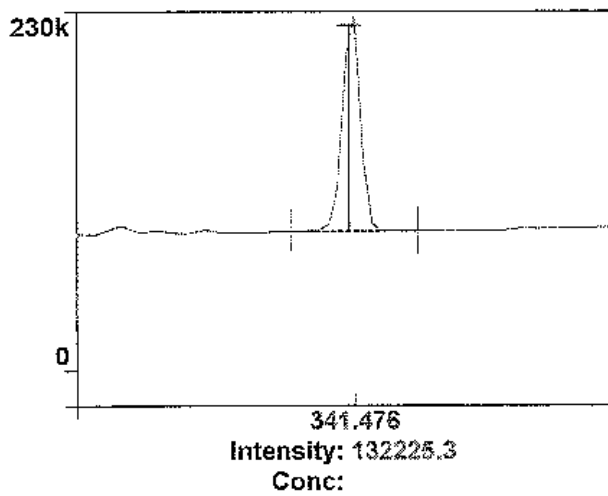
As 193.696-Res

Rep: 3 Ni 231.604-Res

Rep: 3

1
Ni 341.476-ResRep: 3 2
Ba 455.403-Res

Rep: 1



3

4

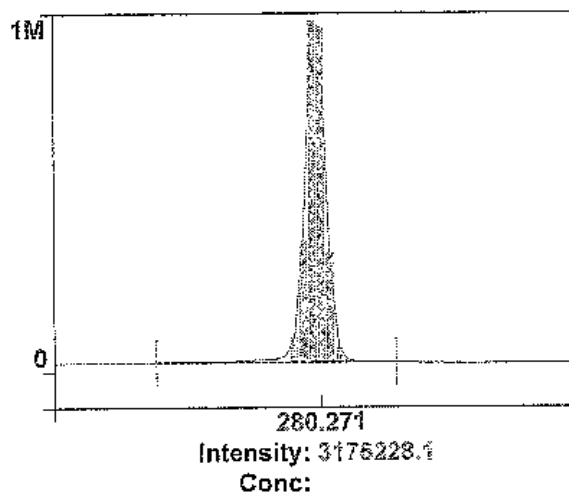
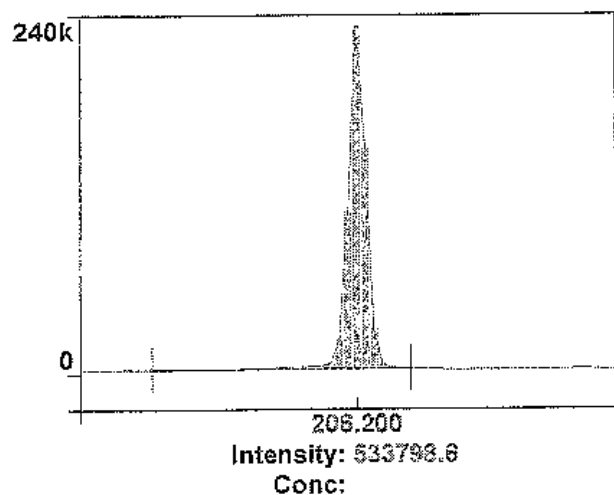
Analysis

R 12:52:36.775	10/04/2022	ID: Res	(N069-1579/10)	AS 193.696-Res	Rep 1	Res: 0.00726 nm
R 12:52:43.936	10/04/2022	ID: Res	(N069-1579/10)	AS 193.696-Res	Rep 2	Res: 0.00718 nm
R 12:52:50.018	10/04/2022	ID: Res	(N069-1579/10)	AS 193.696-Res	Rep 3	Res: 0.00709 nm
R 12:53:01.267	10/04/2022	ID: Res	(N069-1579/10)	Ni 231.604-Res	Rep 1	Res: 0.00832 nm
R 12:53:07.757	10/04/2022	ID: Res	(N069-1579/10)	Ni 231.604-Res	Rep 2	Res: 0.00833 nm
R 12:53:14.167	10/04/2022	ID: Res	(N069-1579/10)	Ni 231.604-Res	Rep 3	Res: 0.00817 nm
R 12:53:23.775	10/04/2022	ID: Res	(N069-1579/10)	Ni 341.476-Res	Rep 1	Res: 0.01226 nm
R 12:53:32.296	10/04/2022	ID: Res	(N069-1579/10)	Ni 341.476-Res	Rep 2	Res: 0.01232 nm
R 12:53:39.628	10/04/2022	ID: Res	(N069-1579/10)	Ni 341.476-Res	Rep 3	Res: 0.01219 nm
R 12:53:51.108	10/04/2022	ID: Res	(N069-1579/10)	Ba 455.403-Res	Rep 1	Res: 0.01564 nm
R 12:54:00.062	10/04/2022	ID: Res	(N069-1579/10)	Ba 455.403-Res	Rep 2	Res: 0.01573 nm
R 12:54:09.268	10/04/2022	ID: Res	(N069-1579/10)	Ba 455.403-Res	Rep 3	Res: 0.01577 nm

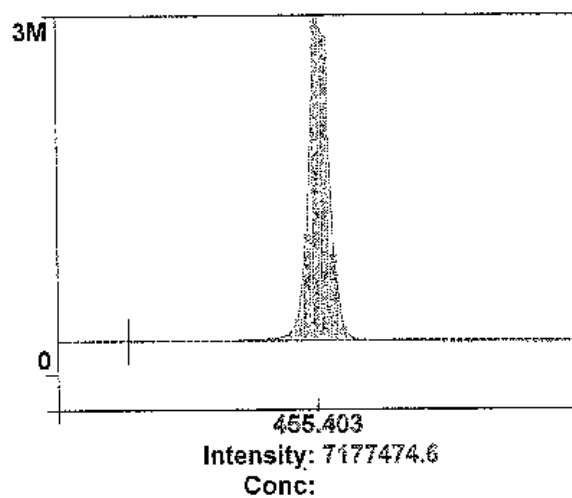
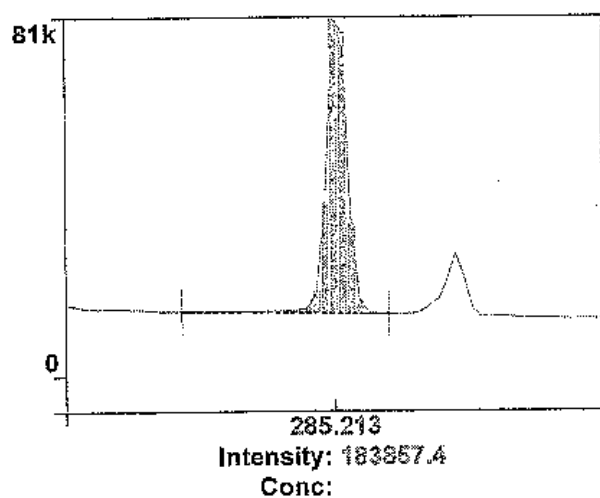
Zn 206.200

Rep: 3 Mg 280.271

Rep: 3

1
Mg 285.2132
Rep: 3 Ba 455.403

Rep: 3



3

4

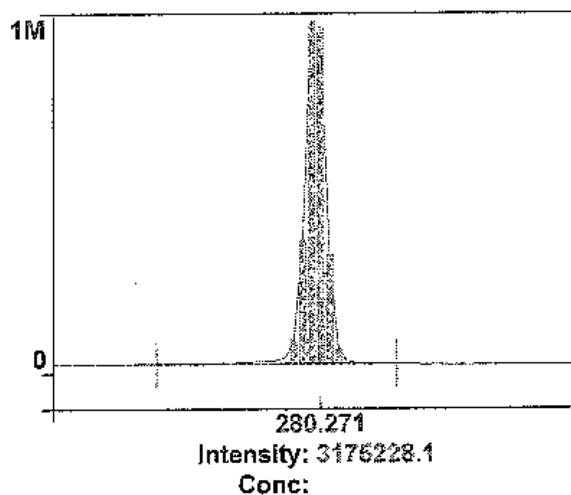
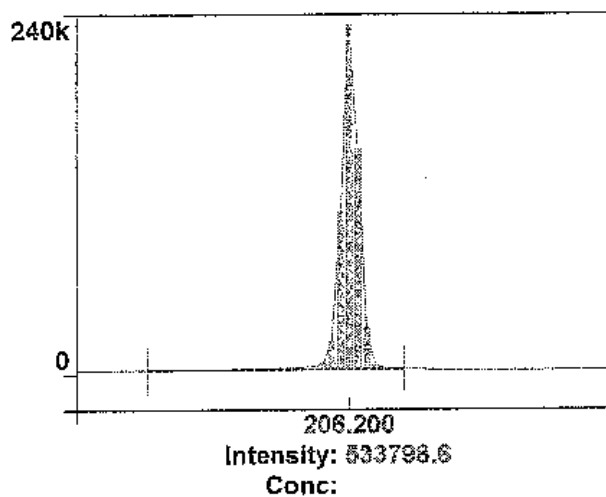
Method: Precision
Result: PM4OCT22

Sample ID: RSD STD (N069-1579/10)

Zn 206.200

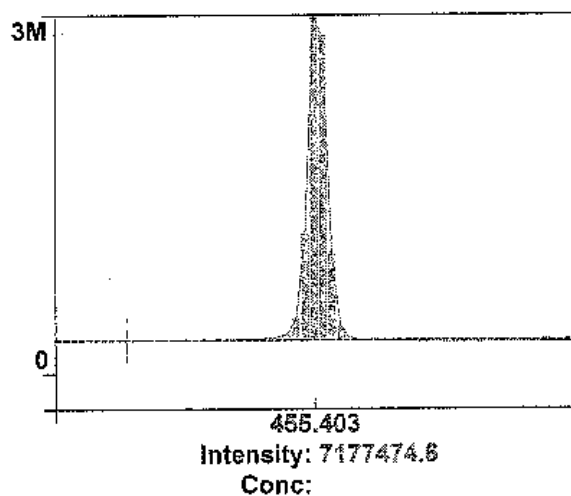
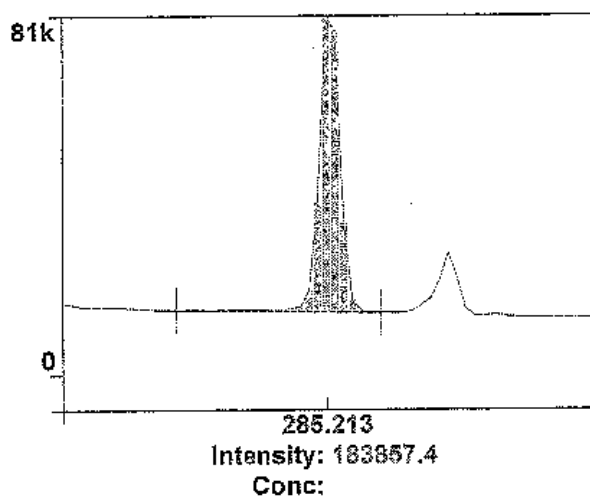
Rep: 3 Mg 280.271

Rep: 3

1
Mg 285.213

Rep: 3 Ba 455.403

Rep: 3



3

4

Method Loaded

Method Name: Precision

IEC File:

Method Description: C8000 -N=10- 1.0% RSD

Method Last Saved: 3/5/2554 12:31:51

MSF File:

Sequence No.: 4

Sample ID: RSD STD (N069-1579/10)

Analyst:

Initial Sample Wt:

Dilution:

Wash Time:

Autosampler Location:

Date Collected: 4/10/2565 12:48:29

Data Type: Original

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: RSD STD (N069-1579/10)

Analyte

Back Pressure

Flow

All

187.0 kPa

0.55 L/min

Mean Data: RSD STD (N069-1579/10)

Analyte	Mean Corrected Intensity	Calib. Conc. Units	Std.Dev.	Sample Conc. Units	Std.Dev.	RSD
Zn 206.200	532964.1				953.06	0.18%
Mg 280.271	3182498.0				14602.29	0.46%
Mg 285.213	184385.3				774.20	0.42%
Ba 455.403	7181766.3				4330.85	0.06%

PerkinElmer TruQ

Atomic Spectroscopy Standard



Certificate of Analysis

PerkinElmer Number: N0691579
Description: Multi-Element Standard
Matrix: 2% HNO₃
Lot Number: 57-324CRX1

Certification Date: NOV -- 2021
Expiration Date: MAY 30 2023

* Instrumental Analysis using ICP Spectrometer:

Analyte	Labeled	Measured	SRM	Analyte	Labeled	Measured	SRM
As	50.0 µg/mL	50.1 µg/mL	3103a*	Ni	10.0 µg/mL	10.0 µg/mL	3136*
K	50.0 µg/mL	50.3 µg/mL	3141a*	Sr	10.0 µg/mL	10.0 µg/mL	3153a*
La	10.0 µg/mL	10.0 µg/mL	3127a*	Zn	10.0 µg/mL	10.0 µg/mL	3168a*
Li	10.0 µg/mL	10.0 µg/mL	3129a*	Ba	1.00 µg/mL	1.01 µg/mL	3104a*
Mn	10.0 µg/mL	10.1 µg/mL	3132*	Mg	1.00 µg/mL	1.01 µg/mL	3131a*

* - indicates NIST SRM

† - indicates CRM (when NIST SRM is not available)

Reference Multi: Lot# 2-84MJ, 3-168MJ, 4-39MJ

Refer to side 2 for details of certification.

Balances are calibrated with weight sets traceable to NIST.

We guarantee that our PerkinElmer TruQ Atomic Spectroscopy Standards are stable and accurate to $\pm 0.5\%$ of certified concentration until the expiration date, provided the standards are kept tightly capped and stored under normal laboratory conditions. This value is the sum of cumulative errors associated with the analytical determinations, pipetting, and diluting to final volume. For these solutions we use high purity acids, ASTM Type I water (18 megohm double deionized), and leached, triple-rinsed bottles. All glassware used is class A.



Certifying Officer: Y. Parikh

PerkinElmer®

PerkinElmer, Inc.

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U.S.A. Toll Free: 1-800-762-4000

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PerkinElmer

Global Service Training Department

Service Engineer Certification

Wiphan Promlumda

**This is to certify that the above mentioned
PerkinElmer representative has been trained to
service the instrument indicated below:**

ICP220B Optima 8300 & Optima 4X/5X/7X00 Series

Instructor:



Geoff Cook

Date: July 20, 2012

Certified by:



(Manager, Global Training Operations)

PerkinElmer TruQ

Atomic Spectroscopy Standard



Certificate of Analysis

PerkinElmer Number: N9300221

Description: Instrument Calibration Standard 4

Matrix: 5% HNO₃

Lot Number: 58-169CRY1

Certification Date: MAY -- 2022

Expiration Date: NOV 30 2023

* Instrumental Analysis using ICP Spectrometer:

Analyte	Labeled	Measured	SRM	Analyte	Labeled	Measured	SRM
As	100 µg/mL	99.8 µg/mL	3103a*	Pb	50.0 µg/mL	49.9 µg/mL	3128*
Ti	100 µg/mL	99.4 µg/mL	3158*	Se	50.0 µg/mL	49.8 µg/mL	3149*
Cd	50.0 µg/mL	50.0 µg/mL	3108*				

* - indicates NIST SRM

† - indicates CRM (when NIST SRM is not available)

Reference Multi: Lot# 57-156CR, 1-177YJ, 54-134CR

Refer to side 2 for details of certification.

