

ภาคผนวกที่ 4

ใบรับรองการสอบเทียบเครื่องมือ



บริษัท เอ็ม ซี ที จำกัด MET CO.,LTD.

36/659 หมู่ 6 ต.บางรักพัฒนา อ.บางบัวทอง จ.นนทบุรี 11110

36/659 Moo 6 Tambol Bangrakpattana Amphur Bangbuatong Nontaburi 11110

Tel : 0 2920 1458-9 Fax : 0 2920 1460 E-mail : met_jj@yahoo.com

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	May 7, 2024
โรงเรียนหนองใหญ่ศิริวาฬวิทยา				Start Time	9:05 AM
Sampler Number	TSP No.2	Transfer Standard Type	Orifice	Stop Time	9:10 AM
Motor Serial Number	BL-02	Calibrator Model	TE-5025A	Person	Mr.Jirayut Seehabut
Recorder Serial Number	-	Calibrator Serial Number	1		

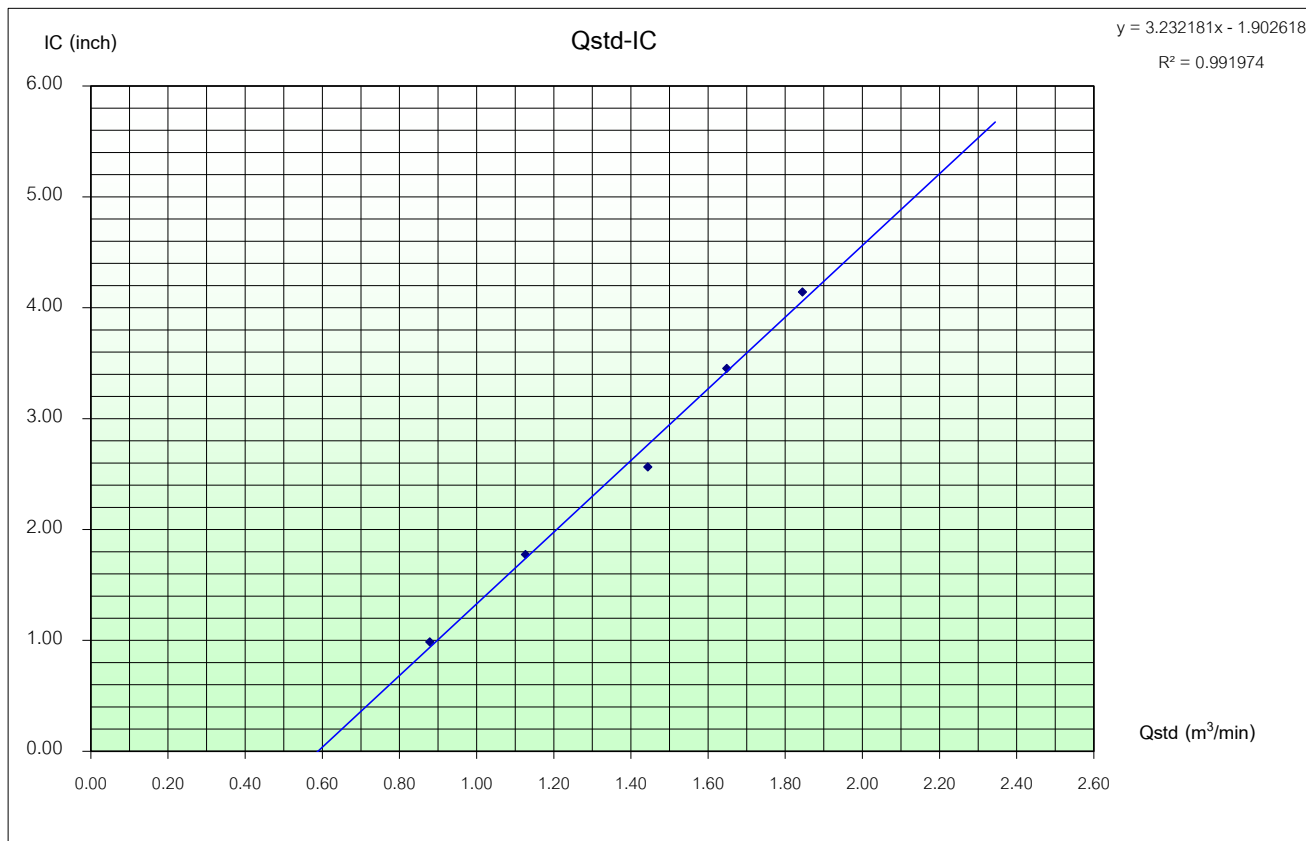
Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
	Positive	Negative	ΔH_2O	$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m^3/min)	Sample Flow Rate Indication (inch)	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	($^{\circ}K = ^{\circ}C + 273$)	Pressure (mmHg)	Meter	Meter
5	1.5	1.5	3.0	1.70868	0.87849	1.0	0.99	305.0	757.0		
7	2.4	2.5	4.9	2.18372	1.12676	1.8	1.78	305.0	757.0		
10	4.0	4.0	8.0	2.79026	1.44374	2.6	2.56	305.0	757.0		
13	5.2	5.2	10.4	3.18138	1.64815	3.5	3.45	305.0	757.0		
18	6.5	6.5	13.0	3.55689	1.84440	4.2	4.14	305.0	757.0		

