

SERVICE REPORT
Preventive Maintenance
For

**Continuous Emission Monitoring System
(CEMS)**



EGCO COGENERATION CO., LTD



July, 2022 ^{7th}

JID2200029-006

BY:

PETRO-INSTRUMENTS CORP.,LTD

Received by
WIRASIT GOON
14 / 7 / 2022

PETRO-INSTRUMENTS CORP., LTD.

7/409 Soi Vibhavadi-Rangsit 36, Vibhavadi-Rangsit Rd., Chatuchak, Chatuchak
Bangkok 10900 Thailand
Tel.:(+66) 2939 5711 (12 Lines), (+66) 2513 2333 (12 Lines), Fax. : (+66) 939

SERVICE REPORT

DOC. NUMBER

REPORT DATE

EQUIPMENT:	SERIAL NUMBER / TAG NUMBER	BRAND / MANUFACTURER
CEMs	-	ABB
CUSTOMER NAME: Egco cogeneration	LACATION: Rayong	JOB NUMBER / REQUESTED NUMBER JID2200029-006

REASON FOR VISIT

- Preventive maintenance CEMs unit 11, 12.

FOUND FAILURE & CORRECTIVE ACTION DETAILS

- Operation checked of the gas analyzer all units.
- Checked diagnostic of the gas analyzer all units.
- Checked the sample gas cooler all unit was normal operation.
- Checked the sample gas feed all unit was normal operation.
- Checked the automatic condensate drain was normal operation.
- Checked the sample flow and by pass flow were kept in set point.
- Validate zero and span gas for the gas analyzer was normal response.
- Calibration zero and span gas for the gas analyzer by feed gas direct to the sample gas cooler.
- Replaced new Oxygen sensor P/N: 856666 1pc.(For HRS611)

Standard gas CO supply by PICO

WORK CONCLUSION

WORK CONCLUSION			PARTS REPLACEMENT		
<input checked="" type="checkbox"/> COMPLETED		<input type="checkbox"/> IN COMPLETED	PARTS NAME	P/N	QTY.
<input checked="" type="checkbox"/> CHARGE	<input type="checkbox"/> NO CHARGE				
<input type="checkbox"/> SERVICE FEE	<input type="checkbox"/> PROJECT WARRANTY	<input type="checkbox"/> TAKE TO OFFICE	Oxygen sensor	856666	1 pc.
<input type="checkbox"/> TRAVELLING	<input type="checkbox"/> SERVICE WARRANTY	<input type="checkbox"/> WAIT FOR PARTS			
<input type="checkbox"/> SPARE PARTS	<input type="checkbox"/> PARTS WARRANTY	<input type="checkbox"/> IN PROCESS			
<input type="checkbox"/> OTHER	<input checked="" type="checkbox"/> SERVICE CONTRACT	<input type="checkbox"/> OTHER			

TIME SPENT (HOURS)

TIME SPENT (HOURS)								TOTAL HOURS	TRAVELING DETAILS	
YEAR	2022									
MONTH	7									
DATE	7							TRAVEL BY		
SERVICE TIME	6							6	FROM Pico	
OVERTIME	-							-	TO Rayong	
TRAVELING TIME	4							4	TOTAL ROUND TRIP 1	
TOTAL HOURS	10							10	DISTANCE (KM.) 360	

SERVICE CREW

SERVICE CREW	
NAME	NAME
1. Mr. Phuwanai N.	3.
2. Mr. Chatoetch E.	4.

CUSTOMER'S NAME 1674. N. W. 1000	CUSTOMER'S SIGNATURE 	DATE 8/7/2022
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UNIT 1A



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

SERVICE REPORT

Job No. :	JID2200029-006	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1A
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.345753.3	Telephone :	038-637-051-57 #9241
Working date :	7-July-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1A.
PHYSICAL & FUNCTION CHECK	<p>Sampling system.</p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set point. - Checked the condensate alarm for cut-off pump was normal operation. <p>Gas analyzer</p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition such as temperature, pressure. - Validate zero and span for the gas analyzer found normal responding.
CORRECT ACTION	<p>Gas analyzer</p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	<ul style="list-style-type: none"> - Replaced new Oxygen sensor P/N: 856666 1 pc.
RECOMMENDATION	-

Internal information: ID Warranty.

Gas analyzer (Uras26) : 1360

Gas cooler (SCC-C) : 7703

Gas feed unit (SCC-F) : 7705

NO_x Converter : 7707

Sampling system 1A : 4156



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CHECK BY :	Mr. Phuwanai	DATE :	7-July-2022
APPROVE BY:	Mr. Nadthapong	DATE:	8-July-2022
CUSTOMER SIGN :		DATE :	



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GENERAL CHECK

UNIT NAME :		1SAA-IRK-1A	LOCATION :		HRSG 1
ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	24.7 °C	24.3 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	72 %	53 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	61 l/h	60 l/h	
12	Bypass flow	60 l/h	60 l/h	60 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	500 psi	500 psi	
15	Span gas CO cylinder	> 300 psi	1,350 psi	1,350 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	137.7 °C	137.7 °C	
19	Heated line Bypass	140 °C	137.7 °C	137.7 °C	

CHECK BY : Mr. Phuwana

DATE : 7-July-2022

ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MANUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.345753.3
UNIT NAME :	1SAA-IRK-1A	LOCATION :	HRSG 1

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	85.1 ppm	3-May-2021	3-May-2023	D878337

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.8	4.14	0%	-4%	±30%	Passed
CO@7% 0 - 200 ppm	1.4	-	-	-		
NO _x 0 - 250 ppm	42.3	6.71	3%	21%		Passed
NO _x @7% 0 - 250 ppm	33.9	-	-	-		
O ₂ 0 - 25 Vol%	3.54	6.27	0%	20%		Passed

VALIDATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	-0.2	-0.20	0.10	164.6	163.1	-1.50	0.75	±5.0 %	Passed
NO	0 - 250	ppm	0.0	-2.7	-2.70	1.08	85.1	84.2	-0.90	0.36	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.07	0.07	-0.07	20.95	20.89	-0.06	0.06	±0.5 %	Passed

CALIBRATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.1	0.10	-0.05	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO	0 - 250	ppm	0.0	0.1	0.10	-0.04	85.1	85.1	0.00	0.00	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.4	4.11	0%	-4%	±30%	Passed
CO@7% 0 - 200 ppm	1.1	-	-	-		-
NO _x 0 - 250 ppm	55.2	7.53	0%	0%		Passed
NO _x @7% 0 - 250 ppm	119.0	-	-	-		-
O ₂ 0 - 25 Vol%	14.48	13.27	0%	0%		Passed

* % Error Calculate from percent of range.

CHECK BY : Mr. Phuwanai

DATE : 7-July-2022

UNIT 1B



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SERVICE REPORT

Job No. :	JID2200029-006	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1B
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.387669.9	Telephone :	038-637-051-57 #9241
Working date :	7-July-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1B.
PHYSICAL & FUNCTION CHECK	<p>Sampling system.</p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set-point. - Checked the condensate alarm for cut-off pump was normal operation. <p>Gas analyzer</p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition. - Validate zero and span for the gas analyzer was normal responding.
CORRECT ACTION	<p>Gas analyzer</p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	- No part replacement.
RECOMMENDATION	-

Internal information: ID Warranty.

Sampling system 1B	: 4157
Gas analyzer (Uras26)	: 4723
Gas cooler (SCC-C)	: 7704
Gas feed unit (SCC-F)	: 7706
NO _x Converter	: 7708



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CHECK BY :	Mr. Phuwanaei	DATE :	7-July-2022
APPROVE BY:	Mr. Nadthapong	DATE:	8-July-2022
CUSTOMER SIGN :		DATE :	

GENERAL CHECK

UNIT NAME :	1SAA-IRK-1B	LOCATION :	HRSG 2
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ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	24.8 °C	25.1 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	64 %	53 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	60 l/h	60 l/h	
12	Bypass flow	≈20 l/h	20 l/h	20 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	500 psi	500 psi	
15	Span gas CO cylinder	> 300 psi	1,350 psi	1,350 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	139.4 °C	139.3 °C	
19	Heated line Bypass	140 °C	139.4 °C	139.3 °C	

CHECK BY : Mr. Phuwanai

DATE : 7-July-2022



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ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MANUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.387669.9
UNIT NAME :	1SAA-IRK-1B	LOCATION :	HRS 2

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	85.1 ppm	3-May-2021	3-May-2023	D878337

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	0.9	4.07	-1%	4%	±30%	Passed
CO@7% 0 - 200 ppm	1.9	-	-	-		
NO _x 0 - 250 ppm	41.8	6.68	2%	-3%		Passed
NO _x @7% 0 - 250 ppm	86.6	-	-	-		
O ₂ 0 - 25 Vol%	14.22	13.10	0%	2%		Passed

VALIDATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.1	0.10	-0.05	164.6	164.0	-0.60	0.30	±5.0 %	Passed
NO	0 - 250	ppm	0.0	-3.0	-3.00	1.20	85.1	85.2	0.10	-0.04	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	-0.03	-0.03	0.03	20.95	20.89	-0.06	0.06	±0.5 %	Passed

CALIBRATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.0	0.00	0.00	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO	0 - 250	ppm	0.0	0.0	0.00	0.00	85.1	85.1	0.00	0.00	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.0	4.08	-1%	3%	±30%	Passed
CO@7% 0 - 200 ppm	2.2	-	-	-		-
NO _x 0 - 250 ppm	43.7	6.80	1%	-3%		Passed
NO _x @7% 0 - 250 ppm	94.7	-	-	-		-
O ₂ 0 - 25 Vol%	14.51	13.29	0%	0%		Passed

* % Error Calculate from percent of range.