Balances are calibrated with weight sets traceable to NIST.

We guarantee that our PerkinElmer TruQ Atomic Spectroscopy Standards are stable and accurate to ±0.5% of certified concentration until the expiration date, provided the standards are kept tightly capped and stored under normal laboratory conditions. This value is the sum of cumulative errors associated with the analytical determinations, pipetting, and diluting to final volume. For these solutions we use high purity acids, ASTM Type I water (18 megohm double deionized), and leached, triple-rinsed bottles. All glassware used is class A.



Certifying Officer:

Y. Parikh

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Gas Detector Certificate

Issued By: Sithiporn Associates Company Limited
 Owner Name: Thai Environmental Technic Ltd.
 Reference Number: 3HONG50050
 Product Brand: BW Technologies
 Type Systematic: Personal
 Battery Type: Rechargeable Lithium Polymer
 Calibration Date: 01-Sep-22
 Calibration Due: 01-Sep-23
 Calibration Temp.: 25°C
 Calibration Humidity: 65%RH

Product Model: Gas Alert Micro Clip XT Serial Number: KA415-1047024
 Detection Gases: Measuring Range: Detection Principles:
 H₂S (Hydrogen sulfide): 0-100 ppm in 1 ppm increments Electrochemical cell
 CO (Carbon Monoxide): 0-500 ppm in 1 ppm increments Electrochemical cell
 LEL (Methane): 0-100% LEL of CH₄ in 1% LEL Catalytic cell
 O₂ (Oxygen): 0-30% in 0.1 vol. increments Electrochemical cell

Calibration Standard equipment : Std Gas Mixtures Cylinder Number 1438107 Expired Date 01-Feb-23
 Ultra High Purity Nitrogen Cyl No. M5281014 Expired Date 12-Dec-24

Components Concentration:
 Methane (CH₄): 50.0 %LEL (2.5 %vol.)
 Hydrogen Sulfide(H₂S): 25.0 ppm
 Carbon Monoxide(CO): 100.0 ppm
 Oxygen (O₂): 18.0 %Vol.

Calibration Result

Item Calibration	Fresh Air			Standard Gas			90%T (second)	Standard Drift	Unit
	Before	Calibration	After	Before	Calibration	After			
Hydrogen Sulfide(H ₂ S)	0	0	0	24	25	25	16	0	ppm
Carbon Monoxide(CO)	0	0	0	97	100	100	14	0	ppm
Combustion(CH ₄)	0	0	0	48	50	50	15	0	%LEL
Oxygen (O ₂)	20.9	20.9	20.9	17.8	18	18.0	14	0.0	%Vol.

Result of test the zero oxygen detect by Measurement Nitrogen (N₂) 99.99% : 0.1 %Vol.

** O₂ Detector is set up Auto-Calibration on Startup, 20.9%vol.

* 90%T is response time reading to 90% of standard gas

Gas Alarm Preset	Low Alarm	High Alarm	TWA	STEL	
Hydrogen Sulfide(H ₂ S)	10	15	10	15	ppm
Carbon Monoxide(CO)	30	200	30	200	ppm
Combustion(CH ₄)	10	20	N/A	N/A	%LEL
Oxygen (O ₂)	19.5	23.5	N/A	N/A	%Vol.

Operation Test

Function	Battery Indicate	Sampling Module	Self-Test	Gas Display	Alarm Report	PC/Data Collection	Alarm Functional		
							Audible	Visual	Vibration
Judgement	Pass	N/A	Pass	Pass	Pass	Pass	Pass	Pass	Pass

Remarks

Signature

Approved

บริษัท สิทธีพร แอสโซซิเอต จำกัด

Sithiporn Associates Co., Ltd.

451-451/1 ถนนสีลม แขวงบางนาเหนือ เขตบางนา กรุงเทพมหานคร 10700 โทร. 0-2433-8331, 0-2433-8800, 0-2434-9191 โทรสาร: 0-2433-1679, 0-2434-9510
 451-451/1 Sirinthorn Road, Bangbunru, Bangplud, Bangkok 10700 Thailand Tel. (662) 433-8331, 435-8800, 434-9191 Fax: (662) 433-1679, 434-9510

EMAIL:center@sithiphorn.com

www.sithiphorn.com

ANALYSIS CERTIFICATION

METHOD OF PREPARATION : GRAVIMETRIC / PRESSURE TRANSFILLING

METHOD OF ANALYSIS : ELECTROCHEMICAL CELL, PARAMAGNETIC OXYGEN CELL,
GC(FID)

ACCURACY : $\pm 5\%$ RELATIVE (H_2S), $\pm 2\%$ RELATIVE (CO , CH_4 , O_2)

LOT NO. & QTY.	COMP. 1 H_2S	COMP. 2 CO	COMP. 3 CH_4	COMP. 4 O_2	COMP. 5 N_2	COMP. 6	Exp Dat.
1438107(2)	25PPM	100PPM	2.50%	18.00%	BALANCE		02/01/2

Gas mixtures manufactured with balances calibrated by an ISO 17025 accredited Company using NIST traceable weights and meets or exceeds the requirements of NIST Handbook 44.

Calibration test 121088, 121097, 121091, or 121100 dated, 18th January 2019 applies.

WEIGHT SETS USED: Kit #92231, Test #2740564, Kit # 03610, Test # VA-19-11 T3 Test # VA-19-11350B, T5 Test #VA-19-11350F, VA-19-11350E, VA-19-11350 IM1966 Test VA-18-11340H

No affecting environmental conditions during analysis.

REQUESTED BY : AIR LIQUIDE

CUSTOMER PURCHASE ORDER NUMBER : PO19379/SO27165

PACKING LIST NUMBER : 20327317

CERTIFICATION DATE : January 26, 2021

ANALYSIS BY :

Robert Watson
Quality Representative

We certify that all the cylinders for the Lot numbers identified herein are manufactured and tested within the requirements of CFR 49 part 178.65 and that physical and chemical test reports are on file and copies will be furnished upon request.

CALGAZ, a division of Airgas USA LLC
821 Chesapeake Drive, Cambridge, MD 21613-0149
Phone: (410)228-6400 Fax: (410)228-4251

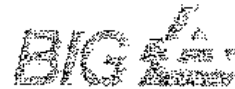
BANGKOK INDUSTRIAL GAS CO., LTD.

11th Floor, Rajanakorn Building

8 South Sathorn Rd, Yanawa, Sathorn

Bangkok 10123, Thailand

Tel : (662) 685-6789 Fax : (662) 685-6790-1



CERTIFICATE OF CONFORMITY (For Package Gases)

Customer Name : Sshiporn Associates Co., Ltd.

Product Name : Nitrogen

Certificate No. : QC1528-4298

Date of Issue : 12 DEC '21

Gas Content : 7 M³

Lot. No. : 171215N201/DO3300016058

Shelf Life : 36 months

Page no. : 1/1

Cylinder Valve Type : CGA 580

Components	Specification
Oxygen	< 2 ppm
Moisture	< 3 ppm
Carbon Dioxide	< 1 ppm
Carbon Monoxide	< 1 ppm
Total Hydrocarbon as CH ₄	< 1 ppm
Nitrogen	> 99.999 %

Cylinders' Number

M5281914

13D007140

บริษัท สหพันธ์อุตสาหกรรม
S-SHIPORN ASSOCIATES CO., LTD.

Signature: _____

(Warehouse Supervisor)





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3090-27 FAX. 0-2719-9484



Cert.No.: 21CHO589

Page.: 1 of 3

Certificate of Calibration

Equipment : Spectrophotometer
Manufacturer : Labtech
Model : Blue Star A
Serial No. : 1606UV1507
ID No. : -
Condition As-Received: Used Item
Received Date : 02 November 2021
Calibration Date : 03 November 2021
Reference : 2111-0006OC-5
Submitted by : Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240

Calibration Place : Laboratory (Thai Environment Technic Limited)
Ambient Temperature : (25.2 - 27.6) °C (On-Site)
Relative Humidity : (64 - 63) % (On-Site)
Calibration Procedure : In - house method :
CP-OCH4 based on ASTM E 275-01

Calibrated by : Uthen Kankawi

Approved by :

Malee Butkruea
Approved Signatory

- (☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date : 9 November 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 0034258



Cert. No. : 21CHO589

Page : 2 of 3

Condition of calibration result

1. Reference Standard Material :

<u>Material</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1. Absorbance Standard set	32593	85665	17 July 2022
2. Absorbance Standard set	32595	86622	08 Sep 2022
3. Wavelength Standard set	29829	94776	02 Sep 2023
4. Wavelength Standard set	29829	94777	02 Sep 2023
5. Stray Light Standard set	32629	107773	23 July 2022

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certificate is traceable to the International System of Unit maintained at :

- National Physical Laboratory (NPL), The United Kingdom of Great Britain and Northern Ireland
- National Institute of Standards and Technology (NIST), The United States of America

4. Spectral BandWidth : 2 nm

Scan Speed : Slow

Calibration Results : without adjustment

Wavelength Accuracy

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (\pm nm)	Coverage Factor <i>k</i>
361.00	360.8	0.16	2.00
472.47	472.0	0.16	2.00
536.66	537.0	0.16	2.00
684.49	683.8	0.17	2.00
879.27	879.4	0.17	2.00

Male

a 1080441



Cert. No. : 21CHO589

Page : 3 of 3

Calibration Results : without adjustment**Photometric Accuracy**

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (\pm Abs)	Coverage Factor <i>k</i>
420.0	Zero	0.0000	0.0028	2.00
	0.5704	0.5659	0.0028	2.00
	0.7139	0.7074	0.0028	2.00
	1.0019	0.9893	0.0028	2.00
546.1	Zero	0.0000	0.0028	2.00
	0.5204	0.5165	0.0028	2.00
	0.7000	0.6955	0.0028	2.00
	0.9814	0.9760	0.0028	2.00
635.0	Zero	0.0000	0.0028	2.00
	0.5621	0.5569	0.0028	2.00
	0.7650	0.7595	0.0028	2.00
	1.0738	1.0669	0.0028	2.00

Stray Light

* Straylight at 279.73 nm \pm 0.11 nm	Reading at 279.73 nm \pm 0.11 nm
Abs	1.9183
%T	1.19

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- Cut-off wavelength of stray light reference material (Potassium Iodide) = 279.73 nm \pm 0.11 nm
- Result = Pass, If Absorbance > 2.00 Abs and Transmission < 1.0 %T at Wavelength 279.73 nm \pm 0.11 nm
- * : Not NSC-ONSC Accredited

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-

Maha.

a 1080440



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



Cert.No.: 22CHO410

Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH1300
Serial No. : B06D0012
ID No. : -
Condition As-Received: Used Item
Received Date : 11 July 2022
Calibration Date : 11 July 2022
Reference : 2207-0243OC-7
Submitted by : Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145
Khwaeng/Khet Saphan Sung,
Bangkok 10240
Calibration Place : Laboratory (Thai Environment Technic Limited)
Ambient Temperature : (25.2 - 25.4) °C
Relative Humidity : (50.8 - 51.3) %
Calibration Procedure : In - house method :
- CP-OCH2 by direct measurement with standard
voltage calibrator and direct measurement
with certified reference material (CRM)

Calibrated by : Krisda Malee

Approved by :

Malee

Approved Signatory

(/) Malee Butkruea
() Saithip Meangmai

Issue Date : 19 July 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 0042417



Cert. No.: 22CHO410

Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	46530031	130RC098	21E3245	07 Oct 2022
2) Digital Thermometer	-	130RC112	21T2118	16 Nov 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 1.681	CPA chem	754027	28 Jun 2023
pH 4.008	CPA chem	794120	14 Feb 2024
pH 6.866	CPA chem	754029	28 Jun 2023
pH 9.181	CPA chem	766823	04 Sep 2022
*pH 12.44	Hach Lenge GmbH	C02796	15 Dec 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 (1.68,4,7,10)**

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: B06D0012	1.680	314.73	314.7	1.694	0.058	2.00
	4.000	177.48	177.5	4.008	0.058	2.00
	6.860	8.28	8.3	6.860	0.058	2.00
	7.000	0.0	0.0	7.000	0.058	2.00
	9.180	-128.97	-128.9	9.188	0.058	2.00
	10.000	-177.48	-177.4	10.011	0.058	2.00

Function : pH Measurement**Performing four buffers standard curve by using buffer nominal pH (1.68,4,7,9)**

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 9X9M0055	1.681	1.681	295.6	0.0050	2.00
	4.008	4.007	159.9	0.0047	2.00
	6.866	6.866	-6.9	0.0084	2.00
	9.181	9.181	-139.9	0.014	2.00
	*12.44	12.440	-314.5	0.056	2.00

Remark: * : Not NSC-ONSC AccreditedThe 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 1090860



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CALIBRATION AND TESTING EQUIPMENT SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000-24 FAX. 0-2719-9484

Cert. No.: 21TM1903

Page.: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator

Manufacturer : Siam Intercool

Model : PJEZSOH000

Serial No. : C9717492

ID No. : LAB BOD 03

Submitted by : Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240

Location : Laboratory (Thai Environmental Technic Limited)

Received Order : 2 November 2021

Calibration Date : 3 November 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 :

9 November 2021

The Uncertainties are for a confidence probability of approximately 95%.

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approval of the head of Calibration and Testing Equipment Services.