Linear Regression Y ON X : $Y = mX + b$

Linear Regression Y ON X: Y= mX + b				Average	305.0	757.0		
1	Slope (m)	1.91345	Linear Equation		r^2	0.971641	Pstd(mmHg)	760.0
2	Intercept (b)	0.02773	Set Point Flow Rate (X) (m ³ /min)	1.133	r	0.9857185	T _{NTP}	298.0
3	Correlation Coefficient (r)	0.99995	Final Set Flow Rate = (I)	0	(Pa/Pstd)*(Tstd/Ta)		0.973192407	
Result						C=(Pa/Pstd)*(Tstd/Ta)^0.5	0.986505148	

COMMENT

Andersen Instruments, Inc.



Calibrated By

(Mr.Jirayut Seehabut)
Field Environmental

Approved By

(Mr.Jarung Jamnongbut)
Division Manager



บริษัท เอ็นไวร์ เซอร์วิส จำกัด

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD.

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201

42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 7 May 2024

Instruments Information

Analyzer Type: SO2 Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 335003719
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Calibration System

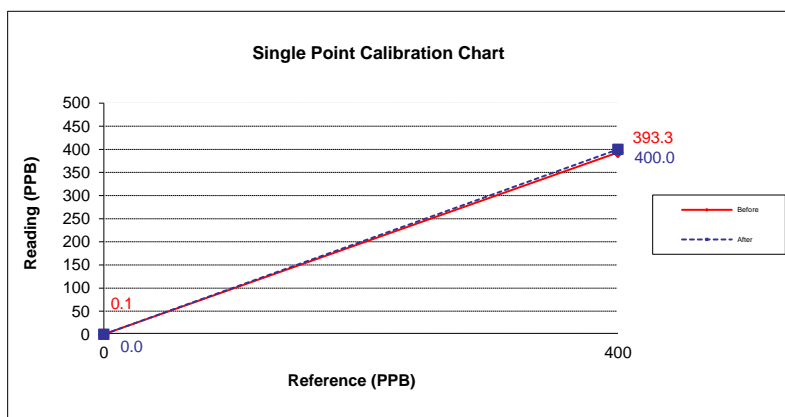
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	393.3	-1.7
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr.PASAGORN SAMOL



บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD.