CHECK BY : Mr. Phuwanai

DATE : 7-July-2022

CERTIFICATE OF STANDARD GAS

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A3300	Reference Number:	82-401076401-1
Cylinder Number:	CC703275	Cylinder Volume:	144.3 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52017	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Dec 28, 2017

Expiration Date: Dec 28, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	160.0 PPM	164.6 PPM	G1	+/- 0.9% NIST Traceable	12/28/2017
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12062228	CC365471	97.56 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	May 25, 2018
ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration		
Nicolet 6700 AHR0801933 CO	FTIR		Dec 08, 2017		

Triad Data Available Upon Request

NOTES:PO# 5217005382

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 2000.02

Approved for Release

Certificate Of Analysis

Special Gases Mixture

Customer Details

Name: EGCO ENGINEERING AND SERVICE Address: 35 T. Huai Pong, A. Muang, Rayong 21150 Customer Tag No.:

Certificate Details

Number: 1742/21 Date of Issue: 3-May-2021 Expiry date: 3-May-2023
 Material Details
 Production Order: 90165329 Material Code: 431600-SV-44 Cylinder No.: D878337
 Gas content: 1.38 M³ Filling pressure: 145.0 bar Valve: CGA 660 SS
 Cylinder Owner: LINDE Cylinder Material: Spectra seal Cylinder Size: 10 L

Laboratory Report**Analytical Result**

Component	Normal Concentration	Analysis Result ¹	Uncertainty ²	Method of Analysis ³	Assay Date
Nitric Oxide	85.0 ppm	85.1 ppm	± 1% relative	(6) I-PB-352	26-Apr & 3-May-21
Other NOx impurity In Nitrogen		Less than 4.2 ppm			

Reference Standard used in Assay

Reference Standard	Cylinder number	Concentration	Expiry date:
Nitric Oxide In Nitrogen	278811SG	51.58± 0.41 ppm	29-Oct-2022

Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
FTIR Spectrometers Nicolet iS50	FTIR-NO	5-Apr-2021

Recommend usage condition

Minimum utilization: 5% of actual content or before expire 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

Page 1 of 1

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บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

เลขที่ใบอนุญาตประกอบธุรกิจ 0107537000785

ชั้น 15 อาคารทาวเวอร์ เอ 2/3 หมู่ 14 ถนนบางนา-ตราด กม. 6.5 แขวงแบริ่ง

อ.บางพลี จ.สมุทรปราการ 10540 โทรศัพท์ (66) 2338-6100 โทรสาร (66) 2338-6333

โรงงานเวลโกรว์: 105 หมู่ 5 ต.บางสนธิ์ อ.บางปะกง จ.ฉะเชิงเทรา 24180

โทรศัพท์ (66) 38.570-479-93

โทรสาร (66) 38.570-323

Sukanya Parinyasoontorn

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

Linde (Thailand) Public Company Limited

PB-002/F006

Iss: J/2, 01 April 2021

PLC Registration no. 0107537000785

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

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

PREVENTIVE MAINTENANCE PLAN

SCHEDULE PLAN FOR PREVENTIVE MAINTENANCE CEMS												
Item	Part name	P/N	Interval	Q.ty	Unit	2022						
						Jan	Feb	Mar	Apr	May	Jun	Jul
	PM Schedule		1 M			X	X	X	X	X	X	X
	Sampling probe											
1	Ceramic filter	IT0001141	1 Y	2	pc				X			
2	Set of gaskets FPM	IT0001152	1 Y	2	set				X			
	Sample gas cooler SCC-C											
3	sealing GL25-12mm (SCC-C)	IT0001830	1 Y	2	pc				X			
4	sealing GL18-8mm (SCC-C)	IT0001831	1 Y	4	pc				X			
5	Driver complete	IT0001823	1 Y	2	pc				X			
6	Flexible tube	IT0001931	3 M	1	Pack	X			X			
	Acid filler unit											
7	Filter element for acid filter	IT0000732	-	4	pc							
8	O-ring 56 x 3. FPM	IT0000777	1 Y	2	pc				X			
	Gas feed unit SCC-F											
9	Spare parts set (for diaphragm pump)	IT0000716	1 Y	2	set							
10	O-ring 60x3.5mm , FPM70	IT0000890	1 Y	2	pc							
11	Filter membrane	IT0001128	-	1	Pack							
	Gas analyzer											
13	Oxygen sensor	IT0000702	1 Y	2	pc							
14	Disposable filter unit	IT0001136	3	4	pc							
15	Viton tube PPM-70-SV 4x1.5	IT0000741	1 Y	4	Meter				X			

กำหนดการเข้าปฏิบัติงานการบำรุงรักษาเชิงป้องกันตามแผน
กำหนดการปฏิบัติงานตามโปรแกรมป้องกันและลดความเสี่ยง

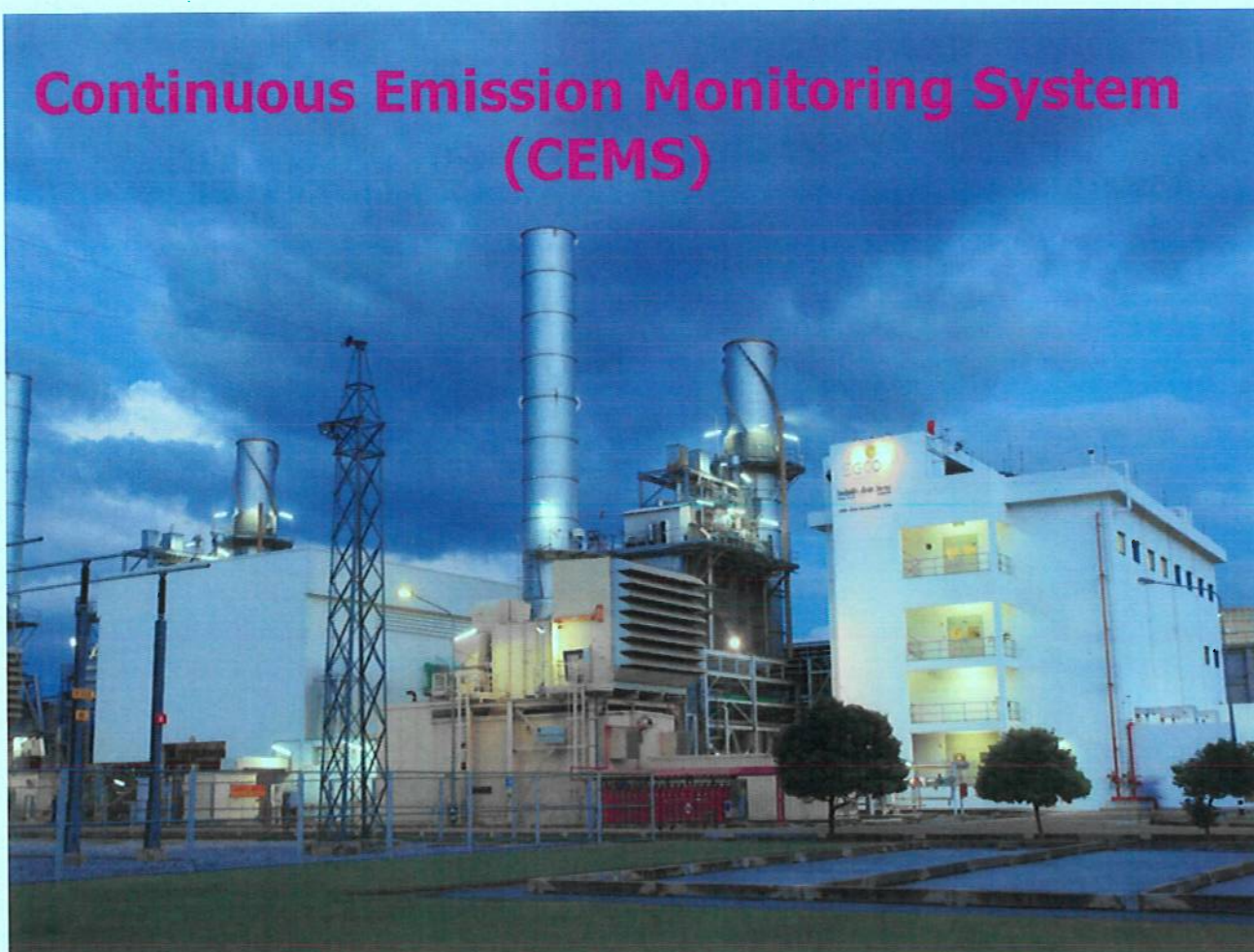


SERVICE REPORT

Preventive Maintenance

For

Continuous Emission Monitoring System (CEMS)