A 0007910



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2111-0006OC-4
Procedure Used :-

Cert. No.: 21TM1903
Page.: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with 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	34970A	MY44060450	21LM4/1	06 Mar 2022

2. This certificate is valid only to the item calibrated on date and place of calibration.

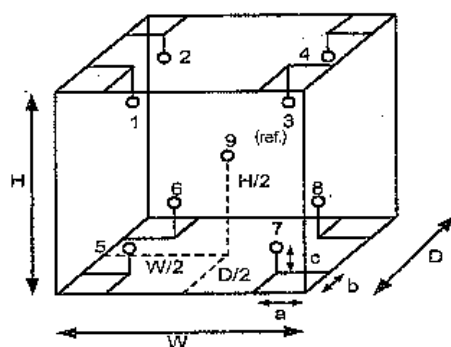
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	25
REL.Humid. (%)	52	55
AC Supply (Volt)	221	220



Position :	Ref. Std. ID No.:
1	19-14TC-01
2	19-14TC-02
3	19-14TC-03
4	19-14TC-04
5	19-14TC-05
6	19-14TC-06
7	19-14TC-07
8	19-14TC-08
9 (ref.)	19-14TC-09

Probe Installation Details :

a = 10 cm
 b = 10 cm
 c = 10 cm

Dimension of Chamber :

D = 0.50 m
 W = 0.50 m
 H = 1.2 m
 Capacity = 0.30 m³

Male



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2111-0006OC-4

Cert. No.: 21TM1903

Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
20.0	20.0	20.0	0.084	0.26	0.36	0.83	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.071	19.877	19.969	19.955	20.008	20.008	20.107	19.981	19.883

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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Mahu .

a 1080442



MAINTENANCE REPORT

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 100

Customer : บริษัท เทคนิคสิ่งแวดลอมไทย จำกัด Address : 1/6 ซอยรามคำแหง 145, แขวงสะพานสูง, เขตสะพานสูง, กรุงเทพฯ 10240 TH User Name: คุณ กิตติศักดิ์ เมืองงาม Phone: 02-3737799 E-mail: phornlip.p@tet1995.com ketsarin.c@tet1995.com	Date Tested: 3-ด.ค.-65 Recommendation Recertification Period 6 Months Recertification Due: 2-เม.ย.-66 Date Last Certified: 4-เม.ย.-65 Visit Number: 2 of 2 TH ONE SOURCE Phone: 081-7316733 E-mail: thonesource@gmail.com
---	--

CONFIGURATION TESTED

MODEL	SERIAL NUMBER	SOFTWARE
AAAnalyst 100	040S0110503	AA WinLab 3.2
TEST STANDARD USED	PART NUMBER	
Copper	N9300183	
Filter 0.2 %	MG0-057	



MAINTENANCE REPORT

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 100

SERIAL NUMBER 040S0110503
DATE TESTED
3-๓.๓.-65
1. OPTIC CHECKS

A. Optical alignment condition (if necessary)

☐ OK

B. Condition of Mirrors,Lenses etc.(if necessary)

☐ OK

C. D2,HCL beam adjust (if necessary)

☐ OK

2. GAS SYSTEM CHECKS

A. Leak test all internal and external gas box joints

☐ OK

B. All gas box safety features

☐ OK

C. Burner system including nebulizer and all o-ring and gasket

☐ OK

D. Drain system (safety)

☐ F

3. ELECTRONICS CHECKS

A. Power Supplies

 $+ 5.00 \text{ Vdc} \pm 0.2 \text{ Vdc}$
+ 5.02 Vdc

 $+ 11.50 \text{ Vdc} \pm 0.2 \text{ Vdc}$
+ 11.48 Vdc

 $+ 15.00 \text{ Vdc} \pm 1.0 \text{ Vdc}$
+14.99 Vdc

 $- 15.00 \text{ Vdc} \pm 1.0 \text{ Vdc}$
-15.06 Vdc

 $+ 35.00 \text{ Vdc} \pm 3.0 \text{ Vdc}$
+35.13 Vdc

4. WAVELENGTH ACCURACY TEST

 A. Zn Lamp wavelength $213.9 \text{ nm} \pm 0.3 \text{ nm}$.

213.74 nm.

 B. Fe Lamp wavelength $248.3 \text{ nm} \pm 0.3 \text{ nm}$.

248.12 nm.

 C. Cu Lamp wavelength $324.8 \text{ nm} \pm 0.3 \text{ nm}$.

324.67 nm.



MAINTENANCE REPORT

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 100

SERIAL NUMBER <u>040S0110503</u>	DATE TESTED <u>3-ธ.ค.-65</u>
5. PERFORMANCE TESTS	SPEC. RESULTS
*A. Neutral density filter checks with Copper (324.8 nm)	
Neutral Density Filter $0.2 \pm 10\%$	0.180 <u>0.173</u> Abs.
B. AA Baseline noise test with Copper (324.8 nm)	
Integration time = 0.5 seconds	
Replicates = 99 times	
Standard Deviation	≤ 0.001 <u>0.000</u>
C. Flame sensitivity with Copper (324.8nm)	
(5 mg/L Cu Standard a read time of 10 seconds	
10 replicates, standard burner)	
Stainless steel nebulizer	≥ 0.25 <u>0.285</u> Abs.
%RSD	≤ 0.3 <u>0.14</u> %



MAINTENANCE REPORT
ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL
AAAnalyst 100

SERIAL NUMBER 040S0110503DATE TESTED 3-๑๑-๖5

Remarks :

This is to certify that the above tests have been performed and the configuration tested

☒

meets

☐

does not meet

This certificate does not modify PerkinElmer's standard terms and condition of sale,
including warranty terms.

Service Department TH ONE SOURCE CO., LTD.

Krungchai T.

(Krungchai Treevichien)

Customer Support Engineer

Certificate of Completion

Presented To:

Krungchai Treevichien

For Successfully Completing:

AAAnalyst 100/300 Flame & Graphite/As 90
Series/FLAS
Service Training

Eric W. Schmitt

Eric W. Schmitt
Instructor

PERKIN ELMER

9-19 June, 1998

Date



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0237

MTC No. EEL. BP. 47/0165

CALIBRATION CERTIFICATE

Submitted by : THAI ENVIRONMENTAL TECHNIC LIMITED.

Address : 1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphansung, Bangkok, 10240, Thailand.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Ambient Environment

Description : Sound Calibrator

Temperature : $(23 \pm 3) ^\circ\text{C}$

Manufacturer : Tenmars

Relative Humidity : $(50 \pm 15) \%$

Model : TM-100

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Serial No. : 181203570

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N 4106495.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 13 Jan. 2022

Date of Calibration : 26 Jan. 2022

1/3
✓

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BLMTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0237

MTC No. EEL. BP. 47/0165

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

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 HzAcoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0°C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	94.50	0.50	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	989.4	-10.6	± 1.5	$\pm 2.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	2.45	± 0.60	$\pm 4.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Date of Calibration : 26 Jan. 2022

2/3 ✓

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FM.BLMTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0237

MTC No. EEL. BP. 47/0165

Nominal Output of Unit Under Test = 114 dB re 20µPa at 1000 Hz

Acoustic Output in dB re 20µPa, Corrected to Reference Conditions : 101.325 kPa, 23.0 °C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	114.28	0.28	± 0.10	±0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	984.9	-15.1	± 1.5	±2.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	2.58	± 0.60	±4.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyao)

Approved by :

(Mr. Prawnud Kiataypa)
Acting Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 26 Jan. 2022

Date of Issue : 27 Jan. 2022

Ref : 2011265011300154001

End of Certificate

3 / 3

The results relate only to the items tested/calibrated or value assigned.

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FM.BL.MTC.002 Rev.4

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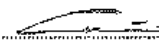


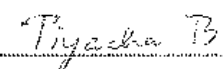
Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type	: Sound Level Meter	Calibration Date	: 24-Oct-2022
Calibrator	: TENMARS Sound Calibrator TM-100	Barometric pressure (mmHg)	: 759.0 mmHg
Standard	: IEC 60942	Temperature (23±3)°C	: 25 °C
Accuracy	: 94.0 ±0.3 dB and 114.0±0.5 dB	Relative Humidity(50±15 %)	: 45.0 % RH
Frequency	: at 1,000 Hz ±1%	Dued Date of Calibrate	: 30-Nov-2022
Calibrator Serial NO.	: 181203570		

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
18	ACO	6226	070046	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
19	ACO	6226	070047	94.0	93.8	93.8	93.8	93.8	94.0	0.2	PASS
				114.0	113.8	113.8	113.8	113.8			
20	ACO	6226	070048	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
21	ACO	6226	070049	94.1	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
23	RION	NL-21	00487676	94.0	94.3	94.3	94.3	94.3	94.0	0.3	PASS
				114.0	114.1	114.1	114.1	114.1			
25	ACO	6226	100098	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
26	ACO	6226	100099	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
28	ACO	6226	100101	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
29	ACO	6226	100102	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
30	ACO	6226	100106	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			

Calibration By : 

Approve by : 



Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type	: Sound Level Meter	Calibration Date	: 24-Oct-2022
Calibrator	: TENMARS Sound Calibrator TM-100	Barometric pressure (mmHg)	: 759.0 mmHg
Standard	: IEC 60942	Temperature (23±3)°C	: 25 °C
Accuracy	: 94.0±0.3 dB and 114.0±0.5 dB	Relative Humidity(50±15 %)	: 45.0 % RH
Frequency	: at 1,000 Hz ±1%	Dued Date of Calibrate	: 30-Nov-2022
Calibrator Serial NO.	: 181203570		

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
51	ACO	6236	152077	94.0	93.8	93.8	93.8	93.8	94.0	0.2	PASS
				114.0	113.7	113.7	113.7	113.7			
52	ACO	6226	150142	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
53	ACO	6226	160095	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
54	ACO	6226	160096	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.1	114.1	114.1	114.1			
55	ACO	6226	160097	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
56	ACO	6226	160098	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
57	ACO	6226	160099	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	113.9	113.9	113.9	113.9			
58	ACO	6226	160143	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
59	ACO	6226	160203	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
60	ACO	6226	160204	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			

Calibration By :

Approve by :

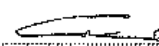


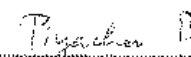
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Sound Level Meter Calibration Report

Equipment Type	: Sound Level Meter	Calibration Date	: 24-Oct-2022
Calibrator	: TENMARS Sound Calibrator TM-100	Barometric pressure (mmHg)	: 759.0 mmHg
Standard	: IEC 60942	Temperature (23±5)°C	: 25 °C
Accuracy	: 94.0 ±0.3 dB and 114.0 ±0.5 dB	Relative Humidity(50±15 %)	: 45.0 % RH
Frequency	: at 1,000 Hz ±1%	Dued Date of Calibrate	: 30-Nov-2022
Calibrator Serial NO.	: 181203570		

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
61	ACO	6226	160205	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
62	ACO	6226	160211	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
63	ACO	6226	160212	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
64	ACO	6226	160213	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
66	ACO	6226	160215	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
67	ACO	6226	160216	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
68	ACO	6236	222036	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.1	114.1	114.1	114.1			
69	ACO	6236	222037	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
70	ACO	6236	222038	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
71	ACO	6236	222039	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
72	ACO	6236	222040	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			

Calibration By : 

Approve by : 




Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

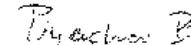
Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter
Calibrator : TENMARS Sound Calibrator TM-100
Standard : IEC 60942
Accuracy : 94.0 \pm 0.3 dB and 114.0 \pm 0.5 dB
Frequency : at 1,000 Hz \pm 1%
Calibrator Serial NO. : 181203570

Calibration Date : 24-Aug-2022
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23 \pm 3) $^{\circ}$ C : 25 $^{\circ}$ C
Relative Humidity (50 \pm 15 %) : 50.0 % RH
Dued Date of Calibrate : 30-Sep-2022

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust \pm dB	Deviation \pm dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
39	ACO	6226	110104	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
40	ACO	6226	110100	94.0	93.8	93.8	93.8	93.8	94.0	0.2	PASS
				114.0	113.8	113.8	113.8	113.8			
41	ACO	6226	130127	94.0	94.3	94.3	94.3	94.3	94.0	0.3	PASS
				114.0	114.3	114.3	114.3	114.3			
42	ACO	6226	130128	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.1	114.1	114.1	114.1			
43	ACO	6226	130129	134.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				154.0	114.1	114.1	114.1	114.1			
44	ACO	6226	130130	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
45	ACO	6226	130131	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
46	ACO	6236	112029	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
47	ACO	6236	152073	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
48	ACO	6236	152074	94.0	93.8	93.8	93.8	93.8	94.0	0.2	PASS
				114.0	113.7	113.7	113.7	113.7			
49	ACO	6236	152075	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
50	ACO	6236	152076	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			

Calibration By : 

Approve by : 

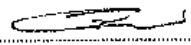


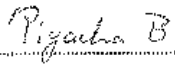
Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type	: Sound Level Meter	Calibration Date	: 24-Aug-2022
Calibrator	: TENMARS Sound Calibrator TM-100	Barometric pressure (mmHg)	: 759.0 mmHg
Standard	: IEC 60942	Temperature (23±3)°C	: 25 °C
Accuracy	: 94.0 ±0.3 dB and 114.0±0.5 dB	Relative Humidity(50±15 %)	: 50.0 % RH
Frequency	: at 1,000 Hz ±1%	Dued Date of Calibrate	: 30-Sep-2022
Calibrator Serial NO.	: 181203570		

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
51	ACO	6236	152077	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
52	ACO	6226	150142	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
53	ACO	6226	160095	94.0	94.3	94.3	94.3	94.3	94.0	0.3	PASS
				114.0	114.3	114.3	114.3	114.3			
54	ACO	6226	160096	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
55	ACO	6226	160097	94.0	961.0	961.0	961.0	961.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
56	ACO	6226	160098	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
57	ACO	6226	160099	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
58	ACO	6226	160143	94.0	93.7	93.7	93.7	93.7	94.0	0.3	PASS
				114.0	113.1	113.1	113.1	113.1			
59	ACO	6226	160203	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.1	114.1	114.1	114.1			
60	ACO	6226	160204	94.0	93.8	93.8	93.8	93.8	94.0	0.2	PASS
				114.0	113.7	113.7	113.7	113.7			
61	ACO	6226	160205	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
62	ACO	6226	160211	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			

Calibration By : 

Approve by : 



Thai Environmental Technic Limited
บริษัท เทคนิควิเสณแวดลอมไทย จํากัด

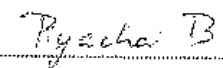
Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter
Calibrator : TENMARS Sound Calibrator TM-100
Standard : IEC 60942
Accuracy : 94.0 \pm 0.3 dB and 114.0 \pm 0.5 dB
Frequency : at 1,000 Hz \pm 1%
Calibrator Serial NO. : 181203570

Calibration Date : 24-Aug-2022
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23 \pm 3) $^{\circ}$ C : 25 $^{\circ}$ C
Relative Humidity(50 \pm 15 %) : 50.0 % RH
Dued Date of Calibrate : 30-Sep-2022

Item	Instrument Calibrated			Reference Aconstic dB	Before Adjust				After Adjust \pm dB	Deviation \pm dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
63	ACO	6226	160212	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.1	114.1	114.1	114.1			
64	ACO	6226	160213	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	113.9	113.9	113.9	113.9			
66	ACO	6226	160215	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
67	ACO	6226	160216	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
68	ACO	6236	222036	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
69	ACO	6236	222037	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
70	ACO	6236	222038	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
71	ACO	6236	222039	94.0	93.8	93.8	93.8	93.8	94.0	0.2	PASS
				114.0	113.9	113.9	113.9	113.9			
72	ACO	6236	222040	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	113.9	113.9	113.9	113.9			

Calibration By : 

Approve by : 