บริษัท เอ็นไวร์ เซอร์วิส จำกัด

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42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 7 May 2024

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: 42C	Manufacturer Thermo Environmental S/N: 72706374
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 46.05 PPM SO ₂ Conc 46.01 PPM CO Conc 4,487 PPM Cylinder number CC507080 Expire Date: 23 Jul. 2025

Environment: Temperature 25.5 °C

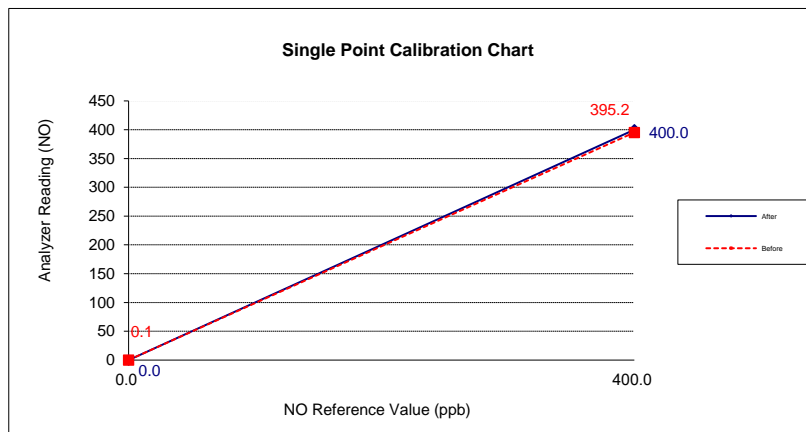
Humidity: 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	395.2	400.0	-1.2
NO _x	0.1	0.0	0.1	400.0	400.0	0.0

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NO _x	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By : Mr. Pasagorn Samol

Calibration Test

Calibrated Date: 27/2/2024

Certificate No. 024/24

Instruments Information

Manufacturer : YOUNG Instrument Type : four blade helicoid propeller
Model : 40C Serial Number : Logger 309018964

Environment : Temperature 25.5 °C Humidity: 51 %RH

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563
: HOOK GAGE NO 1425 : Wind Aloft Plotting Board
N.I.S.T. Test Reference Number 731/241460
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586) JAPAN QUALITY ASSURANCE ORGANIZATION

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO 1425			TESTED ANEMOMETER			
	Pressure inches	Vacuum inches	Pressure hPa	Pressure hPa	Correction hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	-	-	0.9	0.10
3.02	-	-	-	-	-	2.8	0.22
5.04	-	-	-	-	-	4.9	0.14
7.03	-	-	-	-	-	6.8	0.23
9.01	-	-	-	-	-	8.8	0.21
11.03	-	-	-	-	-	10.7	0.33
13.01	-	-	-	-	-	12.6	0.41
15.03	-	-	-	-	-	14.4	0.63
17.05	-	-	-	-	-	16.5	0.55
20.02	-	-	-	-	-	19.4	0.62

Wind Aloft Plotting Board. US. DEPARTMENT OF COMMERCE WEATHER BUREAU			
WIND DIRECTION	TESTED WIND DIRECTION	Deviation	Result
0	0	0	Pass
90	90	0	Pass
180	180	0	Pass
270	270	0	Pass

Calibrate By

MR. KITTISAK JANSANGWATTANA

MR. PASAGORN SAMOL



บริษัท เอ็ม ซี ที จำกัด MET CO.,LTD.

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Tel : 0 2920 1458-9 Fax : 0 2920 1460 E-mail : met_jj@yahoo.com

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	May 7, 2024
พื้นที่โครงการ				Start Time	9:55 AM
Sampler Number	TSP No.11	Transfer Standard Type	Orifice	Stop Time	10:00 AM
Motor Serial Number	BL-11	Calibrator Model	TE-5025A	Person	Mr.Jirayut Seehabut
Recorder Serial Number	-	Calibrator Serial Number	1		