EGCO COGENERATION CO., LTD



August, 2022^{8th}

JID2200029-007

BY:

PETRO-INSTRUMENTS CORP.,LTD

Received by
นันทิวิทย์ งาม
18/08/2022

**PETRO-INSTRUMENTS CORP., LTD.**

7/409 Soi Vibhavadi-Rangsit 36, Vibhavadi-Rangsit Rd., Chatuchak, Chatuchak
Bangkok 10900 Thailand
Tel.:(+66) 2939 5711 (12 Lines), (+66) 2513 2333 (12 Lines), Fax. : (+66) 939

DOC. NUMBER

SERVICE REPORT

REPORT DATE

EQUIPMENT: CEMs	SERIAL NUMBER / TAG NUMBER -	BRAND / MANUFACTURER ABB
CUSTOMER NAME: Egco cogeneration	LACATION: Rayong	JOB NUMBER / REQUESTED NUMBER JID2200029-007

REASON FOR VISIT

- Preventive maintenance CEMs unit 11, 12.

FOUND FAILURE & CORRECTIVE ACTION DETAILS

- Operation checked of the gas analyzer all units.
- Checked diagnostic of the gas analyzer all units.
- Checked the sample gas cooler all unit was normal operation.
- Checked the sample gas feed all unit was normal operation.
- Checked the automatic condensate drain was normal operation.
- Checked the sample flow and by pass flow were kept in set point.
- Validate zero and span gas for the gas analyzer was normal response.
- Calibration zero and span gas for the gas analyzer by feed gas direct to the sample gas cooler.

Standard gas CO supply by PICO

WORK CONCLUSION

<input checked="" type="checkbox"/> COMPLETED		<input type="checkbox"/> IN COMPLETED	PARTS REPLACEMENT		
<input checked="" type="checkbox"/> CHARGE	<input type="checkbox"/> NO CHARGE		PARTS NAME	P/N	QTY.
<input type="checkbox"/> SERVICE FEE	<input type="checkbox"/> PROJECT WARRANTY	<input type="checkbox"/> TAKE TO OFFICE			
<input type="checkbox"/> TRAVELLING	<input type="checkbox"/> SERVICE WARRANTY	<input type="checkbox"/> WAIT FOR PARTS			
<input type="checkbox"/> SPARE PARTS	<input type="checkbox"/> PARTS WARRANTY	<input type="checkbox"/> IN PROCESS			
<input type="checkbox"/> OTHER	<input checked="" type="checkbox"/> SERVICE CONTRACT	<input type="checkbox"/> OTHER			

TIME SPENT (HOURS)

YEAR	2022								TOTAL HOURS	TRAVELING DETAILS	
MONTH	8									TRAVEL BY	
DATE	10								6	FROM	Pico
SERVICE TIME	6p								-	TO	Rayong
OVERTIME	-								4	TOTAL ROUND TRIP	1
TRAVELING TIME	4								10	DISTANCE (KM.)	360
TOTAL HOURS	10										

SERVICE CREW

NAME		NAME	
1. Mr. Phuwanai N.		3.	
2. Mr. Chatpetch F.		4.	

CUSTOMER'S NAME 	CUSTOMER'S SIGNATURE 	DATE 11-08-2022
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UNIT 1A



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

SERVICE REPORT

Job No. :	JID2200029-007	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1A
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.345753.3	Telephone :	038-637-051-57 #9241
Working date :	10-August-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1A.
PHYSICAL & FUNCTION CHECK	<p>Sampling system.</p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set point. - Checked the condensate alarm for cut-off pump was normal operation. <p>Gas analyzer</p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition such as temperature, pressure. - Validate zero and span for the gas analyzer found normal responding.
CORRECT ACTION	<p>Gas analyzer</p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	- No part replacement.
RECOMMENDATION	-

Internal information: ID Warranty.

Gas analyzer (Uras26) : 1360

Gas cooler (SCC-C) : 7703

Gas feed unit (SCC-F) : 7705

NO_x Converter : 7707

Sampling system 1A : 4156



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

CHECK BY :	Mr. Phuwanai	DATE :	10-August-2022
APPROVE BY:	Mr. Nadthapong	DATE:	15-August-2022
CUSTOMER SIGN :		DATE :	



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GENERAL CHECK

UNIT NAME :	1SAA-IRK-1A	LOCATION :	HRSG 1
-------------	-------------	------------	--------

ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	24.7 °C	24.3 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	42 %	53 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	61 l/h	60 l/h	
12	Bypass flow	60 l/h	60 l/h	60 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	500 psi	500 psi	
15	Span gas CO cylinder	> 300 psi	1,350 psi	1,350 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	137.7 °C	137.7 °C	
19	Heated line Bypass	140 °C	137.7 °C	137.7 °C	

CHECK BY : Mr. Phuwanai

DATE : 10-August-2022

ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MANUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.345753.3
UNIT NAME :	1SAA-IRK-1A	LOCATION :	HRSG 1

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	85.1 ppm	3-May-2021	3-May-2023	D878337

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.7	4.14	0%	-2%	±30%	Passed
CO@7% 0 - 200 ppm	3.5	-	-	-		
NO _x 0 - 250 ppm	41.3	6.64	2%	14%		Passed
NO _x @7% 0 - 250 ppm	86.0	-	-	-		
O ₂ 0 - 25 Vol%	14.25	13.12	0%	3%		Passed

VALIDATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.8	0.80	-0.40	164.6	163.0	-1.60	0.80	±5.0 %	Passed
NO	0 - 250	ppm	0.0	-2.0	-2.00	0.80	85.1	84.2	-0.90	0.36	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.05	0.05	-0.05	20.95	20.89	-0.06	0.06	±0.5 %	Passed

CALIBRATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.1	0.10	-0.05	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO	0 - 250	ppm	0.0	0.1	0.10	-0.04	85.1	85.1	0.00	0.00	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	0.9	4.07	0%	5%	±30%	Passed
CO@7% 0 - 200 ppm	1.9	-	-	-		-
NO _x 0 - 250 ppm	57.7	7.69	0%	0%		Passed
NO _x @7% 0 - 250 ppm	125.2	-	-	-		-
O ₂ 0 - 25 Vol%	14.52	13.29	0%	0%		Passed

* % Error Calculate from percent of range.

CHECK BY :	Mr. Phuwanai
DATE :	10-August-2022

UNIT 1B

SERVICE REPORT

Job No. :	JID2200029-007	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1B
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.387669.9	Telephone :	038-637-051-57 #9241
Working date :	10-August-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1B.
PHYSICAL & FUNCTION CHECK	<p><u>Sampling system.</u></p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set-point. - Checked the condensate alarm for cut-off pump was normal operation. <p><u>Gas analyzer</u></p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition. - Validate zero and span for the gas analyzer was normal responding.
CORRECT ACTION	<p><u>Gas analyzer</u></p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	- No part replacement.
RECOMMENDATION	-

Internal information: ID Warranty.

Sampling system 1B	: 4157
Gas analyzer (Uras26)	: 4723
Gas cooler (SCC-C)	: 7704
Gas feed unit (SCC-F)	: 7706
NO _x Converter	: 7708



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

CHECK BY :	Mr. Phuwanai	DATE :	10-August-2022
APPROVE BY:	Mr. Nadthapong	DATE:	15-August-2022
CUSTOMER SIGN :		DATE :	



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GENERAL CHECK

UNIT NAME :		1SAA-IRK-1B	LOCATION :		HRSG 2
ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	24.8 °C	25.1 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	64 %	53 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	60 l/h	60 l/h	
12	Bypass flow	≈20 l/h	20 l/h	20 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	500 psi	450 psi	
15	Span gas CO cylinder	> 300 psi	1,350 psi	1,350 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	139.4 °C	139.3 °C	
19	Heated line Bypass	140 °C	139.4 °C	139.3 °C	

CHECK BY : Mr. Phuwanai

DATE : 10-August-2022



PETRO - INSTRUMENTS CORP., LTD.