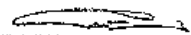


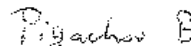
Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type	: Sound Level Meter	Calibration Date	: 25-Sep-2022
Calibrator	: TENMARS Sound Calibrator TM-100	Barometric pressure (mmHg)	: 759.0 mmHg
Standard	: IEC 60942	Temperature (23±3)°C	: 25 °C
Accuracy	: 94.0 ±0.3 dB and 114.0 ±0.5 dB	Relative Humidity(50±15 %)	: 45.0 % RH
Frequency	: at 1,000 Hz ±1%	Dued Date of Calibrate	: 31-Oct-2022
Calibrator Serial NO.	: I81203570		

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
51	ACO	6236	152077	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	113.9	113.9	113.9	113.9			
52	ACO	6226	150142	94.0	93.7	93.7	93.7	93.7	94.0	0.3	PASS
				114.0	113.9	113.9	113.9	113.9			
53	ACO	6226	160095	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
54	ACO	6226	160096	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
55	ACO	6226	160097	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
56	ACO	6226	160098	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.1	114.1	114.1	114.1			
57	ACO	6226	160099	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	113.9	113.9	113.9	113.9			
58	ACO	6226	160143	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
59	ACO	6226	160203	94.0	94.3	94.3	94.3	94.3	94.0	0.3	PASS
				114.0	114.0	114.0	114.0	114.0			
60	ACO	6226	160204	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.0	114.0	114.0	114.0			

Calibration By : 

Approve by : 



Certificate of Calibration

Certificate Number : SPR22030025-1

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 170400163

ID. Number : No.20

Environmental Conditions

Ambient Temperature : $23\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$

Received Date : 02 Mar 2022

Relative Humidity : $50\text{ } \% \pm 15\text{ } \%$

Calibration Date : 04 Mar 2022

Location of Calibration : In-Lab

Recommend Due Date : 04 Mar 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 05 Mar 2022

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul

Approved by :

Calibration Officer

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22030025-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due Date
Sound Level Calibrator	SC-942	B014059	EEL.BP. 34/1264	22 Dec 2022

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPB22030025-1

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR22030025-2

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 170400165

ID. Number : No.21

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 02 Mar 2022

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 04 Mar 2022

Location of Calibration : In-Lab

Recommend Due Date : 04 Mar 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 05 Mar 2022

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul

Approved by :

Calibration Officer

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22030025-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	B014059	EEL.BP. 34/1264	22 Dec 2022

Traceability

This certification is traceable to the International System of Unit maintained at :

ISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR22030025-2

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR22010075-1

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 170400177

ID, Number : No.22

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Received Date : 07 Jan 2022

Relative Humidity : $50\% \pm 15\%$ Calibration Date : 08 Jan 2022

Location of Calibration : In-Lab Recommend Due Date : 08 Jan 2023

Calibration Procedure : SP-CPE-04-01 Date of Issue : 09 Jan 2022

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul

Approved by :

Calibration Officer

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22010075-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due Date
Sound Level Calibrator	SC-942	B014059	EELBP.19/1063	15 Oct 2022

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SP522010075-1

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR22010075-2

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 170800191

ID. Number : No.23

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Received Date : 07 Jan 2022

Relative Humidity : $50\% \pm 15\%$ Calibration Date : 08 Jan 2022

Location of Calibration : In-Lab Recommend Due Date : 08 Jan 2023

Calibration Procedure : SP-CPE-04-01 Date of Issue : 09 Jan 2022

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul

Approved by :

Calibration Officer

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22010075-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	9014059	EEL.BP.19/1063	15 Oct 2022

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research



Figure 1. The effect of the number of trials on the number of correct responses. The number of correct responses was plotted against the number of trials for each condition. The number of correct responses increased with the number of trials for all conditions. The number of correct responses was highest for the condition with the highest number of trials (10 trials) and lowest for the condition with the lowest number of trials (2 trials).



Factory Calibration Certificate

Instrument Information

Name	WET BULB GLOBE TEMPERATURE (WBGT) METER
Series No	3522210140
Type	JT2011-E2A

Integrity check of instrument

Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison test with standard instrument	✓

Calibration Results

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET	30.0	30.2	-0.2	0.2
	35.0	34.8	0.2	0.2
	40.0	39.9	0.1	0.2
DRY	30.0	29.9	0.1	0.2
	35.0	35.1	-0.1	0.2
	40.0	40.2	-0.2	0.2
GLOBE	30.0	29.8	0.2	0.2
	35.0	34.9	0.1	0.2
	40.0	40.2	-0.2	0.2

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers, Manufacturer: BGRI, Model: STA, SN: 2-56,

Calibrated Date: 30 March 2021, Calibration Certificate No. : RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000073

Calibration Engineer: _____

Date: _____



Factory Calibration Certificate



Instrument information

Name **WET BULB GLOBE TEMPERATURE (WBGT) METER**
Series No **3522210141**
Type **JT2011-E2A**

Integrity check of instrument

Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison test with standard instrument	✓

Calibration Results

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET	30.0	30.2	-0.2	0.2
	35.0	35.1	-0.1	0.2
	40.0	39.9	0.1	0.2
DRY	30.0	30.2	-0.2	0.2
	35.0	34.8	0.2	0.2
	40.0	39.8	0.2	0.2
GLOBE	30.0	30.1	-0.1	0.2
	35.0	35.2	-0.2	0.2
	40.0	39.9	0.1	0.2

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers, Manufacturer: BGRI, Model: STA, SN: 2-56,
Calibrated Date: 30 March 2021, Calibration Certificate No.: RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000073

Calibration Engineer: _____

Date: _____



Factory Calibration Certificate



Instrument Information

Name **WET BULB GLOBE TEMPERATURE (WBGT) METER**
 Series No **3522210144**
 Type **JT2011-E2A**

Integrity check of instrument

Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison test with standard instrument	✓

Calibration Results

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET	30.0	29.8	0.2	0.2
	35.0	35.1	-0.1	0.2
	40.0	40.2	-0.2	0.2
DRY	30.0	29.9	0.1	0.2
	35.0	35.1	-0.1	0.2
	40.0	39.8	0.2	0.2
GLOBE	30.0	29.9	0.1	0.2
	35.0	34.9	0.1	0.2
	40.0	40.1	-0.1	0.2

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers , Manufacturer: BGRI, Model: STA, SN: 2-56,
 Calibrated Date: 30 March 2021, Calibration Certificate No. : RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000073

Calibration Engineer: _____

Date: _____





Factory Calibration Certificate

Instrument information

Name **WET BULB GLOBE TEMPERATURE (WBGT) METER**
Series No **3522210147**
Type **JT2011-E2A**

Integrity check of instrument

Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison test with standard instrument	✓

Calibration Results

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET	30.0	29.8	0.2	0.2
	35.0	34.8	0.2	0.2
	40.0	40.1	-0.1	0.2
DRY	30.0	30.2	-0.2	0.2
	35.0	35.1	-0.1	0.2
	40.0	39.8	0.2	0.2
GLOBE	30.0	30.1	-0.1	0.2
	35.0	35.2	-0.2	0.2
	40.0	40.2	-0.2	0.2

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers, Manufacturer: BGRI, Model: STA, SN: 2-56.

Calibrated Date: 30 March 2021, Calibration Certificate No. : RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000073

Calibration Engineer: _____

Date: _____





JANTYTECH
建通科技

Factory Calibration Certificate

Instrument information

Name **WET BULB GLOBE TEMPERATURE (WBGT) METER**
Series No **3522210149**
Type **JT2011-E2A**

Integrity check of instrument

Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison test with standard instrument	✓

Calibration Results

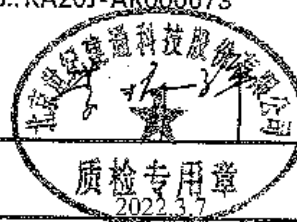
UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET	30.0	30.1	-0.1	0.2
	35.0	35.2	-0.2	0.2
	40.0	39.8	0.2	0.2
DRY	30.0	30.1	-0.1	0.2
	35.0	35.2	-0.2	0.2
	40.0	39.9	0.1	0.2
GLOBE	30.0	29.8	0.2	0.2
	35.0	35.2	-0.2	0.2
	40.0	40.1	-0.1	0.2

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers, Manufacturer: BGRI, Model: STA, SN: 2-56,
Calibrated Date: 30 March 2021, Calibration Certificate No. : RA21H-AB1000009
This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK0000073

Calibration Engineer: _____

Date: _____



JANTYTECH
建通科技

Factory Calibration Certificate

Instrument information

Name	WET BULB GLOBE TEMPERATURE (WBGT) METER
Series No	3522210149
Type	JT2011-E2A

Integrity check of instrument

Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison test with standard instrument	✓

Calibration Results

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET	30.0	30.1	-0.1	0.2
	35.0	35.2	-0.2	0.2
	40.0	39.8	0.2	0.2
DRY	30.0	30.1	-0.1	0.2
	35.0	35.2	-0.2	0.2
	40.0	39.9	0.1	0.2
GLOBE	30.0	29.8	0.2	0.2
	35.0	35.2	-0.2	0.2
	40.0	40.1	-0.1	0.2

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

Reference Standard : Standard Mercury Thermometers, Manufacturer: BGRI, Model: STA, SN: 2-56,
Calibrated Date: 30 March 2021, Calibration Certificate No. : RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK0000073

Calibration Engineer: _____

Date: _____



ภาคผนวก ฉ

หนังสือขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
เลขทะเบียน ว-236




ಗ್ರಾಹಕರ ಸಂಖ್ಯೆ ಹೆಚ್ಚಿದಂತೆ

เอกสารแนบท้ายหนังสือรับส่งสารขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด
เลขทะเบียน ๖-๒๓๖
ลงวันที่ ๑๕ ตุลาคม ๒๕๖๓

ขอรับข้อมูลรายชื่อห้องปฏิบัติการวิเคราะห์ที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔๐ รายการ
น้ำเสีย จำนวน 40 รายการ


ลำดับที่	สารเคมี	วิธีการตรวจ
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
2	Arsenic	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(a)
3	Barium	1) Digestion, Direct Nitrous Oxide-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
4	α-BHC	3) Digestion, Inductively Coupled Plasma Method ^(a)
5	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
6	Biochemical Oxygen Demand	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
7	Cadmium	5-Day BOD Test, Azide Modification Method ^(a) 1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
8	Chemical Oxygen Demand	3) Digestion, Inductively Coupled Plasma Method ^(a)
9	Chromium	Closed Reflux, Titrimetric Method ^(a) 1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
10	Chlordane	3) Digestion, Inductively Coupled Plasma Method ^(a)
11	Color	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
12	Copper	ADMI Weighted-Ordinate Spectrophotometric Method ^(a) 1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
13	Cyanide	3) Digestion, Inductively Coupled Plasma Method ^(a)
14	4,4'-DDE	Distillation, Colorimetric Method ^(a)
15	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
16	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)


(นางสาวณัฐพร อัครกุลวิไล)
ผู้อำนวยการฝ่ายปฏิบัติการวิเคราะห์เอกชนระดับ
และระดับห้องปฏิบัติการ

17 Endrin...

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ลำดับที่	สารเคมี	วิธีการตรวจ
17	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
18	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
19	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
20	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
21	Formaldehyde	Distillation, Colorimetric Method ^(a)
22	Free Chlorine	DPD Ferrous Titrimetric Method ^(a)
23	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
24	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
25	Hexavalent Chromium	Filtration, Colorimetric Method ^(a)
26	Lead	1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
27	Manganese	3) Digestion, Inductively Coupled Plasma Method ^(a) 1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
28	Mercury	3) Digestion, Inductively Coupled Plasma Method ^(a) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(a)
29	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
30	Oil & Grease	3) Digestion, Inductively Coupled Plasma Method ^(a) 1) Liquid-Liquid, Partition-Gravimetric Method ^(a) 2) Soxhlet Extraction Method ^(a)
31	pH	Electrometric Method ^(a)
32	Phenols	Distillation, Direct Photometric Method ^(a)
33	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(a)
34	Sulfide	1) ZnS Precipitation, Iodometric Method ^(a) 2) ZnS Precipitation, Methylene Blue Method ^(a)
35	Temperature	Laboratory and Field Methods ^(a)
36	Total Dissolved Solids	Dried at 180 °C ^(a)
37	Total Kjeldahl Nitrogen	Macro-Kjeldahl Method ^(a)


(นางสาวณัฐพร อัครกุลวิไล)
ผู้อำนวยการฝ่ายปฏิบัติการวิเคราะห์เอกชนระดับ
และระดับห้องปฏิบัติการ

38 Total Suspended

ลำดับที่	สารเคมี	วิธีการวิเคราะห์
38	Total Suspended Solids	Dried at 103-105 °C ^(a)
39	Trivalent Chromium	Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation ^(a)
40	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a) 3) Digestion, Inductively Coupled Plasma Method ^(a)

น้ำใต้ดิน อำเภอ 77 ขัยภณ

ลำดับที่	สารเคมี	วิธีการวิเคราะห์
1	Acetone	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
2	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
3	Antimony	1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
4	Arsenic	3) Digestion, Inductively Coupled Plasma Method ^(a) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(a)
5	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
6	Barium	1) Digestion, Direct Nitrous Oxide-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
7	Benzene	3) Digestion, Inductively Coupled Plasma Method ^(a) Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
8	Beryllium	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a) 2) Digestion, Inductively Coupled Plasma Method ^(a) Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
9	Bromodichloromethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
10	Bromoform	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)

Signature

(นางธิษฐาน นิตยกุลศิริ)

ผู้อำนวยการศูนย์วิเคราะห์ทางพิษวิทยา
กรมอนามัย กรุงเทพมหานคร

11 Butanol

ลำดับที่	สารเคมี	วิธีการวิเคราะห์
11	Butanol	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
12	Cadmium	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a) 2) Digestion, Inductively Coupled Plasma Method ^(a) Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
13	Carbon Disulfide	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
14	Carbon tetrachloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
15	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
16	Chlorobenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
17	Chlorobromomethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
18	Chloroform	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
19	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
20	Chromium (VI)	3) Digestion, Inductively Coupled Plasma Method ^(a) 1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method; Filtration, Colorimetric Method; Calculation ^(a)
21	Chromium (VI)	3) Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation ^(a)
22	Cyanide	Filtration, Colorimetric Method ^(a) Distillation and Colorimetric Method ^(a)
23	DDO	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
24	DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
25	DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
26	1,2-Dichlorobenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)

Signature

(นางธิษฐาน นิตยกุลศิริ)