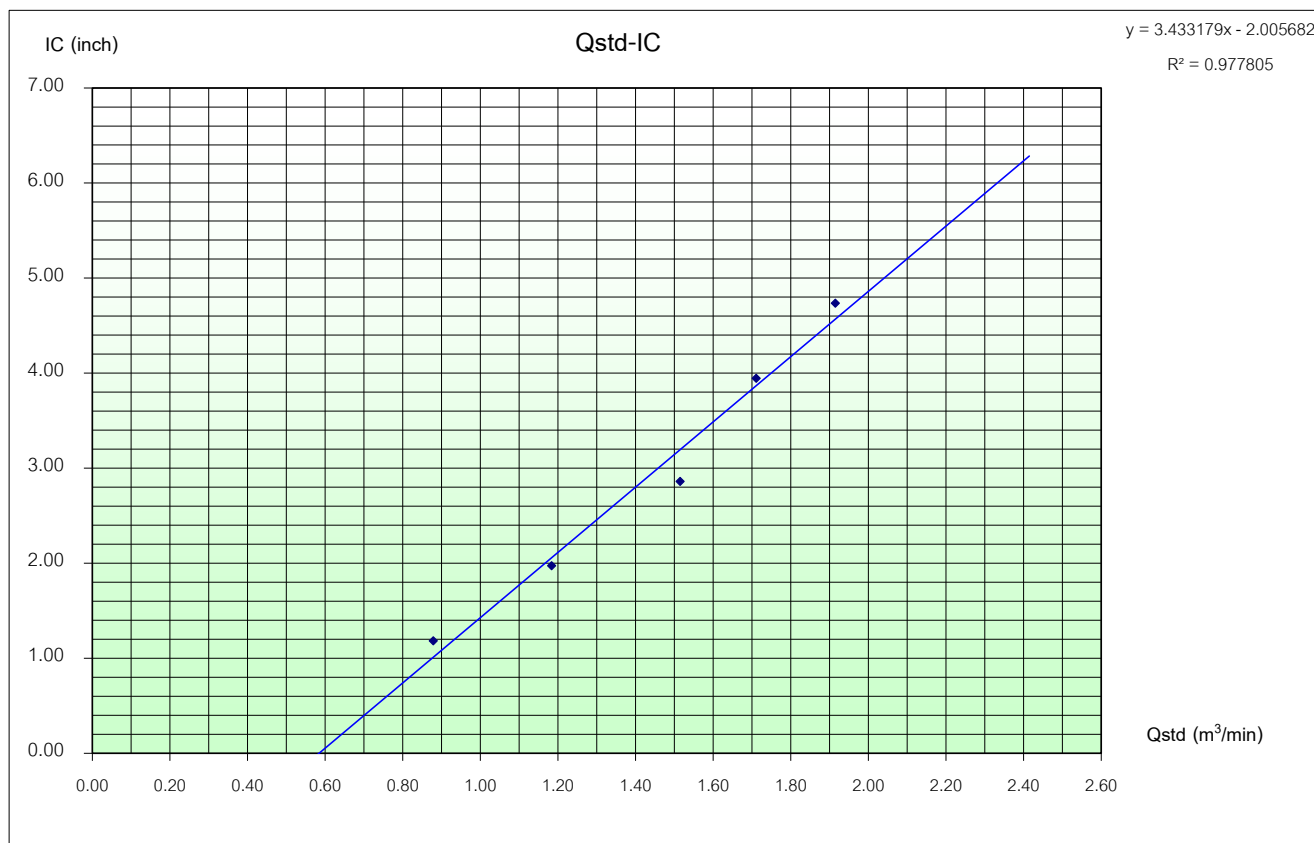
Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Positive	Negative	ΔH_2O	$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m^3/min)	Sample Flow Rate Indication (inch)	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	($^{\circ}K = ^{\circ}C+273$)	(mmHg)		
5	1.5	1.5	3.0	1.70868	0.87849	1.2	1.18	305.0	757.0		
7	2.7	2.7	5.4	2.29243	1.18357	2.0	1.97	305.0	757.0		
10	4.4	4.4	8.8	2.92645	1.51492	2.9	2.86	305.0	757.0		
13	5.6	5.6	11.2	3.30148	1.71091	4.0	3.95	305.0	757.0		
18	7.0	7.0	14.0	3.69116	1.91457	4.8	4.74	305.0	757.0		

Linear Regression Y ON X : $Y = mX + b$

Linear Regression Y ON X : Y= mX + b					Average	305.0	757.0		
1	Slope (m)	1.91345	Linear Equation		r^2	0.963579	Pstd(mmHg)	760.0	
2	Intercept (b)	0.02773	Set Point Flow Rate (X) (m ³ /min)	1.133	r		0.9816206	T _{NTP}	298.0
3	Correlation Coefficient (r)	0.99995	Final Set Flow Rate = (I)	0	(Pa/Pstd)*(Tstd/Ta)		0.973192407		
Result					C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.986505148		

COMMENT

Andersen Instruments, Inc.