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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MANUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.387669.9
UNIT NAME :	1SAA-IRK-1B	LOCATION :	HRS 2

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	85.1 ppm	3-May-2021	3-May-2023	D878337

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.0	4.08	-1%	3%	±30%	Passed
CO@7% 0 - 200 ppm	2.2	-	-	-		
NO _x 0 - 250 ppm	40.2	6.57	1%	-3%		Passed
NO _x @7% 0 - 250 ppm	89.0	-	-	-		
O ₂ 0 - 25 Vol%	14.65	13.38	0%	0%		Passed

VALIDATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.1	0.10	-0.05	164.6	164.0	-0.60	0.30	±5.0 %	Passed
NO	0 - 250	ppm	0.0	-0.8	-0.80	0.32	85.1	85.2	0.10	-0.04	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	-0.03	-0.03	0.03	20.95	20.92	-0.03	0.03	±0.5 %	Passed

CALIBRATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.0	0.00	0.00	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO	0 - 250	ppm	0.0	0.0	0.00	0.00	85.1	85.1	0.00	0.00	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.4	4.11	-1%	-2%	±30%	Passed
CO@7% 0 - 200 ppm	3.1	-	-	-		-
NO _x 0 - 250 ppm	37.7	6.41	1%	-3%		Passed
NO _x @7% 0 - 250 ppm	82.8	-	-	-		-
O ₂ 0 - 25 Vol%	14.60	13.34	0%	0%		Passed

* % Error Calculate from percent of range.

CHECK BY : Mr. Phuwanai

DATE : 10-August-2022

CERTIFICATE OF STANDARD GAS

Certificate Of Analysis

Special Gases Mixture

Customer Details

Name: EGCO ENGINEERING AND SERVICE Address: 35 T. Huai Pong, A. Muang, Rayong 21150 Customer Tag No.:

Certificate Details

Number: 1742/21 Date of Issue: 3-May-2021 Expiry date: 3-May-2023
 Material Details
 Production Order: 90165329 Material Code: 431600-SV-44 Cylinder No.: D878337
 Gas content: 1.38 M³ Filling pressure: 145.0 bar Valve: CGA 660 SS
 Cylinder Owner: LINDE Cylinder Material: Spectra seal Cylinder Size: 10 L

Laboratory Report**Analytical Result**

Component	Normal Concentration	Analysis Result ¹	Uncertainty ²	Method of Analysis ³	Assay Date
Nitric Oxide	85.0 ppm	85.1 ppm	± 1% relative	(6) I-PB-352	26-Apr & 3-May-21
Other NOx impurity In Nitrogen		Less than 4.2 ppm			

Reference Standard used in Assay

Reference Standard	Cylinder number	Concentration	Expiry date:
Nitric Oxide In Nitrogen	278811SG	51.58 ± 0.41 ppm	29-Oct-2022

Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
FTIR Spectrometers Nicolet iS50	FTIR-NO	5-Apr-2021

Recommend usage condition

Minimum utilization: 5% of actual content or before expire 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

Page 1 of 1

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บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

เลขที่ใบอนุญาตประกอบธุรกิจ 0107537000785

ชั้น 15 อาคารทาวเวอร์ เอ 2/3 หมู่ 14 ถนนพหลโยธิน-ตราด กม. 6.5 บางนา-ตราด

อ.บางพลี จ.สมุทรปราการ 10540 โทรศัพท์ (66) 2338-6100 โทรสาร (66) 2338-6333

โรงงานผลิต: 105 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 24180

โทรศัพท์ (66) 38.570-479-93

โทรสาร (66) 38.570-323

Sukanya Parinyasoonorn

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

Linde (Thailand) Public Company Limited

Iss: J/2, 01 April 2021

PLC Registration no. 0107537000785

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

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

PB-002/F006

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A3300	Reference Number:	82-401076401-1
Cylinder Number:	CC703275	Cylinder Volume:	144.3 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52017	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Dec 28, 2017

Expiration Date: Dec 28, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	160.0 PPM	164.6 PPM	G1	+/- 0.9% NIST Traceable	12/28/2017
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12062228	CC365471	97.56 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	May 25, 2018

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801933 CO	FTIR	Dec 08, 2017

Triad Data Available Upon Request

NOTES:PO# 5217005382

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



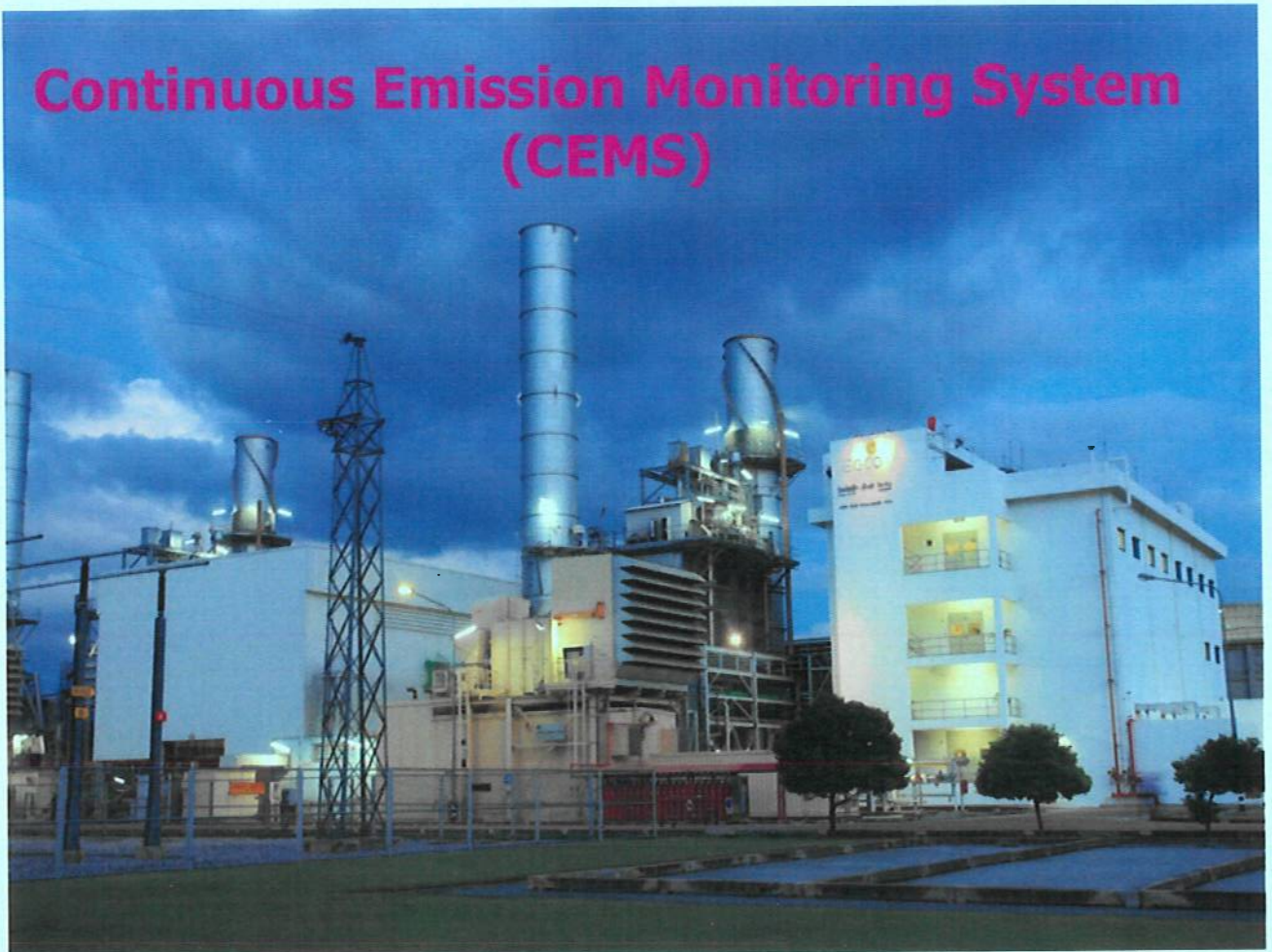
TESTING CERT No. 2000.02

Approved for Release

PREVENTIVE MAINTENANCE PLAN

SERVICE REPORT
Preventive Maintenance
For

**Continuous Emission Monitoring System
(CEMS)**



EGCO COGENERATION CO., LTD



September, 2022^{9th}

JID2200029-008

BY:

PETRO-INSTRUMENTS CORP.,LTD

Received by
Nirong 9001
15/09/2022

**PETRO-INSTRUMENTS CORP., LTD.**

7/409 Soi Vibhavadi-Rangsit 36, Vibhavadi-Rangsit Rd., Chatuchak, Chatuchak
Bangkok 10900 Thailand
Tel.:(+66) 2939 5711 (12 Lines), (+66) 2513 2333 (12 Lines), Fax. : (+66) 939

SERVICE REPORT

DOC. NUMBER

REPORT DATE

EQUIPMENT: CEMs	SERIAL NUMBER / TAG NUMBER -	BRAND / MANUFACTURER ABB
CUSTOMER NAME: Egco cogeneration	LACATION: Rayong	JOB NUMBER / REQUESTED NUMBER JID2200029-008

REASON FOR VISIT

- Preventive maintenance CEMs unit 11, 12.