ผู้อำนวยการศูนย์วิเคราะห์ทางพิษวิทยา
กรมอนามัย กรุงเทพมหานคร

2/ 1,3-Dichlorobenzene

ลำดับที่	สารเคมี	วิธีวิเคราะห์
27	1,3-Dichlorobenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
28	1,4-Dichlorobenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
29	1,1-Dichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
30	1,2-Dichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
31	1,1-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
32	cis-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
33	trans-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
34	1,2-Dichloropropane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
35	1,3-Dichloropropane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
36	1,3-Dichloropropene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
37	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
38	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
39	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
40	Ethylbenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
41	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
42	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
43	Hexachloro-1,3-butadiene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
44	α-HCH	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
45	β-HCH	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
46	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
47	n-Hexane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)

วิมล
(นางสิริวิมล อัครกุลวิไล)
ผู้อำนวยการศูนย์ปฏิบัติการวิเคราะห์และทดสอบ
และควบคุมสิ่งแวดล้อม


48 Lead...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
48	Lead	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a) 2) Digestion, Inductively Coupled Plasma Method ^(a)
49	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
50	Mercury	3) Digestion, Inductively Coupled Plasma Method ^(a) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(a)
51	Methanol	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
52	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
53	Methylene chloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
54	Naphthalene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)
55	Nickel	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a) 2) Digestion, Inductively Coupled Plasma Method ^(a)
56	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
57	pH	Electrometric Method ^(a)
58	Phenol	Distillation, Direct Photometric Method ^(a)
59	Polychlorinated Biphenyls PCB 1016 PCB 1260 Selenium	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
60		Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(a)
61	Silver	1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
62	Styrene	3) Digestion, Inductively Coupled Plasma Method ^(a) Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^(a)

วิมล
(นางสิริวิมล อัครกุลวิไล)
ผู้อำนวยการศูนย์ปฏิบัติการวิเคราะห์และทดสอบ
และควบคุมสิ่งแวดล้อม

63 1,1,2,2-Tetrachloroethane


ลำดับที่	สารเคมี	วิธีวิเคราะห์
63	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
64	Tetrachloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
65	Toluene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
66	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
67	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
68	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
69	Trichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
70	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
71	Vanadium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁶⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁶⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
72	Vinyl chloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
73	m-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
74	o-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
75	p-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
76	Xylene (Total)	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
77	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁶⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾


 (นางจิตทิพย์ นิตยกุลศิริโต)
 ผู้อำนวยการศูนย์ปฏิบัติการตรวจสอบและประเมินสิ่งแวดล้อม

ฉบับแก้ไข

จากชุดเสีย (ปล่องระบาย) จำนวน 18 รายการ


ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Antimony	1) Isokinetic Digestion, Atomic Absorption Spectrometric Method ⁽⁵⁾ 2) Isokinetic Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁵⁾ 3) Isokinetic Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
2	Arsenic	Isokinetic Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁵⁾ 1) Bag Sampling, Non-Dispersive Infrared Method ⁽⁵⁾ 2) Instrument Analyzer Method ⁽⁵⁾
3	Carbon Monoxide	Absorption, Ion Chromatographic Method ⁽⁵⁾
4	Chlorine	1) Isokinetic Digestion, Atomic Absorption Spectrometric Method ⁽⁵⁾
5	Copper	2) Isokinetic Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁵⁾ 3) Isokinetic Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
6	Cresol	Adsorption, Gas Chromatographic Method ⁽⁵⁾
7	Dioxins/Furans	Isokinetic Sampling Analysis by ISO/IEC 17025 Accredited Laboratory or Analysis by Department of Industrial Works Registered Laboratory ⁽³⁾ (Dioxins/Furans Analysis Approved)
8	Hydrogen Chloride	Absorption, Ion Chromatographic Method ⁽⁵⁾
9	Hydrogen Fluoride	Absorption, Ion Chromatographic Method ⁽⁵⁾
10	Hydrogen Sulfide	Absorption, Titrimetric Method ⁽⁵⁾
11	Lead	1) Isokinetic Digestion, Atomic Absorption Spectrometric Method ⁽⁵⁾ 2) Isokinetic Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁵⁾ 3) Isokinetic Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
12	Mercury	Isokinetic Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁵⁾


 (นางจิตทิพย์ นิตยกุลศิริโต)
 ผู้อำนวยการศูนย์ปฏิบัติการตรวจสอบและประเมินสิ่งแวดล้อม

ลำดับที่	สารเคมี	วิธีวิเคราะห์
13	Opacity	Ringelmann's Method ⁽²⁾
14	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ⁽³⁾ 2) Instrument Analyzer Method ⁽³⁾
15	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorium Titrimetric Method ⁽³⁾ 2) Instrument Analyzer Method ⁽³⁾
16	Sulfuric Acid	Absorption, Barium-Thorium Titrimetric Method ⁽³⁾
17	Total Suspended Particulate	Isokinetic, Gravimetric Method ⁽³⁾
18	Xylene	Absorption, Gas Chromatographic Method ⁽³⁾


สิ่งปฏิกูลหรือวัสดุที่ไม่ได้สิ่ง จานวน 30 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾⁽²⁰⁾ 2) Solid-Phase Extraction, Gas Chromatographic Method ⁽⁹⁾⁽²⁰⁾ 3) Soxhlet Extraction, Gas Chromatographic Method ⁽²⁰⁾⁽²⁰⁾
2	Antimony	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ⁽¹⁾⁽⁶⁾⁽¹⁴⁾ 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ⁽¹⁾⁽⁶⁾⁽¹⁵⁾ 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽¹⁾⁽⁶⁾⁽¹⁵⁾ 4) Digestion, Flame Atomic Absorption Spectrometric Method ⁽⁶⁾⁽¹⁴⁾ 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ⁽⁶⁾⁽¹⁵⁾ 6) Digestion, Inductively Coupled Plasma Method ⁽⁶⁾⁽¹⁵⁾
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽¹⁾⁽⁶⁾⁽¹⁶⁾ 2) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁶⁾⁽¹⁶⁾


 (นางสาวกัญจน์ นักร้องกุลกิจโต)
 ผู้ควบคุมคุณภาพการตรวจวัดมลพิษทางอากาศ
 แผนกปฏิบัติการวัดมลพิษทางอากาศ

4 Barium...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
4	Barium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ⁽¹⁾⁽⁶⁾⁽¹⁴⁾ 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ⁽¹⁾⁽⁶⁾⁽¹⁵⁾ 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽¹⁾⁽⁶⁾⁽¹⁵⁾ 4) Digestion, Flame Atomic Absorption Spectrometric Method ⁽⁶⁾⁽¹⁶⁾ 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ⁽⁶⁾⁽¹⁵⁾ 6) Digestion, Inductively Coupled Plasma Method ⁽⁶⁾⁽¹⁵⁾
5	Beryllium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ⁽¹⁾⁽⁶⁾⁽¹⁴⁾ 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ⁽¹⁾⁽⁶⁾⁽¹⁵⁾ 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽¹⁾⁽⁶⁾⁽¹⁵⁾ 4) Digestion, Flame Atomic Absorption Spectrometric Method ⁽⁶⁾⁽¹⁴⁾ 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ⁽⁶⁾⁽¹⁵⁾ 6) Digestion, Inductively Coupled Plasma Method ⁽⁶⁾⁽¹⁵⁾
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ⁽¹⁾⁽⁶⁾⁽¹⁴⁾ 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ⁽¹⁾⁽⁶⁾⁽¹⁵⁾ 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽¹⁾⁽⁶⁾⁽¹⁵⁾ 4) Digestion, Flame Atomic Absorption Spectrometric Method ⁽⁶⁾⁽¹⁶⁾ 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ⁽⁶⁾⁽¹⁵⁾ 6) Digestion, Inductively Coupled Plasma Method ⁽⁶⁾⁽¹⁵⁾


 (นางสาวกัญจน์ นักร้องกุลกิจโต)
 ผู้ควบคุมคุณภาพการตรวจวัดมลพิษทางอากาศ
 แผนกปฏิบัติการวัดมลพิษทางอากาศ

7 Chlordane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
7	Chordane	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 2) Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 3) Soxhlet Extraction, Gas Chromatographic Method ^(4.9.20)
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(4.6.14) 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(4.6.14) 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(4.6.13) 4) Digestion, Flame Atomic Absorption Spectrometric Method ^(4.6.10) 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(4.6.13) 6) Digestion, Inductively Coupled Plasma Method ^(4.6.13)
9	Cobalt	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(4.6.14) 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(4.6.13) 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(4.6.13) 4) Digestion, Flame Atomic Absorption Spectrometric Method ^(4.6.10) 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(4.6.13) 6) Digestion, Inductively Coupled Plasma Method ^(4.6.13)
10	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(4.6.12) 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(4.6.13) 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(4.6.13) 4) Digestion, Flame Atomic Absorption Spectrometric Method ^(4.6.14)



(นางวิภาดา วัฒนศิริกุล)

5) Digestion...

ผู้แทนจากหน่วยงานราชการที่กรมควบคุมมลพิษ
และขอรับรองการปฏิบัติตาม

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	DOD	5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(4.6.14) 6) Digestion, Inductively Coupled Plasma Method ^(4.6.13) 1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 2) Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 3) Soxhlet Extraction, Gas Chromatographic Method ^(4.9.20)
12	DDE	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 2) Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 3) Soxhlet Extraction, Gas Chromatographic Method ^(4.9.20)
13	DDT	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 2) Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 3) Soxhlet Extraction, Gas Chromatographic Method ^(4.9.20)
14	Dieldrin	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 2) Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 3) Soxhlet Extraction, Gas Chromatographic Method ^(4.9.20)
15	Endrin	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 2) Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 3) Soxhlet Extraction, Gas Chromatographic Method ^(4.9.20)
16	Heptachlor	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 2) Solid-Phase Extraction, Gas Chromatographic Method ^(4.9.20) 3) Soxhlet Extraction, Gas Chromatographic Method ^(4.9.20)
17	Hexavalent Chromium	1) Waste Extraction, Colorimetric Method ^(4.7.17) 2) Alkaline Digestion, Colorimetric Method ^(4.17) 3) Soxhlet Extraction, Gas Chromatographic Method ^(4.9.20)



(นางวิภาดา วัฒนศิริกุล)

18 Lead...

ผู้แทนจากหน่วยงานราชการที่กรมควบคุมมลพิษ
และขอรับรองการปฏิบัติตาม

ลำดับที่	สารเคมี	วิธีวิเคราะห์
18	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(6.14) 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(16.13) 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(16.13) 4) Digestion, Flame Atomic Absorption Spectrometric Method ^(6.14) 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6.14) 6) Digestion, Inductively Coupled Plasma Method ^(6.13) 1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(19.20) 2) Solid-Phase Extraction, Gas Chromatographic Method ^(9.20) 3) Soxhlet Extraction, Gas Chromatographic Method ^(10.20)
19	Lindane	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(16.18) 2) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(6.18) 1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(19.20) 2) Solid-Phase Extraction, Gas Chromatographic Method ^(9.20) 3) Soxhlet Extraction, Gas Chromatographic Method ^(10.20)
20	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(16.18) 2) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(6.18) 1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(19.20) 2) Solid-Phase Extraction, Gas Chromatographic Method ^(9.20) 3) Soxhlet Extraction, Gas Chromatographic Method ^(10.20)
21	Methoxychlor	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(6.14) 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(16.13) 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(16.13)
22	Molybdenum	4) Digestion, Flame Atomic Absorption Spectrometric Method ^(6.14)

(นาย) พญานันท์ พันธ์สุภาวดี

ผู้อำนวยการศูนย์มาตรฐานปฏิบัติการวิเคราะห์ทดสอบและ
ควบคุมคุณภาพห้องปฏิบัติการ

5) Digestion ...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
23	Nickel	5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6.13) 6) Digestion, Inductively Coupled Plasma Method ^(16.13) 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(6.14) 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(16.13) 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(16.13) 4) Digestion, Flame Atomic Absorption Spectrometric Method ^(6.14) 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6.13) 6) Digestion, Inductively Coupled Plasma Method ^(16.13) 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(18.21) 2) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(19.21) 3) Soxhlet Extraction, Gas Chromatographic Method ^(10.21)
24	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1260 - 2,2',3,4,4',5,5'- Heptachlorobiphenyl - 2,2',3,4,4',5' Hexachlorobiphenyl - 2,2',4,4',5,5'- Hexachlorobiphenyl - 2,2',4',5,5'- Pentachlorobiphenyl - 2,2',5,5'- Tetrachlorobiphenyl - 2,4,4'-Trichlorobiphenyl	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(16.19) 2) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(6.19) 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(6.14)
25	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(16.19) 2) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(6.19) 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(6.14)
26	Silver	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(6.14)

(นาย) พญานันท์ พันธ์สุภาวดี

ผู้อำนวยการศูนย์มาตรฐานปฏิบัติการวิเคราะห์ทดสอบและ
ควบคุมคุณภาพห้องปฏิบัติการ

2) Waste ...

ลำดับที่	สารเคมี	วิธีการวิเคราะห์
27	Thallium	2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(4.19)
		3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(4.13)
		4) Digestion, Flame Atomic Absorption Spectrometric Method ^(6.10)
		5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6.13)
		6) Digestion, Inductively Coupled Plasma Method ^(6.13)
		1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(6.10)
28	Toxaphene	2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(4.19)
		3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(4.13)
		4) Digestion, Flame Atomic Absorption Spectrometric Method ^(6.10)
29	Vanadium	5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6.13)
		6) Digestion, Inductively Coupled Plasma Method ^(6.13)
		1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^(10.20)
		2) Solid-Phase Extraction, Gas Chromatographic Method ^(8.20)
		3) Soxhlet Extraction, Gas Chromatographic Method ^(10.20)
		1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(6.10)
		2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(4.19)
		3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(4.13)
		4) Digestion, Flame Atomic Absorption Spectrometric Method ^(6.10)
		5) Digestion ...



นางกริยาพร วัตรธนะกุลชัย

ผู้อำนวยการศูนย์วิจัยการควบคุมคุณภาพ
และมาตรฐานผลิตภัณฑ์

5) Digestion ...