Calibrated By

(Mr.Jirayut Seehabut)
Field Environmental

Approved By

(Mr.Jarung Jamnongbut)
Division Manager



บริษัท เอ็นไวร์ เซอร์วิส จำกัด

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD.

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42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 7 May 2024

Instruments Information

Analyzer Type: SO2 Analyzer Model: 100A	Manufacturer API Environmental S/N: 1810
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Calibration System

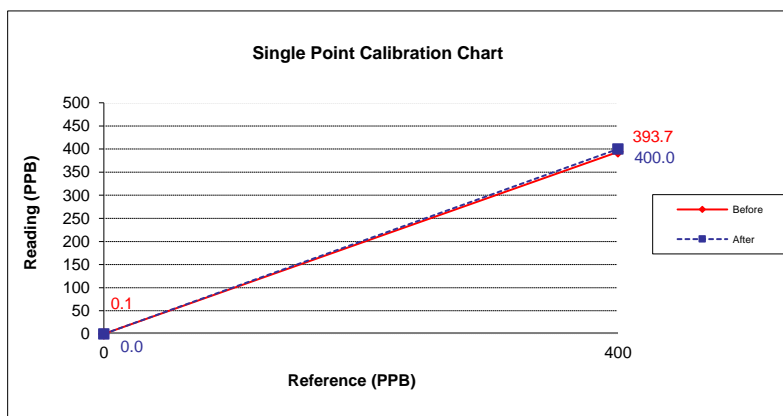
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,435 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	393.7	-1.6
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr.PASAGORN SAMOL



บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD.

บริษัท เอ็นไวร์ เซอร์วิส จำกัด

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42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 7 May 2024

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: 42C	Manufacturer Thermo Environmental S/N: 0601114783
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 55.00 PPM SO ₂ Conc 55.00 PPM CO Conc 4,500 PPM Expire Date: 23 Jul. 2025

Environment: Temperature 25.5 °C

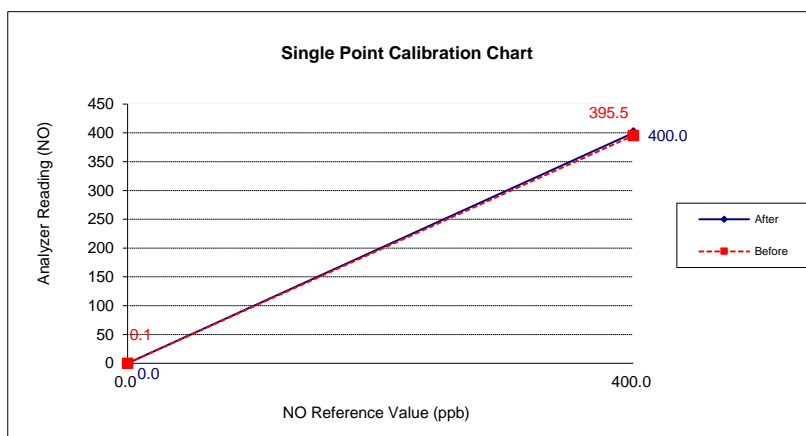
Humidity: 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	395.5	400.0	-1.1
NO _x	0.1	0.0	0.1	400.0	400.0	0.0

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NO _x	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By : Mr. Pasagorn Samol

Calibration Test

Calibrated Date: 27/2/2024

Certificate No. 022/24

Instruments Information

Manufacturer : YOUNG Instrument Type : four blade helicoid propeller
Model : 40C Serial Number : Logger 428003082