FOUND FAILURE & CORRECTIVE ACTION DETAILS

- Operation checked of the gas analyzer all units.
- Checked diagnostic of the gas analyzer all units.
- Checked the sample gas cooler all unit was normal operation.
- Checked the sample gas feed all unit was normal operation.
- Checked the automatic condensate drain was normal operation.
- Checked the sample flow and by pass flow were kept in set point.
- Validate zero and span gas for the gas analyzer was normal response.
- Calibration zero and span gas for the gas analyzer by feed gas direct to the sample gas cooler.

Standard gas CO supply by PICO

WORK CONCLUSION

<input checked="" type="checkbox"/> COMPLETED		<input type="checkbox"/> IN COMPLETED	PARTS REPLACEMENT		
<input checked="" type="checkbox"/> CHARGE	<input type="checkbox"/> NO CHARGE		PARTS NAME	P/N	QTY.
<input type="checkbox"/> SERVICE FEE	<input type="checkbox"/> PROJECT WARRANTY	<input type="checkbox"/> TAKE TO OFFICE			
<input type="checkbox"/> TRAVELLING	<input type="checkbox"/> SERVICE WARRANTY	<input type="checkbox"/> WAIT FOR PARTS			
<input type="checkbox"/> SPARE PARTS	<input type="checkbox"/> PARTS WARRANTY	<input type="checkbox"/> IN PROCESS			
<input type="checkbox"/> OTHER	<input checked="" type="checkbox"/> SERVICE CONTRACT	<input type="checkbox"/> OTHER			

TIME SPENT (HOURS)

YEAR	2022								TOTAL HOURS	TRAVELING DETAILS	
MONTH	9									TRAVEL BY	
DATE	6								6	FROM	Pico
SERVICE TIME	6								-	TO	Rayong
OVERTIME	-								4	TOTAL ROUND TRIP	1
TRAVELING TIME	4								10	DISTANCE (KM.)	360
TOTAL HOURS	10										

SERVICE CREW

NAME		NAME	
1. Mr. Phuwanai N.		3.	
2.		4.	

CUSTOMER'S NAME 	CUSTOMER'S SIGNATURE 	DATE 6/09/2022
--	--	-------------------

UNIT 1A



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7/409 Soi Vibhavadi-Rangsit 36 Vibhavadi-Rangsit Rd., Chatuchak, Bangkok 10900, Thailand

TEL: (662) 939 5711 (12 Lines), 513 2333 (12 Lines), 513 9575-9 FAX: (662) 939 4207

http : // www.pico.co.th E-mail-address : combustion@pico.co.th

SERVICE REPORT

Job No. :	JID2200029-008	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1A
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.345753.3	Telephone :	038-637-051-57 #9241
Working date :	6-September-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1A.
PHYSICAL & FUNCTION CHECK	<p>Sampling system.</p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set point. - Checked the condensate alarm for cut-off pump was normal operation. <p>Gas analyzer</p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition such as temperature, pressure. - Validate zero and span for the gas analyzer found normal responding.
CORRECT ACTION	<p>Gas analyzer</p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	- No part replacement.
RECOMMENDATION	-

Internal information: ID Warranty.

Gas analyzer (Uras26) : 1360

Gas cooler (SCC-C) : 7703

Gas feed unit (SCC-F) : 7705

NO_x Converter : 7707

Sampling system 1A : 4156



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

CHECK BY :	Mr. Phuwanai	DATE :	6-September-2022
APPROVE BY:	Mr. Nadthapong	DATE:	8-September-2022
CUSTOMER SIGN :		DATE :	



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

GENERAL CHECK

UNIT NAME :		1SAA-IRK-1A	LOCATION :		HRSG 1
ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	23.7 °C	24.4 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	60 %	62 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	61 l/h	60 l/h	
12	Bypass flow	60 l/h	60 l/h	60 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	400 psi	400 psi	
15	Span gas CO cylinder	> 300 psi	1,350 psi	1,350 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	137.7 °C	137.7 °C	
19	Heated line Bypass	140 °C	137.7 °C	137.7 °C	

CHECK BY :

Mr. Phuwanai

DATE :

6-September-2022

ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MANUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.345753.3
UNIT NAME :	1SAA-IRK-1A	LOCATION :	HRS 1

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	85.1 ppm	3-May-2021	3-May-2023	D878337

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.7	4.14	1%	-5%	±30%	Passed
CO@7% 0 - 200 ppm	3.7	-	-	-		
NO _x 0 - 250 ppm	39.2	6.51	2%	16%		Passed
NO _x @7% 0 - 250 ppm	84.9	-	-	-		
O ₂ 0 - 25 Vol%	14.51	13.29	0%	3%		Passed

VALIDATION RESULT											
Parameter		Zero				Span				% Error Acceptance	Note
		Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200 ppm	0.0	0.1	0.10	-0.05	164.6	164.1	-0.50	0.25	±5.0 %	Passed
NO	0 - 250 ppm	0.0	-0.4	-0.40	0.16	85.1	84.6	-0.50	0.20	±2.5 %	Passed
O ₂	0 - 25 Vol%	0.00	0.02	0.02	-0.02	20.95	20.90	-0.05	0.05	±0.5 %	Passed

CALIBRATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.1	0.10	-0.05	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO	0 - 250	ppm	0.0	0.1	0.10	-0.04	85.1	85.1	0.00	0.00	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.5	4.12	1%	-7%	±30%	Passed
CO@7% 0 - 200 ppm	3.2	-	-	-		-
NO _x 0 - 250 ppm	51.6	7.30	0%	0%		Passed
NO _x @7% 0 - 250 ppm	115.7	-	-	-		-
O ₂ 0 - 25 Vol%	14.73	13.43	0%	0%		Passed

* % Error Calculate from percent of range.

CHECK BY :	Mr. Phuwanai
DATE :	6-September-2022

UNIT 1B



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

SERVICE REPORT

Job No. :	JID2200029-008	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1B
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.387669.9	Telephone :	038-637-051-57 #9241
Working date :	6-September-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1B.
PHYSICAL & FUNCTION CHECK	<p><u>Sampling system.</u></p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set-point. - Checked the condensate alarm for cut-off pump was normal operation. <p><u>Gas analyzer</u></p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition. - Validate zero and span for the gas analyzer was normal responding.
CORRECT ACTION	<p><u>Gas analyzer</u></p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	- No part replacement.
RECOMMENDATION	-

Internal information: ID Warranty.

Sampling system 1B : 4157
 Gas analyzer (Uras26) : 4723
 Gas cooler (SCC-C) : 7704
 Gas feed unit (SCC-F) : 7706
 NO_x Converter : 7708



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CHECK BY :	Mr. Phuwanai	DATE :	6-September-2022
APPROVE BY:	Mr. Nadthapong	DATE:	8-September-2022
CUSTOMER SIGN :		DATE :	



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GENERAL CHECK

UNIT NAME :	1SAA-IRK-1B	LOCATION :	HRSG 2
-------------	-------------	------------	--------

ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	24.3 °C	25.1 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	73 %	53 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	60 l/h	60 l/h	
12	Bypass flow	≈20 l/h	20 l/h	20 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	400 psi	400 psi	
15	Span gas CO cylinder	> 300 psi	1,350 psi	1,350 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	139.4 °C	139.3 °C	
19	Heated line Bypass	140 °C	139.4 °C	139.3 °C	

CHECK BY :

Mr. Phuwanai

DATE :

6-September-2022

ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MENUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.387669.9
UNIT NAME :	1SAA-IRK-1B	LOCATION :	HRSR 2

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	85.1 ppm	3-May-2021	3-May-2023	D878337

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.4	4.11	-1%	3%	±30%	Passed
CO@7% 0 - 200 ppm	3.2	-	-	-		
NO _x 0 - 250 ppm	39.0	6.50	1%	-3%		Passed
NO _x @7% 0 - 250 ppm	88.2	-	-	-		
O ₂ 0 - 25 Vol%	14.78	13.46	0%	0%		Passed

VALIDATION RESULT											
Parameter		Zero				Span				% Error Acceptance	Note
		Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200 ppm	0.0	-0.1	-0.10	0.05	164.6	164.2	-0.40	0.20	±5.0 %	Passed
NO	0 - 250 ppm	0.0	0.1	0.10	-0.04	85.1	85.2	0.10	-0.04	±2.5 %	Passed
O ₂	0 - 25 Vol%	0.00	0.02	0.02	-0.02	20.95	20.92	-0.03	0.03	±0.5 %	Passed

CALIBRATION RESULT											
Parameter		Zero				Span				% Error Acceptance	Note
		Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200 ppm	0.0	0.0	0.00	0.00	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO	0 - 250 ppm	0.0	0.0	0.00	0.00	85.1	85.1	0.00	0.00	±2.5 %	Passed
O ₂	0 - 25 Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.2	4.10	-1%	-2%	±30%	Passed
CO@7% 0 - 200 ppm	2.7	-	-	-		-
NO _x 0 - 250 ppm	40.1	6.57	1%	-3%		Passed
NO _x @7% 0 - 250 ppm	89.9	-	-	-		-
O ₂ 0 - 25 Vol%	14.73	13.43	0%	0%		Passed

* % Error Calculate from percent of range.