ลำดับที่	สารเคมี	วิธีการวิเคราะห์
30	Zinc	5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6.10)
		6) Digestion, Inductively Coupled Plasma Method ^(4.13)
		1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(6.10)
		2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(4.19)
		3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(4.13)
		4) Digestion, Flame Atomic Absorption Spectrometric Method ^(6.10)
		5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6.13)
		6) Digestion, Inductively Coupled Plasma Method ^(4.13)

ข้อมูลจำแนก 75 ชนิด/13

ลำดับที่	สารเคมี	วิธีการวิเคราะห์
1	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12.23)
2	Aldrin	Soxhlet Extraction, Gas Chromatographic Method ^(10.20)
3	Antimony	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(6.10)
4	Arsenic	2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6.13)
		3) Digestion, Inductively Coupled Plasma Method ^(4.13)
5	Atrazine	Digestion, hydride Generation/Atomic Absorption Spectrometric Method ^(6.10)
		Soxhlet Extraction, Gas Chromatographic Method ^(10.20)
6	Barium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(6.10)
		2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6.13)
		3) Digestion, Inductively Coupled Plasma Method ^(4.13)



นางกริยาพร วัตรธนะกุลชัย

ผู้อำนวยการศูนย์วิจัยการควบคุม
และมาตรฐานผลิตภัณฑ์

7 Benzene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
7	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
8	Beryllium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(6,13) 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6,13) 3) Digestion, Inductively Coupled Plasma Method ^(6,13)
9	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
10	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
11	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
12	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(6,14) 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6,13) 3) Digestion, Inductively Coupled Plasma Method ^(6,13)
13	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
14	Carbon Tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
15	Chlordane	Soxhlet Extraction, Gas Chromatographic Method ^(16,21)
16	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
17	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
18	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
19	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(6,14) 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6,13) 3) Digestion, Inductively Coupled Plasma Method ^(6,13)

นายวิชาญ ด้วงสุวิไล
ผู้อำนวยการศูนย์วิจัยการวิเคราะห์ทางเคมี
และพิษวิทยาสิ่งแวดล้อม

20 Chromium (II)...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
20	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(6,7,10,13) 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(6,7,15,17) 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(6,7,13,17) Alkaline Digestion, Colorimetric Method ^(7,17) 1) Extraction, Distillation, Titrimetric Method ^(19,25,26) 2) Extraction, Distillation, Colorimetric Method ^(19,25,26) Soxhlet Extraction, Gas Chromatographic Method ^(10,28) Soxhlet Extraction, Gas Chromatographic Method ^(10,28) Soxhlet Extraction, Gas Chromatographic Method ^(10,28) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
21	Chromium (VI)	
22	Cyanide	
23	DDD	
24	DDE	
25	DDT	
26	1,2-Dichlorobenzene	
27	1,3-Dichlorobenzene	
28	1,4-Dichlorobenzene	
29	1,1-Dichloroethane	
30	1,2-Dichloroethane	
31	1,1-Dichloroethylene	
32	cis-1,2-Dichloroethylene	
33	trans-1,2-Dichloroethylene	
34	1,2-Dichloropropane	
35	1,3-Dichloropropane	

นายวิชาญ ด้วงสุวิไล
ผู้อำนวยการศูนย์วิจัยการวิเคราะห์ทางเคมี
และพิษวิทยาสิ่งแวดล้อม

36 1,3-Dichloropropene ...

ลำดับที่	สารเคมี	วิธีการตรวจ
36	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(1,2,3)
37	Dieldrin	Soxhlet Extraction, Gas Chromatographic Method ^(10,20)
38	Endosulfan	Soxhlet Extraction, Gas Chromatographic Method ^(10,20)
39	Endrin	Soxhlet Extraction, Gas Chromatographic Method ^(10,23)
40	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
45	α -HCH	Soxhlet Extraction, Gas Chromatographic Method ^(10,20)
46	β -HCH	Soxhlet Extraction, Gas Chromatographic Method ^(10,20)
47	γ -HCH	Soxhlet Extraction, Gas Chromatographic Method ^(10,20)
41	Heptachlor	Soxhlet Extraction, Gas Chromatographic Method ^(10,20)
42	Heptachlor epoxide	Soxhlet Extraction, Gas Chromatographic Method ^(10,20)
43	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
44	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
48	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(6,11) 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6,13) 3) Digestion, Inductively Coupled Plasma Method ^(6,13)
49	Manganese	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(6,14) 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6,13) 3) Digestion, Inductively Coupled Plasma Method ^(6,13)
50	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁹⁾
51	Methanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
52	Methoxychlor	Soxhlet Extraction, Gas Chromatographic Method ^(10,20)
53	Methylene chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
54	Naphthalene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)

(นางวิภาดา วัฒนศิริกุล)

55 Nickel...

ผู้ควบคุมการตรวจวิเคราะห์ในห้องปฏิบัติการ
เกษตรและปศุสัตว์จังหวัดนนทบุรี

ลำดับที่	สารเคมี	วิธีการตรวจ
55	Nickel	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(6,14) 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6,13) 3) Digestion, Inductively Coupled Plasma Method ^(6,13) Soxhlet Extraction, Gas Chromatographic Method ^(10,23)
56	Polychlorinated Biphenyls -Aroclor 1016 -Aroclor 1260 -2,2',5,5'- Tetrachlorobiphenyl -2,2',4,5,5'- Pentachlorobiphenyl -2,2',3,4,4',5'- Hexachlorobiphenyl -2,2',4,4',5,5'- Hexachlorobiphenyl -2,2',3,4,4',5,5'- Heptachlorobiphenyl Pentachlorophenol Selenium	Soxhlet Extraction, Gas Chromatographic Method ^(10,20) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(6,19) 1) Digestion, Flame Atomic Absorption Spectrometric Method ^(6,14) 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^(6,13) 3) Digestion, Inductively Coupled Plasma Method ^(6,13) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(12,23)
57	Polychlorinated Biphenyls	Soxhlet Extraction, Gas Chromatographic Method ^(10,20)
58	Polychlorinated Biphenyls	Soxhlet Extraction, Gas Chromatographic Method ^(10,20)
59	Polychlorinated Biphenyls	Soxhlet Extraction, Gas Chromatographic Method ^(10,20)
60	Styrene	1,1,2,2-Tetrachloroethane
61	1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane
62	Tetrachloroethylene	Tetrachloroethylene
63	Toluene	Toluene

(นางวิภาดา วัฒนศิริกุล)


64 1,2,4-Trichlorobenzene...

ผู้ควบคุมการตรวจวิเคราะห์ในห้องปฏิบัติการ
เกษตรและปศุสัตว์จังหวัดนนทบุรี

ลำดับที่	สารเคมี	วิธีการหา
64	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽³⁾
65	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽³⁾
66	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽³⁾
67	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽³⁾
68	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽³⁾
69	Vanadium	1) Digestion, Flame Atomic Absorption Spectrometric Method ⁽⁶⁾⁽⁴⁾ 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ⁽⁶⁾⁽⁵⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁶⁾⁽³⁾
70	Vinyl chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽³⁾
71	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽³⁾
72	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽³⁾
73	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽³⁾
74	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽³⁾
75	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method ⁽⁶⁾⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁶⁾⁽³⁾


เอกสารอ้างอิง

- กระทรวงอุตสาหกรรม, ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2548, เรื่อง การกำจัดสิ่งปฏิกูลหรือวัสดุที่ไม่ได้ใช้แล้ว, ราชกิจจานุเบกษา, 25 มกราคม 2549, เล่มที่ 123 ตอนที่ 114.
- กระทรวงอุตสาหกรรม, ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549, เรื่อง กำหนดค่าปริมาณเกณฑ์ครั้นที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำโรงสีข้าวที่เพิ่มระดับเป็นร้อยละ, ราชกิจจานุเบกษา, 4 ธันวาคม 2549, เล่มที่ 123 ตอนที่ 125.


 (นางสาวกัญจน์ อัครสกุลวิไล)
 ผู้อำนวยการกองบริหารการสิ่งแวดล้อม
 และนายอภัยสิทธิ์ อึ้งอัมพร

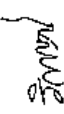
3. สมาคม...

- สมาคมวิชาการสิ่งแวดล้อมแห่งประเทศไทย, คู่มือวิเคราะห์น้ำเสีย, พิมพ์ครั้งที่ 4, กรุงเทพฯ: เรือนแก้วการพิมพ์, 2547.
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 (นางสาวกัญจน์ อัครสกุลวิไล)
 ผู้อำนวยการกองบริหารการสิ่งแวดล้อม

21. United...

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(นางกนกพร ชัยประสิทธิ์)
ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทางห้องปฏิบัติการ
และทะเบียนผลิตภัณฑ์สาร



ที่ อก ๐๓๐๐(๑)/ ๑๗ ๒ ๕

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ เขตราชเทวี
กรุงเทพมหานคร ๑๐๕๐๐

๑๐ กุมภาพันธ์ ๒๕๖๕

เรื่อง เปลี่ยนแปลงบุคลากรและสามเหลี่ยมสีตรา
เรียน การประชุมผู้บริหาร บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด
ทั้งนี้ คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์ของ
วันที่ ๒๖ ตุลาคม ๒๕๖๓

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสามเหลี่ยมสีตรา
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด จำนวน ๕ แผ่น

ตามหนังสือที่ยังมี บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด ห้องปฏิบัติการวิเคราะห์ของ
เลขทะเบียน ๖-๒๓๖ สถานที่ตั้งเลขที่ ๑/๖ ซอยรามคำแหง ๑๕๕ แขวงสะพานสูง เขตสะพานสูง กรุงเทพมหานคร
ของเปลี่ยนแปลงบุคลากรและสามเหลี่ยมสีตราที่วิเคราะห์ ความละเอียดแจ้งแล้ว

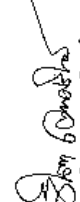
กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ออกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑ ราย
นางสาวสุนารี ชื่นอินทร์ ทะเบียนเลขที่ ๖-๓๓๖-๑ ๗๒๐๓
๒. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑ ราย
นางสาววิจิตพรพรหม ศรีสุวรรณ ทะเบียนเลขที่ ๖-๒๓๖-๑-๔๒๐๓
๓. ให้เพิ่มขอบข่ายสารเคมีที่วิเคราะห์เพิ่มให้ได้ ๓ รายการ ๔๗ รายการ สิ่งปลูกสร้างหรือ
วัสดุที่ไม่ใช่แล้ว จำนวน ๔ รายการ และดิน จำนวน ๘ รายการ รวมทั้งสิ้นจำนวน ๑๐๑ รายการ
ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะหมดอายุภายในหนึ่งร้อยต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
เอกสาร ที่ อก ๐๓๐๐(๑)/๑๗๖๑๑ ลงวันที่ ๑๕ ตุลาคม ๒๕๖๓ คือในวันที่ ๑๓ มีนาคม ๒๕๖๖

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ


/ สิงห์สุดา ทากระสินทร์
ผู้อำนวยการศูนย์และทะเบียนผลิตภัณฑ์สาร
ศูนย์มาตรฐานผลิตภัณฑ์สารกรมโรงงาน

กองวิจัยและพัฒนายานยนต์กรมโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบผลิตภัณฑ์และทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๕๑๕๖ ๐ ๒๒๐๒ ๕๐๐๖

โทรสาร ๐ ๒๒๕๕ ๓๕๕๕

เอกสารแนบท้ายหนังสือเวียนเปลี่ยนแปลงแบบฟอร์มและรายการสารพิษที่วิเคราะห์
บริษัท ปตท. จำกัด (มหาชน) เลขที่ ๑๐๐๐/๑๐/๑๕๖๖
ที่ ๑๐๐๐๐/๑๐/๑๕๖๖ ลงวันที่ ๑๐ กุมภาพันธ์ ๒๕๖๕

ขอบข่ายสารพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๐๕ รายการ

หน้าถัดไป จำนวน 47 รายการ

ลำดับที่	สารเคมีพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
2	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
3	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
4	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
5	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
6	Benzoic Acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
7	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
8	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
9	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
10	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
11	Butyl Benzyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
12	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
13	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
14	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
15	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
16	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾

วิมล
(นางสาววิมล อัครพรวิไล)
ผู้อำนวยการฝ่ายปฏิบัติการตรวจสอบคุณภาพ
และประเมินความเสี่ยงสุขภาพ

17 Di-n-Butyl...

-๒-

ลำดับที่	สารเคมีพิษ	วิธีวิเคราะห์
17	Di-n-Butyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
18	Diethyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
19	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic ⁽²⁾
20	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic ⁽²⁾
21	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic ⁽²⁾
22	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic ⁽²⁾
23	Di-n-Octyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
24	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
25	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
26	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
27	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
28	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
29	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
30	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
31	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
32	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
33	Methyl Tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
34	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
35	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾

วิมล
(นางสาววิมล อัครพรวิไล)
ผู้อำนวยการฝ่ายปฏิบัติการตรวจสอบคุณภาพ
และประเมินความเสี่ยงสุขภาพ

36 N-Nitrosodi...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
36	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
37	Polychlorinated Biphenyls - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254	Liquid-Liquid Extraction, Gas Chromatographic ⁽²⁾
38	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
39	Phenol	Liquid-Liquid Extraction, Gas Chromatographic ⁽²⁾
40	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
41	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic ⁽²⁾
42	TPH (C ₉ -C ₉)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾
43	TPH (C ₉ -C ₁₀)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic ⁽²⁾
44	TPH (C ₁₁ -C ₁₃)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic ⁽²⁾
45	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic ⁽²⁾
46	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic ⁽²⁾
47	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽²⁾

สิ่งปฏิกูลหรือวัสดุที่ไม่ได้เสีย จำนวน 7 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾⁽⁶⁾⁽¹⁶⁾ 2) Soxhlet Extraction, Gas Chromatographic Method ⁽⁷⁾⁽¹⁶⁾

Signature

นางสาวกัญญาพร อัครสุภาสุริยา

ผู้อำนวยการศูนย์ปฏิบัติการและทดสอบมลพิษ
และสารเคมีอันตราย

2 Mirex...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
2	Mirex	1) Waste Extraction, Separatory Funnel/ Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾⁽⁶⁾⁽¹⁶⁾ 2) Soxhlet Extraction, Gas Chromatographic Method ⁽⁷⁾⁽¹⁶⁾
3	Polychlorinated Biphenyls (PCBs) - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1268	1) Waste Extraction, Separatory Funnel/ Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾⁽⁶⁾⁽¹⁶⁾ 2) Soxhlet Extraction, Gas Chromatographic Method ⁽⁷⁾⁽¹⁶⁾
4	Pentachlorophenol	1) Waste Extraction, Separatory Funnel/ Liquid-Liquid Extraction, Gas Chromatographic ⁽¹⁾⁽⁶⁾⁽¹⁶⁾ 2) Soxhlet Extraction, Gas Chromatographic Method ⁽⁷⁾⁽¹⁶⁾
5	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁵⁾⁽⁹⁾⁽¹⁶⁾ 2) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁵⁾⁽¹⁶⁾ Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁹⁾⁽¹⁶⁾
6	Vinyl Chloride	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ⁽¹⁾⁽³⁾⁽¹¹⁾⁽¹³⁾
7	Trivalent Chromium	2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ⁽¹⁾⁽³⁾⁽¹¹⁾⁽¹³⁾ 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ⁽³⁾⁽⁵⁾⁽¹⁰⁾⁽¹³⁾

Signature

(นางสาวกัญญาพร อัครสุภาสุริยา)

ผู้อำนวยการศูนย์ปฏิบัติการและทดสอบมลพิษ
และสารเคมีอันตราย

4) Digestion...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
		4) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^{๕.๙.๙.๑๕} 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^{๕.๙.๙.๑๖} 6) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^{๕.๙.๙.๑๗}

สินค้าจำนวน 47 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๘)
2	Anthracene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
3	Benz(a)anthracene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
4	Benz(b)fluoranthene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
5	Benz(k)fluoranthene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
6	Benzoic acid	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
7	Benzo(a)pyrene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
8	Benzo(g,h,i)perylene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
9	Bis(2-chloroethyl)ether	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
10	Bis(2-ethylhexyl)phthalate	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
11	Butyl Benzyl Phthalate	Mass spectrometric Method ^(๗.๑๙)

31/10/๖๓

(นางวิภาดาญ์ นีระสุภกิจ)

ผู้อำนวยการศูนย์วิจัยและพัฒนาการป้องกันและจัดการภัยพิบัติ

12 Carbazole...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
12	Carbazole	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
13	p-Chloroaniline	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
14	Chrysene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
15	2,4-D	Soxhlet Extraction, Gas Chromatographic Method ^(๗.๑๙)
16	Dibenz(a,h)anthracene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
17	Diethyl Phthalate	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
18	2,4-Dimethylphenol	Soxhlet Extraction, Gas Chromatographic Method ^(๗.๑๙)
19	2,4-Dinitrophenol	Soxhlet Extraction, Gas Chromatographic Method ^(๗.๑๙)
20	2,4-Dinitrotoluene	Soxhlet Extraction, Gas Chromatographic Method ^(๗.๑๙)
21	2,6-Dinitrotoluene	Soxhlet Extraction, Gas Chromatographic Method ^(๗.๑๙)
22	Di-n Butyl Phthalate	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
23	Di-n-Octyl Phthalate	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
24	Fluoranthene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
25	Fluorene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
26	Hexachlorocyclopentadiene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
27	Hexachloroethane	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
28	Indeno(1,2,3-cd)pyrene	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
29	Isophorone	Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
30	Methyl Bromide	Purge and Trap, Gas Chromatographic/Mass spectrometric Method ^(๗.๑๙)
31	2-Methylphenol	Soxhlet Extraction, Gas Chromatographic Method ^(๗.๑๙)

31/10/๖๓

(นางวิภาดาญ์ นีระสุภกิจ)

ผู้อำนวยการศูนย์วิจัยและพัฒนาการป้องกันและจัดการภัยพิบัติ

32 2-Methylnaphthalene...