Environment : Temperature 25.5 °C Humidity: 51 %RH

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563
: HOOK GAGE NO 1425 : Wind Aloft Plotting Board
N.I.S.T. Test Reference Number 731/241460
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586) JAPAN QUALITY ASSURANCE ORGANIZATION

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO 1425			TESTED ANEMOMETER			
	Pressure inches	Vacuum inches	Pressure hPa	Pressure hPa	Correction hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	-	-	0.8	0.20
3.02	-	-	-	-	-	2.8	0.22
5.04	-	-	-	-	-	4.9	0.14
7.03	-	-	-	-	-	6.8	0.23
9.01	-	-	-	-	-	8.8	0.21
11.03	-	-	-	-	-	10.7	0.33
13.01	-	-	-	-	-	12.6	0.41
15.03	-	-	-	-	-	14.4	0.63
17.05	-	-	-	-	-	16.5	0.55
20.02	-	-	-	-	-	19.3	0.72

Wind Aloft Plotting Board. US. DEPARTMENT OF COMMERCE WEATHER BUREAU			
WIND DIRECTION	TESTED WIND DIRECTION	Deviation	Result
0	0	0	Pass
90	90	0	Pass
180	180	0	Pass
270	270	0	Pass

Calibrate By :

MR. KITTISAK JANSANGWATTANA

MR. PASAGORN SAMOL



บริษัท เอ็ม ซี ที จำกัด MET CO.,LTD.
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Tel : 0 2920 1458-9 Fax : 0 2920 1460 E-mail : met_jj@yahoo.com

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	May 7, 2024
วัดหนองใหญ่ศิริธรรม				Start Time	11:05 AM
Sampler Number	TSP No.16	Transfer Standard Type	Orifice	Stop Time	11:10 AM
Motor Serial Number	BL-16	Calibrator Model	TE-5025A	Person	Mr.Jirayut Seehabut
Recorder Serial Number	-	Calibrator Serial Number	1		