CHECK BY :	Mr. Phuwanai
DATE :	6-September-2022

CERTIFICATE OF STANDARD GAS

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A3300	Reference Number:	82-401076401-1
Cylinder Number:	CC703275	Cylinder Volume:	144.3 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52017	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Dec 28, 2017

Expiration Date: Dec 28, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	160.0 PPM	164.6 PPM	G1	+/- 0.9% NIST Traceable	12/28/2017
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12062228	CC365471	97.56 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	May 25, 2018

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801933 CO	FTIR	Dec 08, 2017

Triad Data Available Upon Request

NOTES:PO# 5217005382

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 2000.02


Approved for Release

Certificate Of Analysis

Special Gases Mixture

Customer Details

Name: EGCO ENGINEERING AND SERVICE Address: 35 T. Huai Pong, A. Muang, Rayong 21150 Customer Tag No.:

Certificate Details

Number:	1742/21	Date of Issue:	3-May-2021	Expiry date:	3-May-2023
Material Details					
Production Order:	90165329	Material Code:	431600-SV-44	Cylinder No.:	D878337
Gas content:	1.38 M ³	Filling pressure:	145.0 bar	Valve:	CGA 660 SS
Cylinder Owner:	LINDE	Cylinder Material:	Spectra seal	Cylinder Size:	10 L

Laboratory Report

Analytical Result

Component	Nominal Concentration	Analysis Result ¹	Uncertainty ²	Method of Analysis ³	Assay Date
Nitric Oxide	85.0 ppm	85.1 ppm	± 1% relative	(6) I-PB-352	26-Apr & 3-May-21
Other NOx impurity In Nitrogen		Less than 4.2 ppm			

Reference Standard
Nitric Oxide
In Nitrogen

Reference Standard used in Assay

Cylinder number	Concentration	Expiry date:
278811SG	51.58± 0.41 ppm	29-Oct-2022

Instrument/Make/Model
FTIR Spectrometers Nicolet iS50

Analytical Instruments used in Assay

Analytical Principle
FTIR-NO

Last Multipoint Calibration
5-Apr-2021

Recommend usage condition

Minimum utilization: 5% of actual content or before expire 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

Page 1 of 1

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บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

เลขที่ใบอนุญาตประกอบธุรกิจ 0107537000785

ชั้น 15 อาคารทาวเวอร์ 2/3 หมู่ 14 ถนนพหลโยธิน-ตราด กม. 6.5 แขวงคลอง

อ.บางพลี จ.สมุทรปราการ 10540 โทรศัพท์ (66) 2338-6100 โทรสาร (66) 2338-6333

โรงงานผลิตก๊าซ: 105 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 24180

โทรศัพท์ (66) 38.570-479-93

โทรสาร (66) 38.570-323

Sukanya Parinyasoonorn

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

Linde (Thailand) Public Company Limited

PB-002/F006
Iss: 2, 01 April 2021

PLC Registration no. 0107537000785

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

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

Thailand, Tel (66) 38.570-479-93

Fax (66) 38.570-323

PREVENTIVE MAINTENANCE PLAN

SCHEDULE PLAN FOR PREVENTIVE MAINTENANCE CEMS												
Item	Part name	P/N	Interval	Qty	Unit	2022						
						Jan	Feb	Mar	Apr	May	Jun	Jul
			1 M									
	PMT Schedule											
	Sampling probe											
1	Ceramic filter	IT0001141	1 Y	2	pc							
2	Set of gaskets FPM	IT0001152	1 Y	2	set							
	Sample gas cooler SCC-C											
3	scaling GL25-12mm (SCC-C)	IT0001830	1 Y	2	pc							
4	scaling GL18-8mm (SCC-C)	IT0001831	1 Y	4	pc							
5	Driver complete	IT0001823	1 Y	2	pc							
6	Flexible tube	IT0001931	3 M	1	Pack							
	Acid filter unit											
7	Filter element for acid filter	IT0000732	•	4	pc							
8	O-ring 56 x 3, FPM	IT0000777	1 Y	2	pc							
	Gas feed unit SCC-F											
9	Spare parts set (for diaphragm pump)	IT0000716	1 Y	2	set							
10	O-ring 60x3,5mm , FPM70	IT0000800	1 Y	2	pc							
11	Filter membrane	IT0001128	•	1	Pack							
	Gas analyzer											
13	Oxygen sensor	IT0000702	1 Y	2	pc							
14	Disposable filter unit	IT0001136	3	4	pc							
15	Viton tube FPM-70-SW 4x1,5	IT0000741	1 Y	4	Meer							

กำหนดการซ่อมบำรุงการปฏิบัติงานตามแผน
กำหนดการเปลี่ยนวัสดุสิ้นเปลืองตามแผนและรายการ



บริษัท เพปิโก-อินสตรูเมนต์ จำกัด

SERVICE REPORT

Preventive Maintenance

For

Continuous Emission Monitoring System (CEMS)



EGCO COGENERATION CO., LTD



October, 2022^{10th}

JID2200029-009

BY:

PETRO-INSTRUMENTS CORP.,LTD

**PETRO-INSTRUMENTS CORP., LTD.**

7/409 Soi Vibhavadi-Rangsit 36, Vibhavadi-Rangsit Rd., Chatuchak, Bangkok 10900 Thailand

Tel.:(+66) 2939 5711 (12 Lines), (+66) 2513 2333 (12 Lines), Fax. : (+66) 939

SERVICE REPORT

DOC. NUMBER

REPORT DATE

EQUIPMENT:	SERIAL NUMBER / TAG NUMBER	BRAND / MANUFACTURER
CEMs	-	ABB
CUSTOMER NAME:	LOCATION:	JOB NUMBER / REQUESTED NUMBER
Egco cogeneration	Rayong	JID2200029-009

REASON FOR VISIT

- Preventive maintenance CEMs unit 11, 12.

FOUND FAILURE & CORRECTIVE ACTION DETAILS

- Operation checked of the gas analyzer all units.
- Checked diagnostic of the gas analyzer all units.
- Checked the sample gas cooler all unit was normal operation.
- Checked the sample gas feed all unit was normal operation.
- Checked the automatic condensate drain was normal operation.
- Checked the sample flow and by pass flow were kept in set point.
- Validate zero and span gas for the gas analyzer was normal response.
- Calibration zero and span gas for the gas analyzer by feed gas direct to the sample gas cooler.

Standard gas CO supply by PICO

WORK CONCLUSION

<input checked="" type="checkbox"/> COMPLETED		<input type="checkbox"/> IN COMPLETED	PARTS REPLACEMENT		
<input checked="" type="checkbox"/> CHARGE	<input type="checkbox"/> NO CHARGE		PARTS NAME	P/N	QTY.
<input type="checkbox"/> SERVICE FEE	<input type="checkbox"/> PROJECT WARRANTY	<input type="checkbox"/> TAKE TO OFFICE			
<input type="checkbox"/> TRAVELLING	<input type="checkbox"/> SERVICE WARRANTY	<input type="checkbox"/> WAIT FOR PARTS			
<input type="checkbox"/> SPARE PARTS	<input type="checkbox"/> PARTS WARRANTY	<input type="checkbox"/> IN PROCESS			
<input type="checkbox"/> OTHER	<input checked="" type="checkbox"/> SERVICE CONTRACT	<input type="checkbox"/> OTHER			

TIME SPENT (HOURS)

YEAR	2022									TOTAL HOURS	TRAVELING DETAILS	
MONTH	10										TRAVEL BY	
DATE	4									6	FROM	Pico
SERVICE TIME	6									-	TO	Rayong
OVERTIME	-									4	TOTAL ROUND TRIP	1
TRAVELING TIME	4									10	DISTANCE (KM.)	360
TOTAL HOURS	10											

SERVICE CREW

NAME		NAME	
1. Mr. Phuwanai N.		3.	
2.		4.	