ลำดับที่	สารเคมี	วิธีการวิเคราะห์
32	2-Methylnaphthalene	Soxhlet Extraction, Gas Chromatographic/ Mass spectrometric Method ⁽⁷⁾⁽⁹⁾
33	Methyl Tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass spectrometric Method ⁽⁷⁾⁽⁸⁾
34	Nitrobenzene	Soxhlet Extraction, Gas Chromatographic/ Mass spectrometric Method ⁽⁷⁾⁽⁹⁾
35	N-Nitrosodiphenylamine	Soxhlet Extraction, Gas Chromatographic/ Mass spectrometric Method ⁽⁷⁾⁽⁹⁾
36	N-Nitrosodi-n-propylamine	Soxhlet Extraction, Gas Chromatographic/ Mass spectrometric Method ⁽⁷⁾⁽⁹⁾
37	Phenanthrene	Soxhlet Extraction, Gas Chromatographic/ Mass spectrometric Method ⁽⁷⁾⁽⁹⁾
38	Phenol	Soxhlet Extraction, Gas Chromatographic Method ⁽⁷⁾⁽⁹⁾
39	Pyrene	Soxhlet Extraction, Gas Chromatographic/ Mass spectrometric Method ⁽⁷⁾⁽⁹⁾
40	Polychlorinated Biphenyls (PCBs) - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1268	Soxhlet Extraction, Gas Chromatographic Method ⁽⁷⁾⁽⁷⁾
41	Toxaphene	Soxhlet Extraction, Gas Chromatographic Method ⁽⁷⁾⁽⁸⁾
42	TPH (C ₉ -C ₉)	Purge and Trap, Gas Chromatographic/ Mass spectrometric Method ⁽⁹⁾⁽⁸⁾
43	TPH (C ₁₀ -C ₁₀)	Soxhlet Extraction, Gas Chromatographic Method ⁽⁷⁾⁽⁸⁾
44	TPH (C ₁₁ -C ₁₁)	Soxhlet Extraction, Gas Chromatographic Method ⁽⁷⁾⁽⁸⁾
45	2,4,5-Trichlorophenol	Soxhlet Extraction, Gas Chromatographic Method ⁽⁷⁾⁽⁹⁾
46	2,4,6-Trichlorophenol	Soxhlet Extraction, Gas Chromatographic Method ⁽⁷⁾⁽⁹⁾
47	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass spectrometric Method ⁽⁸⁾⁽⁸⁾

Signature

(นางสาวกัญญาณ์ นิลธรรมาภรณ์)

ผู้อำนวยการศูนย์ปฏิบัติการด้านความปลอดภัย
และมลพิษสิ่งแวดล้อม

เอกสารอ้างอิง...

เอกสารอ้างอิง

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Signature

(นางสาวกัญญาณ์ นิลธรรมาภรณ์)

ผู้อำนวยการศูนย์ปฏิบัติการด้านความปลอดภัย
และมลพิษสิ่งแวดล้อม

14. United...

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(นางกรกฎณ์ นงนุชกุล)

ผู้อำนวยการศูนย์ปฏิบัติการและห้องปฏิบัติการ
กรมโรงงานอุตสาหกรรม



ที่ อก ๐๓๑๐(๑)/ ๗ ๗ ๓ ๐

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพระไทร
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒ ๕ สิงหาคม ๒๕๖๕

เรื่อง เปลี่ยนแปลงการและสารเคมีที่ใช้วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เพคโคสิ่งแวดล้อมไทย จำกัด

อ้างถึง คำขอเชิญเป็น/พยาน/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีขอเชิญปฏิบัติการวิเคราะห์เอทาน

ลงวันที่ ๑๙ พฤษภาคม ๒๕๖๕

สิ่งที่ส่งมาด้วย เอกสารแบบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารเคมีที่วิเคราะห์

บริษัท เพคโคสิ่งแวดล้อมไทย จำกัด จำนวน ๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เพคโคสิ่งแวดล้อมไทย จำกัด ห้องปฏิบัติการวิเคราะห์เอทาน
เลขทะเบียน ๖-๒๕๖ เลขที่ ๑๖ ของรณ.ค.พ. ๑๕๕ แขวงสะพานสูง เขตสะพานสูง กรุงเทพมหานคร
ขอเปลี่ยนแปลงบุคลากรและสารเคมีที่ใช้วิเคราะห์ ความละเอียดแจ้งแล้ว ดังนี้

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑ ราย

นายกรรณธร์ เปี่ยมวัฒนา

เลขทะเบียน ๖-๒๕๖-๕-๕๕๕๕

๒. ให้เพิ่มขอบข่ายสารเคมีที่วิเคราะห์โดยภาคเดียว จำนวน ๑ รายการ ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือขึงนี้จะมีผลต่อพยานหรือหนังสือหลักฐานที่ขณะยื่นขอเชิญปฏิบัติการวิเคราะห์เอทาน
ที่ อก ๐๓๑๐(๑)/ ๑๑๖๑๑๑ ลงวันที่ ๑๕ ตุลาคม ๒๕๖๓ คือในวันที่ ๑๓ มีนาคม ๒๕๖๖

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นางกรกฎณ์ นงนุชกุล)

ผู้อำนวยการศูนย์ปฏิบัติการและห้องปฏิบัติการ กรมโรงงาน

ผู้อำนวยการศูนย์และห้องปฏิบัติการ

ปฏิบัติการและห้องปฏิบัติการ กรมโรงงาน

กองวิจัยและสิ่งแวดล้อมพิษวิทยา

กลุ่มมาตรฐานปฏิบัติการและห้องปฏิบัติการและห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๐๐๐ ๐ ๒๒๐๒ ๔๑๔๐

โทรสาร ๐ ๒๓๒๕ ๕๑๔๕

เอกสารแนบท้ายหนังสือเรื่องเปลี่ยนแปลงบุคลากรและสารเคมีที่วิเคราะห์
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด เลขที่ทะเบียน ๖-๒๒๖
ที่ ยก ๐๓๑๔(๑)/ ๗ ๙ ๓ ๐ ลงวันที่ ๒๙ สิงหาคม ๒๕๖๕


ขอประชาสัมพันธ์ที่ได้รับทะเบียนการกรังงานอุตสาหกรรม จำนวน ๑ รายการ

เอกสารแนบ (เปลี่ยนรายชื่อ) จำนวน 1 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Sulfur Dioxide	Instrumental Analyzer Method

เอกสารอ้างอิง

United States Environmental Protection Agency: Standards of Performance for
New Stationary Sources, 40 CFR 60, Appendix A, 2019.


นางสาวไชยาพร ไชยทรัพย์
ผู้อำนวยการศูนย์ปฏิบัติการในกรมสิ่งแวดล้อม
เอกสารนี้เป็นของรัฐบาล

ภาคผนวก ช

ใบอนุญาตเป็นผู้ตรวจวัดและวิเคราะห์สภาวะการทำงานเกี่ยวกับ
ความร้อน แสงสว่าง เสียง และสารเคมีอันตรายในบรรยากาศ





แบบ กบ.ญ
ฉ.ศ.คส

กรมสวัสดิการและคุ้มครองแรงงาน

ใบอนุญาต

เป็นผู้ให้บริการตรวจวัดระดับความเข้มแข็งของสารเคมีอันตราย

ใบบรรยายภาพของสถานที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย

ใบอนุญาตเลขที่ ๐๒๐๔๐๓๕๒๕๖๕๐๑๑๓

อนุญาตให้ บริษัท ไทยทีลิ่งแอนด์ลัมไทย จำกัด

เลขทะเบียนนิติบุคคล ๐๑๐๕๕๕๖๗๘๙๐๑๒๓๔

ตั้งอยู่ เลขที่ ๑๔๖ ซอยรามคำแหง ๑๔๕ แขวงสะพานสูง เขตสะพานสูง กรุงเทพมหานคร

เป็นผู้ควบคุมดูแลให้เจ้าหน้าที่ความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎหมาย
เกี่ยวกับความปลอดภัยและอาชีวอนามัย และสภาพแวดล้อมในการทำงาน ปฏิบัติการตรวจวัดระดับความเข้มแข็งของสารเคมีอันตราย และสารเคมีอันตรายอื่น ๆ ที่มีการปฏิบัติงานในโรงงาน และสถานที่เก็บรักษาสารเคมีอันตราย
ไม่ดำเนินการเกี่ยวกับความปลอดภัยและอาชีวอนามัย และสภาพแวดล้อมในการทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย
ของสถานประกอบการในโรงงานอุตสาหกรรมที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย และสถานที่เก็บรักษาสารเคมีอันตราย
ประกอบกับกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งสารเคมีอันตราย ไปรษณีย์ ยานพาหนะ
และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย และ
สภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ โดยมีบุคลากร จำนวน ๒๑ ราย

ตั้งแต่วันที่ ๑๕ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓ กันยายน พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๑๕ ธันวาคม พ.ศ. ๒๕๖๔

นายสมพงษ์ ทรายแก้ว
(นายสมพงษ์ ทรายแก้ว)

ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากรแบบ กบ.ญ

เป็นผู้ควบคุมดูแลให้บริการตรวจวัดระดับความเข้มแข็งของสารเคมีอันตรายในโรงงานอุตสาหกรรมที่ทำงาน

และสถานที่เก็บรักษาสารเคมีอันตราย

ของบริษัท ไทยทีลิ่งแอนด์ลัมไทย จำกัด

ใบอนุญาตเลขที่ ๐๒๐๔๐๓๕๒๕๖๕๐๑๑๓

๑. นายเกียรติชัย บุญรุ่งเกียรติ

๒. นายประจวบ บุคฉะ

๓. นายวิฑูรย์ วชิรรัตน์

๔. นายประสิทธิ์ จิรมงคล

๕. นายสุวิทย์ สุขดี

๖. นายเกียรติศักดิ์ วัชรดี

๗. นายสุวิทย์พงศ์ ยงสุพร

๘. นายจิรวัฒน์ อิมเทศ

๙. นายเฉลิมวุฒิ พูลจวง

๑๐. นายสมบัติ มะลิต

๑๑. นายพิเชฐ อยู่คุ้ม

๑๒. นายสุภาวดี ศรีบุญ

๑๓. นางสาวกรรณศิริ สุวิวัฒน์

๑๔. นายคณินพชัย เสียมไธสง

๑๕. นางสาวนิตยา ไชยะแสง

๑๖. นายสุรภูมิ มะลิต

๑๗. นางสาวนิตยา มะลิต

๑๘. ว่าที่ ร.ต. ไชยภ

๑๙. นางสาวนิตยา วัชรดี

๒๐. นางสาวนิตยา วัชรดี

๒๑. นางสาวนิตยา วัชรดี

ตั้งแต่วันที่ ๑๕ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓ กันยายน พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๑๕ ธันวาคม พ.ศ. ๒๕๖๔

นายสมพงษ์ ทรายแก้ว
(นายสมพงษ์ ทรายแก้ว)

ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



แบบ กง.ปญ
ปศ.คตล

กรมสวัสดิการและคุ้มครองแรงงาน
ใบอนุญาต

เป็นผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตราย
ในบรรยากาศของสถานที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย

ใบอนุญาตเลขที่ ๑๒๐๒๐-๐๓-๒๕๖๔-๐๐๐๑๓

อนุญาตให้... มีชื่อ... มีชื่อ... มีชื่อ...
เลขทะเบียนนิติบุคคล...
ตั้งอยู่เลขที่... หมู่... ตำบล... อำเภอ... จังหวัด...
เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามมาตรฐาน
ด้านความปลอดภัยในการทำงาน และด้านสิ่งแวดล้อมตามข้อกำหนด อาชีวอนามัย และสภาพแวดล้อม
ในการทำงานของกรมสวัสดิการและคุ้มครองแรงงาน พ.ศ. ๒๕๕๖ โดยการเป็นผู้ให้บริการจัดและวิเคราะห์ระดับความ
ไม่ปลอดภัยต่อสุขภาพของแรงงานที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย อาชีวอนามัย
และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย
และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔ โดยมีบุคลากรที่วิทยากร จำนวน ๘ ราย

ทั้งนี้ ตั้งแต่วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓ ธันวาคม พ.ศ. ๒๕๖๕

ให้ไว้ ณ วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔

(นายสมพงษ์ กรวณแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากรแบบท้ายใบอนุญาต
ได้รับใบอนุญาตให้รับราชการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน
และสถานที่เก็บรักษาสารเคมีอันตราย
ของ บริษัท เทคโนโลยี สิ่งแวดล้อมไทย จำกัด
ใบอนุญาตเลขที่ ๑๒๐๒๐-๐๓-๒๕๖๔-๐๐๐๑๓

- | | |
|--------------------|------------------|
| ๑. นายณัฐพงศ์ | โคตรมา |
| ๒. นายเนาวพจน์ | เขียดูเกาะ |
| ๓. นางสาวอรรณี | สีนวล |
| ๔. นางสาวนภาพร | เริ่มประจักษ์ปัด |
| ๕. นายศักดิ์ศักดิ์ | เมืองงาม |
| ๖. นางสาวณัฐณาน | สารแสง |
| ๗. นาคเจือ | นันทวัน |
| ๘. นางสาวณณลักษณ์ | ศรีมงคล |

ทั้งนี้ ตั้งแต่วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓ ธันวาคม พ.ศ. ๒๕๖๕

ให้ไว้ ณ วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔

(นายสมพงษ์ กรวณแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



แบบ ก.บ.บญ
ฉ.บ.บค.