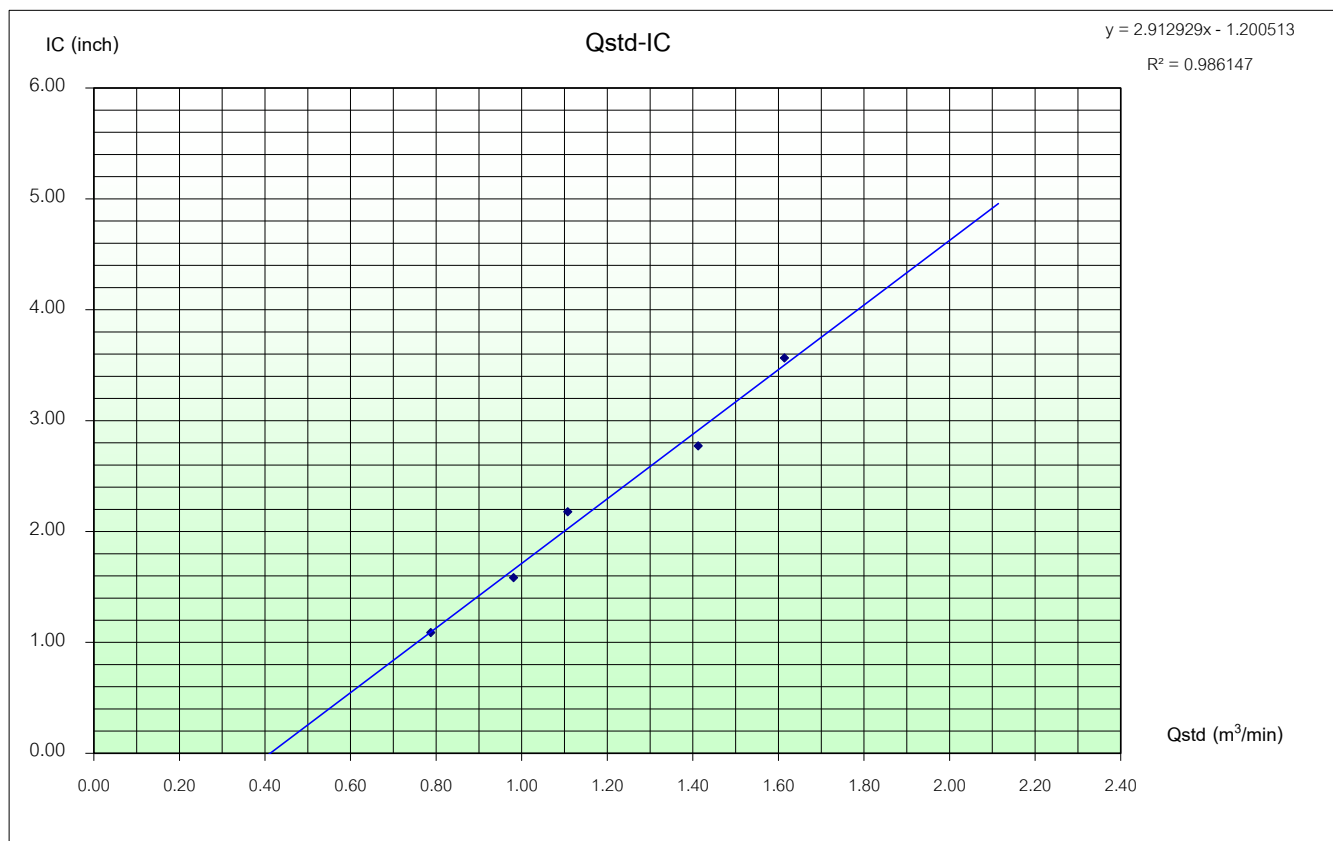
Plate No.	(Delta H) Pressure Drop Across Orifice (inH ₂ O)			(A) [$\Delta H_2O(Pa/P_{std})(T_{std}/T_a)^{1/2}$]	(X) Qstd = (1/m)[(A-b)] (m ³ /min)	(I) Sample Flow Rate Indication (inch)	(Y) IC = I[(Pa/P _{std})(T _{std} /T _a)] ^{1/2}	Temperature (°K = °C+273)	Barometric Pressure (mmHg)	Start Meter	Stop Meter
	Positive	Negative	ΔH ₂ O								
5	1.2	1.2	2.4	1.53434	0.78738	1.1	1.09	303.0	758.0		
7	1.8	1.9	3.7	1.90509	0.98114	1.6	1.58	303.0	758.0		
10	2.3	2.4	4.7	2.14716	1.10765	2.2	2.18	303.0	758.0		
13	3.8	3.8	7.6	2.73037	1.41244	2.8	2.77	303.0	758.0		
18	4.9	5.0	9.9	3.11625	1.61411	3.6	3.57	303.0	758.0		

Linear Regression Y ON X : Y= mX + b

		Average	303.0	758.0		
1	Slope (m)	1.91345	Linear Equation		r ²	0.97882
2	Intercept (b)	0.02773	Set Point Flow Rate (X) (m ³ /min)	1.133	r	0.9893533
3	Correlation Coefficient (r)	0.99995	Final Set Flow Rate = (I)	0	(Pa/Pstd)*(Tstd/Ta)	0.980910196
Result					C=(Pa/Pstd)*(Tstd/Ta)^0.5	0.990409106

COMMENT

Andersen Instruments, Inc.



Calibrated By

(Mr.Jirayut Seehabut)
Field Environmental

Approved By

(Mr.Jarung Jamnongbut)
Division Manager



บริษัท เอ็นไวร์ เซอร์วิส จำกัด

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD.