CUSTOMER'S NAME	CUSTOMER'S SIGNATURE	DATE
Mr. Wintanai 999		4/10/22

UNIT 1A



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SERVICE REPORT

Job No. :	JID2200029-009	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1A
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.345753.3	Telephone :	038-637-051-57 #9241
Working date :	4-October-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1A.
PHYSICAL & FUNCTION CHECK	<p>Sampling system.</p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set point. - Checked the condensate alarm for cut-off pump was normal operation. <p>Gas analyzer</p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition such as temperature, pressure. - Validate zero and span for the gas analyzer found normal responding.
CORRECT ACTION	<p>Gas analyzer</p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	- No part replacement.
RECOMMENDATION	- Must be providing new cylinder of standard gas NO because is nearly empty.

Internal information: ID Warranty.

Gas analyzer (Uras26) : 1360
 Gas cooler (SCC-C) : 7703
 Gas feed unit (SCC-F) : 7705
 NO_x Converter : 7707
 Sampling system 1A : 4156



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

CHECK BY :	Mr. Phuwanai	DATE :	4-October-2022
APPROVE BY:	Mr. Nadthapong	DATE:	7-October-2022
CUSTOMER SIGN :		DATE :	

GENERAL CHECK

UNIT NAME :	1SAA-IRK-1A	LOCATION :	HRSG 11
-------------	-------------	------------	---------

ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	20.7 °C	24.7 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	33 %	50 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	61 l/h	60 l/h	
12	Bypass flow	60 l/h	60 l/h	60 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	300 psi	300 psi	Recommend
15	Span gas CO cylinder	> 300 psi	1,350 psi	1,350 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	137.7 °C	137.7 °C	
19	Heated line Bypass	140 °C	137.7 °C	137.7 °C	

CHECK BY : Mr. Phuwanai

DATE : 4-October-2022

ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MENUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.345753.3
UNIT NAME :	1SAA-IRK-1A	LOCATION :	HRS 1

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	85.1 ppm	3-May-2021	3-May-2023	D878337

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	7.7	4.62	1%	-7%	±30%	Passed
CO@7% 0 - 200 ppm	15.8	-	-	-		
NO _x 0 - 250 ppm	38.4	6.46	3%	15%		Passed
NO _x @7% 0 - 250 ppm	78.8	-	-	-		
O ₂ 0 - 25 Vol%	14.15	13.06	0%	3%		Passed

VALIDATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.2	0.20	-0.10	164.6	164.1	-0.50	0.25	±5.0 %	Passed
NO	0 - 250	ppm	0.0	-0.1	-0.10	0.04	85.1	84.6	-0.50	0.20	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.02	0.02	-0.02	20.95	20.90	-0.05	0.05	±0.5 %	Passed

CALIBRATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.0	0.00	0.00	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO	0 - 250	ppm	0.0	0.0	0.00	0.00	85.1	85.1	0.00	0.00	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.1	4.09	1%	-5%	±30%	Passed
CO@7% 0 - 200 ppm	2.3	-	-	-		-
NO _x 0 - 250 ppm	55.0	7.52	0%	0%		Passed
NO _x @7% 0 - 250 ppm	119.7	-	-	-		-
O ₂ 0 - 25 Vol%	14.54	13.31	0%	0%		Passed

* % Error Calculate from percent of range.

CHECK BY : Mr. Phuwani

DATE : 4-October-2022

UNIT 1B



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SERVICE REPORT

Job No. :	JID2200029-009	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1B
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.387669.9	Telephone :	038-637-051-57 #9241
Working date :	4-October-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1B.
PHYSICAL & FUNCTION CHECK	<p><u>Sampling system.</u></p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set-point. - Checked the condensate alarm for cut-off pump was normal operation. <p><u>Gas analyzer</u></p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition. - Validate zero and span for the gas analyzer was normal responding.
CORRECT ACTION	<p><u>Gas analyzer</u></p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	- No part replacement.
RECOMMENDATION	- Must be providing new cylinder of standard gas NO because is nearly empty.

Internal information: ID Warranty.

Sampling system 1B	: 4157
Gas analyzer (Uras26)	: 4723
Gas cooler (SCC-C)	: 7704
Gas feed unit (SCC-F)	: 7706
NO _x Converter	: 7708



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

CHECK BY :	Mr. Phuwanai	DATE :	4-October-2022
APPROVE BY:	Mr. Nadthapong	DATE:	7-October-2022
CUSTOMER SIGN :		DATE :	



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GENERAL CHECK

UNIT NAME :	1SAA-IRK-1B	LOCATION :	HRSG 12
-------------	-------------	------------	---------

ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	24.3 °C	25.1 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	72 %	58 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	60 l/h	60 l/h	
12	Bypass flow	≈20 l/h	20 l/h	20 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	300 psi	300 psi	Recommend
15	Span gas CO cylinder	> 300 psi	1,350 psi	1,350 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	139.4 °C	139.3 °C	
19	Heated line Bypass	140 °C	139.4 °C	139.3 °C	

CHECK BY : Mr. Phuwanai

DATE : 4-October-2022



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MENUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.387669.9
UNIT NAME :	1SAA-IRK-1B	LOCATION :	HRS G 2

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	85.1 ppm	3-May-2021	3-May-2023	D878337

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE

Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	1.0	4.08	-1%	3%	±30%	Passed
CO@7% 0 - 200 ppm	2.2	-	-	-		
NO _x 0 - 250 ppm	42.6	6.73	1%	-3%		Passed
NO _x @7% 0 - 250 ppm	91.9	-	-	-		
O ₂ 0 - 25 Vol%	14.48	13.27	0%	-1%		Passed

VALIDATION RESULT

Parameter	Zero				Span				% Error Acceptance	Note
	Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO 0 - 200 ppm	0.0	-0.1	-0.10	0.05	164.6	164.8	0.20	-0.10	±5.0 %	Passed
NO 0 - 250 ppm	0.0	0.1	0.10	-0.04	85.1	84.9	-0.20	0.08	±2.5 %	Passed
O ₂ 0 - 25 Vol%	0.00	0.02	0.02	-0.02	20.95	20.92	-0.03	0.03	±0.5 %	Passed

CALIBRATION RESULT

Parameter	Zero				Span				% Error Acceptance	Note
	Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO 0 - 200 ppm	0.0	0.0	0.00	0.00	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO 0 - 250 ppm	0.0	0.0	0.00	0.00	85.1	85.1	0.00	0.00	±2.5 %	Passed
O ₂ 0 - 25 Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE

Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	0.9	4.07	-1%	-2%	±30%	Passed
CO@7% 0 - 200 ppm	1.9	-	-	-		-
NO _x 0 - 250 ppm	41.8	6.68	1%	-3%		Passed
NO _x @7% 0 - 250 ppm	90.5	-	-	-		-
O ₂ 0 - 25 Vol%	14.51	13.29	0%	0%		Passed

* % Error Calculate from percent of range.

CHECK BY : Mr. Phuwanai

DATE : 4-October-2022

CERTIFICATE OF STANDARD GAS

Certificate Of Analysis

Special Gases Mixture

Customer Details

Name: EGCO ENGINEERING AND SERVICE Address: 35 T. Huai Pong, A. Muang, Rayong 21150 Customer Tag No.:

Certificate Details

Number: 1742/21 Date of Issue: 3-May-2021 Expiry date: 3-May-2023
 Material Details
 Production Order: 90165329 Material Code: 431600-SV-44 Cylinder No.: D878337
 Gas content: 1.38 M³ Filling pressure: 145.0 bar Valve: CGA 660 SS
 Cylinder Owner: LINDE Cylinder Material: Spectra seal Cylinder Size: 10 L

Laboratory Report

Analytical Result

Component	Normal Concentration	Analysis Result ¹	Uncertainty ²	Method of Analysis ³	Assay Date
Nitric Oxide	85.0 ppm	85.1 ppm	± 1% relative	(6) I-PB-352	26-Apr & 3-May-21
Other NOx impurity In Nitrogen		Less than 4.2 ppm			

Reference Standard used in Assay

Reference Standard	Cylinder number	Concentration	Expiry date:
Nitric Oxide In Nitrogen	278811SG	51.58± 0.41 ppm	29-Oct-2022

Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
FTIR Spectrometers Nicolet iS50	FTIR-NO	5-Apr-2021