กรมสวัสดิการและคุ้มครองแรงงาน

ใบอนุญาต

เป็นผู้ให้บริการตรวจวัดและวิเคราะห์สภาพการทำงานเกี่ยวกับระดับความร้อน

ใบอนุญาตเลขที่ ๐๙๐๑๑๓-๒๕๖๔-๐๐๐๓

ออกให้ บริษัท เบริตี้ สิ่งแวดล้อมไทย จำกัด

เลขทะเบียนใบอนุญาต ๐๑๒๕๕๕๖๐๐๕๕๖๔

ตั้งอยู่ เลขที่ ๑๔/๖ ซอยรามคำแหง ๑๔๕ แขวงสะพานสูง เขตสะพานสูง กรุงเทพมหานคร

เป็นผู้มีคุณสมบัติให้ บริการด้านความ ร้อน อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎกระทรวง กำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน มาตรา ๑๖ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๓ ในการตรวจวัดและวิเคราะห์ สภาพแวดล้อมในการทำงาน ประกอบกับกฎกระทรวงการขึ้นทะเบียนผู้ประกอบการใบอนุญาตให้บริการ เพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติ ความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๕ นาย

ทั้งนี้ ตั้งแต่วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓ ธันวาคม พ.ศ. ๒๕๖๕

ให้ไว้ ณ วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔



(นายสมพงษ์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากรแบบ ก.บ.บญ
รายชื่อผู้ให้บริการตรวจวัดและวิเคราะห์สภาพการทำงานเกี่ยวกับความ ร้อน
ของ บริษัท เบริตี้ สิ่งแวดล้อมไทย จำกัด
ใบอนุญาตเลขที่ ๐๙๐๑๑๓-๒๕๖๔-๐๐๐๓

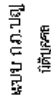
- | | |
|-------------------|----------------|
| ๑. นายปิยะชัย | นายรุ่งเกียรติ |
| ๒. นางสาวนันทดา | จตุรสุณิมา |
| ๓. นางสาวสุวิมล | อรรณี |
| ๔. นายอภิสิทธิ์ | นพรัตน์ |
| ๕. นางสาวอมรรัตน์ | โสมภณ |

ทั้งนี้ ตั้งแต่วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓ ธันวาคม พ.ศ. ๒๕๖๕

ให้ไว้ ณ วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔



(นายสมพงษ์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



โปรแกรมวิจัยปฏิบัติการและศูนย์เครือข่าย
ไบโอมภาต

๗.๔.๕.๖.๗.๘.๙.๑๐.๑๑.๑๒.๑๓.๑๔.๑๕.๑๖.๑๗.๑๘.๑๙.๒๐.๒๑.๒๒.๒๓.๒๔.๒๕.๒๖.๒๗.๒๘.๒๙.๓๐.๓๑.๓๒.๓๓.๓๔.๓๕.๓๖.๓๗.๓๘.๓๙.๔๐.๔๑.๔๒.๔๓.๔๔.๔๕.๔๖.๔๗.๔๘.๔๙.๕๐.๕๑.๕๒.๕๓.๕๔.๕๕.๕๖.๕๗.๕๘.๕๙.๖๐.๖๑.๖๒.๖๓.๖๔.๖๕.๖๖.๖๗.๖๘.๖๙.๗๐.๗๑.๗๒.๗๓.๗๔.๗๕.๗๖.๗๗.๗๘.๗๙.๘๐.๘๑.๘๒.๘๓.๘๔.๘๕.๘๖.๘๗.๘๘.๘๙.๙๐.๙๑.๙๒.๙๓.๙๔.๙๕.๙๖.๙๗.๙๘.๙๙.๑๐๐.

பாபநாசுனம் - 605 001

อนุญาตให้..... บริษัท เพชรบุรีสิ่งแวดล้ขไม่เหม่ จำกัด

[illegible]

^๒ ดูคำอธิบายเพิ่มเติมที่หน้า ๑๖๕

[illegible]

๕๗ วิทยาลัยการอาชีพสุพรรณบุรี
๕๘ วิทยาลัยการอาชีพสุพรรณบุรี
๕๙ วิทยาลัยการอาชีพสุพรรณบุรี

இதில் உள்ள பூங்கா 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 8

✓ *Chrysomelidae* (Chrysomelidae)

ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

[illegible]

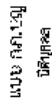
๑. นายปิยะชัย บุญรุ่งเกียรติ
๒. นางสาวกัญชดา จอหงษ์เม็ก
๓. นางสาวสุวิศาลา ยอห์น
๔. นายภคพล ะหาวัณ
๕. นางสาวณรรธินี ไชยมณีด้วย

[illegible]

ทั่วไป ๓: ๒๔ ธันวาคม ๒๕๖๕

15

ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



આમજૂલિપાત્રલેખકશ્રી.કે.વે.વે.વે.

ไปขอเงินมา

เป็นผู้ให้บริการตรวจวัดและวิเคราะห์สภาพแวดล้อมเกี่ยวกับมลพิษทาง

[illegible]

อนุญาตให้...มีพื้นที่เกษตรถึงแนวเขตติดผืนป่าฯ จำนวน

ಗೊಳಗಿನವುಗಳನ್ನು ಬಳಸಿ.....ಎಂಬುದಕ್ಕೆ ಉದಾಹರಣೆ ನೀಡಿ.

2016¹ 2017² 2018³ 2019⁴ 2020⁵ 2021⁶ 2022⁷ 2023⁸ 2024⁹ 2025¹⁰ 2026¹¹ 2027¹² 2028¹³ 2029¹⁴ 2030¹⁵ 2031¹⁶ 2032¹⁷ 2033¹⁸ 2034¹⁹ 2035²⁰ 2036²¹ 2037²² 2038²³ 2039²⁴ 2040²⁵ 2041²⁶ 2042²⁷ 2043²⁸ 2044²⁹ 2045³⁰ 2046³¹ 2047³² 2048³³ 2049³⁴ 2050³⁵ 2051³⁶ 2052³⁷ 2053³⁸ 2054³⁹ 2055⁴⁰ 2056⁴¹ 2057⁴² 2058⁴³ 2059⁴⁴ 2060⁴⁵ 2061⁴⁶ 2062⁴⁷ 2063⁴⁸ 2064⁴⁹ 2065⁵⁰ 2066⁵¹ 2067⁵² 2068⁵³ 2069⁵⁴ 2070⁵⁵ 2071⁵⁶ 2072⁵⁷ 2073⁵⁸ 2074⁵⁹ 2075⁶⁰ 2076⁶¹ 2077⁶² 2078⁶³ 2079⁶⁴ 2080⁶⁵ 2081⁶⁶ 2082⁶⁷ 2083⁶⁸ 2084⁶⁹ 2085⁷⁰ 2086⁷¹ 2087⁷² 2088⁷³ 2089⁷⁴ 2090⁷⁵ 2091⁷⁶ 2092⁷⁷ 2093⁷⁸ 2094⁷⁹ 2095⁸⁰ 2096⁸¹ 2097⁸² 2098⁸³ 2099⁸⁴ 2100⁸⁵ 2101⁸⁶ 2102⁸⁷ 2103⁸⁸ 2104⁸⁹ 2105⁹⁰ 2106⁹¹ 2107⁹² 2108⁹³ 2109⁹⁴ 2110⁹⁵ 2111⁹⁶ 2112⁹⁷ 2113⁹⁸ 2114⁹⁹ 2115¹⁰⁰ 2116¹⁰¹ 2117¹⁰² 2118¹⁰³ 2119¹⁰⁴ 2120¹⁰⁵ 2121¹⁰⁶ 2122¹⁰⁷ 2123¹⁰⁸ 2124¹⁰⁹ 2125¹¹⁰ 2126¹¹¹ 2127¹¹² 2128¹¹³ 2129¹¹⁴ 2130¹¹⁵ 2131¹¹⁶ 2132¹¹⁷ 2133¹¹⁸ 2134¹¹⁹ 2135¹²⁰ 2136¹²¹ 2137¹²² 2138¹²³ 2139¹²⁴ 2140¹²⁵ 2141¹²⁶ 2142¹²⁷ 2143¹²⁸ 2144¹²⁹ 2145¹³⁰ 2146¹³¹ 2147¹³² 2148¹³³ 2149¹³⁴ 2150¹³⁵ 2151¹³⁶ 2152¹³⁷ 2153¹³⁸ 2154¹³⁹ 2155¹⁴⁰ 2156¹⁴¹ 2157¹⁴² 2158¹⁴³ 2159¹⁴⁴ 2160¹⁴⁵ 2161¹⁴⁶ 2162¹⁴⁷ 2163¹⁴⁸ 2164¹⁴⁹ 2165¹⁵⁰ 2166¹⁵¹ 2167¹⁵² 2168¹⁵³ 2169¹⁵⁴ 2170¹⁵⁵ 2171¹⁵⁶ 2172¹⁵⁷ 2173¹⁵⁸ 2174¹⁵⁹ 2175¹⁶⁰ 2176¹⁶¹ 2177¹⁶² 2178¹⁶³ 2179¹⁶⁴ 2180¹⁶⁵ 2181¹⁶⁶ 2182¹⁶⁷ 2183¹⁶⁸ 2184¹⁶⁹ 2185¹⁷⁰ 2186¹⁷¹ 2187¹⁷² 2188¹⁷³ 2189¹⁷⁴ 2190¹⁷⁵ 2191¹⁷⁶ 2192¹⁷⁷ 2193¹⁷⁸ 2194¹⁷⁹ 2195¹⁸⁰ 2196¹⁸¹ 2197¹⁸² 2198¹⁸³ 2199¹⁸⁴ 2200¹⁸⁵ 2201¹⁸⁶ 2202¹⁸⁷ 2203¹⁸⁸ 2204¹⁸⁹ 2205¹⁹⁰ 2206¹⁹¹ 2207¹⁹² 2208¹⁹³ 2209¹⁹⁴ 2210¹⁹⁵ 2211¹⁹⁶ 2212¹⁹⁷ 2213¹⁹⁸ 2214¹⁹⁹ 2215²⁰⁰ 2216²⁰¹ 2217²⁰² 2218²⁰³ 2219²⁰⁴ 2220²⁰⁵ 2221²⁰⁶ 2222²⁰⁷ 2223²⁰⁸ 2224²⁰⁹ 2225²¹⁰ 2226²¹¹ 2227²¹² 2228²¹³ 2229²¹⁴ 2230²¹⁵ 2231²¹⁶ 2232²¹⁷ 2233²¹⁸ 2234²¹⁹ 2235²²⁰ 2236²²¹ 2237²²² 2238²²³ 2239²²⁴ 2240²²⁵ 2241²²⁶ 2242²²⁷ 2243²²⁸ 2244²²⁹ 2245²³⁰ 2246²³¹ 2247²³² 2248²³³ 2249²³⁴ 2250²³⁵ 2251²³⁶ 2252²³⁷ 2253²³⁸ 2254²³⁹ 2255²⁴⁰ 2256²⁴¹ 2257²⁴² 2258²⁴³ 2259²⁴⁴ 2260²⁴⁵ 2261²⁴⁶ 2262²⁴⁷ 2263²⁴⁸ 2264²⁴⁹ 2265²⁵⁰ 2266²⁵¹ 2267²⁵² 2268²⁵³ 2269²⁵⁴ 2270²⁵⁵ 2271²⁵⁶ 2272²⁵⁷ 2273²⁵⁸ 2274²⁵⁹ 2275²⁶⁰ 2276²⁶¹ 2277²⁶² 2278²⁶³ 2279²⁶⁴ 2280²⁶⁵ 2281²⁶⁶ 2282²⁶⁷ 2283²⁶⁸ 2284²⁶⁹ 2285²⁷⁰ 2286²⁷¹ 2287²⁷² 2288²⁷³ 2289²⁷⁴ 2290²⁷⁵ 2291²⁷⁶ 2292²⁷⁷ 2293²⁷⁸ 2294²⁷⁹ 2295²⁸⁰ 2296²⁸¹ 2297²⁸² 2298²⁸³ 2299²⁸⁴ 2300²⁸⁵ 2301²⁸⁶ 2302²⁸⁷ 2303²⁸⁸ 2304²⁸⁹ 2305²⁹⁰ 2306²⁹¹ 2307²⁹² 2308²⁹³ 2309²⁹⁴ 2310²⁹⁵ 2311²⁹⁶ 2312²⁹⁷ 2313²⁹⁸ 2314²⁹⁹ 2315³⁰⁰ 23

เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎหมายว่าด้วยการคุ้มครองสุขภาพของผู้ปฏิบัติงาน และสภาพแวดล้อมที่ไม่เหมาะสมในการทำงานของรัฐบาลในหน่วยงานอื่น รัฐสภา และผู้ให้บริการเพื่อสังคม
ในการให้บริการเกี่ยวกับด้านอื่น และผู้ให้บริการเพื่อสังคมและหน่วยงานอื่น
เมื่อมีวัตถุประสงค์แห่งความประสงค์ในการประกอบกิจการเพื่อสังคม
ปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๒ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๙ โดยมีผลใช้บังคับ ๙ ธันวาคม ๒๕๖๒

ผู้ปฏิบัติงานที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓ ธันวาคม พ.ศ. ๒๕๖๔

ผู้ให้ไว้ ณ วันที่ ๑๙ ธันวาคม พ.ศ. ๒๕๕๑.

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(นายสัมพันธ์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

เป็นนิสิตบุคคลผู้ได้รับการสรรหาและวิธีพิจารณานักบริหารท้องถิ่น
ของจังหวัด เพชรบูรณ์ ประจำปี ๒๕๖๓

๑. นายวิเชียรชัย
๒. นางสาวกมลทิศาพล
๓. นางสาวสุกัญญา
๔. นายกมลพล
๕. นางสาวอภินันท์

พุ่มแดงที่ ๑๔ ถิ่นवास พ.ศ. ๒๕๖๔ ถึง ๕๗ ปีเศษ

วันที่ ๑๕ สิงหาคม ๒๕๖๕

1. การดำเนินงาน

ผู้ตรวจงานราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