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Analyzer Performance Test

Calibrated Date: 7 May 2024

Instruments Information

Analyzer Type: SO2 Analyzer Model: 100A	Manufacturer API S/N: 196
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Calibration System

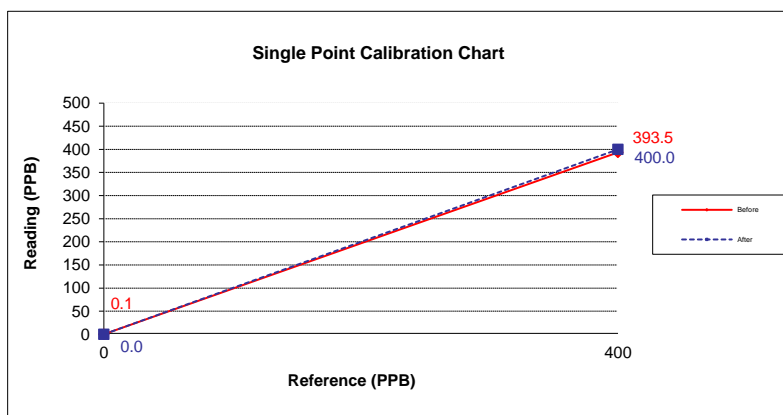
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	393.5	-1.6
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr.PASAGORN SAMOL

Analyzer Performance Test

Calibrated Date: 7 May 2024

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: 42C	Manufacturer Thermo Environmental S/N: 601114763
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

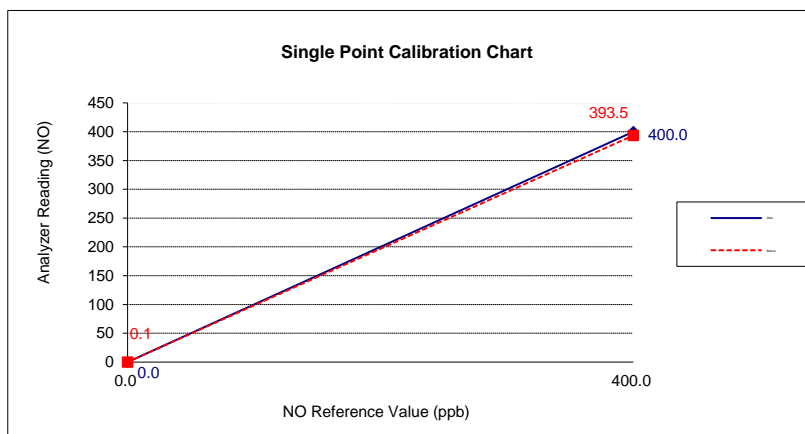
Humidity: 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	393.5	400.0	-1.6
NOx	0.1	0.0	0.1	396.2	400.0	-1.0

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By : Mr. Pasagorn Samol

Calibration Test

Calibrated Date: 27/2/2024

Certificate No. 024/24

Instruments Information

Manufacturer : YOUNG Instrument Type : four blade helicoid propeller
Model : 40C Serial Number : Logger 309018964

Environment : Temperature 25.5 °C Humidity: 51 %RH

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563
: HOOK GAGE NO 1425 : Wind Aloft Plotting Board
N.I.S.T. Test Reference Number 731/241460
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586) JAPAN QUALITY ASSURANCE ORGANIZATION

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO 1425			TESTED ANEMOMETER			
	Pressure inches	Vacuum inches	Pressure hPa	Pressure hPa	Correction hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	-	-	0.9	0.10
3.02	-	-	-	-	-	2.8	0.22
5.04	-	-	-	-	-	4.9	0.14
7.03	-	-	-	-	-	6.8	0.23
9.01	-	-	-	-	-	8.8	0.21
11.03	-	-	-	-	-	10.7	0.33
13.01	-	-	-	-	-	12.6	0.41
15.03	-	-	-	-	-	14.4	0.63
17.05	-	-	-	-	-	16.5	0.55
20.02	-	-	-	-	-	19.4	0.62

Wind Aloft Plotting Board. US. DEPARTMENT OF COMMERCE WEATHER BUREAU			
WIND DIRECTION	TESTED WIND DIRECTION	Deviation	Result
0	0	0	Pass
90	90	0	Pass
180	180	0	Pass
270	270	0	Pass

Calibrate By

MR. KITTISAK JANSANGWATTANA

MR. PASAGORN SAMOL