Recommend usage condition

Minimum utilization: 5% of actual content or before expire 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 Parinyasoontorn

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

PB-002/F006

Linde (Thailand) Public Company Limited Iss: j/2, 01 April 2021

P.L.C. Registration no. 0107537000785

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

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

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A3300	Reference Number:	82-401076401-1
Cylinder Number:	CC703275	Cylinder Volume:	144.3 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52017	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Dec 28, 2017

Expiration Date: Dec 28, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	160.0 PPM	164.6 PPM	G1	+/- 0.9% NIST Traceable	12/28/2017
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12062228	CC365471	97.56 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	May 25, 2018
ANALYTICAL EQUIPMENT					
Instrument/Make/Model		Analytical Principle		Last Multipoint Calibration	
Nicolet 6700 AHR0801933 CO		FTIR		Dec 08, 2017	


Triad Data Available Upon Request

NOTES:PO# 5217005382

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 2000.02


Approved for Release

PREVENTIVE MAINTENANCE PLAN

SERVICE REPORT

Preventive Maintenance

For

Continuous Emission Monitoring System (CEMS)



EGCO COGENERATION CO., LTD



November, 2022^{11th}

JID2200029-010

BY:

PETRO-INSTRUMENTS CORP.,LTD

**PETRO-INSTRUMENTS CORP., LTD.**

7/409 Soi Vibhavadi-Rangsit 36, Vibhavadi-Rangsit Rd., Chatuchak, Chatuchak
Bangkok 10900 Thailand
Tel.:(+66) 2939 5711 (12 Lines), (+66) 2513 2333 (12 Lines), Fax. : (+66) 939

SERVICE REPORT

DOC. NUMBER

REPORT DATE

EQUIPMENT: CEMs	SERIAL NUMBER / TAG NUMBER -	BRAND / MANUFACTURER ABB
CUSTOMER NAME: Egco cogeneration	LOCATION: Rayong	JOB NUMBER / REQUESTED NUMBER JID2200029-010

REASON FOR VISIT

- Preventive maintenance CEMs unit 11, 12.

FOUND FAILURE & CORRECTIVE ACTION DETAILS

- Operation checked of the gas analyzer all units.
- Checked diagnostic of the gas analyzer all units.
- Checked the sample gas cooler all unit was normal operation.
- Checked the sample gas feed all unit was normal operation.
- Checked the automatic condensate drain was normal operation.
- Checked the sample flow and by pass flow were kept in set point.
- Validate zero and span gas for the gas analyzer was normal response.
- Calibration zero and span gas for the gas analyzer by feed gas direct to the sample gas cooler.

Standard gas CO supply by PICO

WORK CONCLUSION

<input checked="" type="checkbox"/> COMPLETED		<input type="checkbox"/> IN COMPLETED	PARTS REPLACEMENT		
<input checked="" type="checkbox"/> CHARGE	<input type="checkbox"/> NO CHARGE		PARTS NAME	P/N	QTY.
<input type="checkbox"/> SERVICE FEE	<input type="checkbox"/> PROJECT WARRANTY	<input type="checkbox"/> TAKE TO OFFICE			
<input type="checkbox"/> TRAVELLING	<input type="checkbox"/> SERVICE WARRANTY	<input type="checkbox"/> WAIT FOR PARTS			
<input type="checkbox"/> SPARE PARTS	<input type="checkbox"/> PARTS WARRANTY	<input type="checkbox"/> IN PROCESS			
<input type="checkbox"/> OTHER	<input checked="" type="checkbox"/> SERVICE CONTRACT	<input type="checkbox"/> OTHER			

TIME SPENT (HOURS)

YEAR	2022									TOTAL HOURS	TRAVELING DETAILS	
MONTH	11										TRAVEL BY	
DATE	8									6	FROM	Pico
SERVICE TIME	6									-	TO	Rayong
OVERTIME	-									4	TOTAL ROUND TRIP	1
TRAVELING TIME	4									10	DISTANCE (KM.)	360
TOTAL HOURS	10											

SERVICE CREW

NAME		NAME	
1. Mr. Phuwanai N.		3.	
2.		4.	

CUSTOMER'S NAME	CUSTOMER'S SIGNATURE	DATE
นาย. นันทิมา งาม		9-11-2022

UNIT 1A



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

SERVICE REPORT

Job No. :	JID2200029-010	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1A
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.345753.3	Telephone :	038-637-051-57 #9241
Working date :	8-November-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1A.
PHYSICAL & FUNCTION CHECK	<p>Sampling system.</p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set point. - Checked the condensate alarm for cut-off pump was normal operation. <p>Gas analyzer</p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition such as temperature, pressure. - Validate zero and span for the gas analyzer found normal responding.
CORRECT ACTION	<p>Gas analyzer</p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	- No part replacement.
RECOMMENDATION	-

Internal information: ID Warranty.

Gas analyzer (Uras26) : 1360

Gas cooler (SCC-C) : 7703

Gas feed unit (SCC-F) : 7705

NO_x Converter : 7707

Sampling system 1A : 4156



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

CHECK BY :	Mr. Phuwanai	DATE :	8-November-2022
APPROVE BY:	Mr. Nadthapong	DATE:	10-November-2022
CUSTOMER SIGN :		DATE :	



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GENERAL CHECK

UNIT NAME :		1SAA-IRK-1A	LOCATION :		HRSG 11
ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	20.7 °C	24.7 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	33 %	50 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	61 l/h	60 l/h	
12	Bypass flow	60 l/h	60 l/h	60 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	1,800 psi	1,800 psi	
15	Span gas CO cylinder	> 300 psi	1,300 psi	1,300 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	137.7 °C	137.7 °C	
19	Heated line Bypass	140 °C	137.7 °C	137.7 °C	

CHECK BY :	Mr. Phuwanai
DATE :	8-November-2022

ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MANUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.345753.3
UNIT NAME :	1SAA-IRK-1A	LOCATION :	HRSG 11

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	82.5 ppm	27-Oct-2021	27-Oct-2025	D878359

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	10.9	4.87	1%	-5%	±30%	Passed
CO@7% 0 - 200 ppm	26.0	-	-	-		
NO _x 0 - 250 ppm	33.1	6.12	0%	23%		Passed
NO _x @7% 0 - 250 ppm	78.9	-	-	-		
O ₂ 0 - 25 Vol%	15.10	13.66	0%	3%		Passed

VALIDATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.2	0.20	-0.10	164.6	164.3	-0.30	0.15	±5.0 %	Passed
NO	0 - 250	ppm	0.0	-0.1	-0.10	0.04	82.5	82.1	-0.40	0.16	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.02	0.02	-0.02	20.95	20.90	-0.05	0.05	±0.5 %	Passed

CALIBRATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.0	0.00	0.00	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO	0 - 250	ppm	0.0	0.0	0.00	0.00	82.5	82.5	0.00	0.00	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	21.9	5.75	1%	-5%	±30%	Passed
CO@7% 0 - 200 ppm	52.2	-	-	-		-
NO _x 0 - 250 ppm	41.6	6.66	0%	0%		Passed
NO _x @7% 0 - 250 ppm	109.5	-	-	-		-
O ₂ 0 - 25 Vol%	15.65	14.02	0%	0%		Passed

* % Error Calculate from percent of range.

CHECK BY :	Mr. Phuwanai
DATE :	8-November-2022

UNIT 1B



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

SERVICE REPORT

Job No. :	JID2200029-010	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1B
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.387669.9	Telephone :	038-637-051-57 #9241
Working date :	8-November-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1B.
PHYSICAL & FUNCTION CHECK	<p>Sampling system.</p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set point. - Checked the condensate alarm for cut-off pump was normal operation. <p>Gas analyzer</p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition. - Validate zero and span for the gas analyzer was normal responding.
CORRECT ACTION	<p>Gas analyzer</p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	- No part replacement.
RECOMMENDATION	-

Internal information: ID Warranty.

Sampling system 1B : 4157
 Gas analyzer (Uras26) : 4723
 Gas cooler (SCC-C) : 7704
 Gas feed unit (SCC-F) : 7706
 NO_x Converter : 7708



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CHECK BY :	Mr. Phuwanai	DATE :	8-November-2022
APPROVE BY:	Mr. Nadthapong	DATE:	10-November-2022
CUSTOMER SIGN :		DATE :	



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GENERAL CHECK

UNIT NAME :	1SAA-IRK-1B	LOCATION :	HRSG 12
-------------	-------------	------------	---------

ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	24.3 °C	25.1 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	72 %	58 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	60 l/h	60 l/h	
12	Bypass flow	≈20 l/h	20 l/h	20 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	1,800 psi	1,800 psi	
15	Span gas CO cylinder	> 300 psi	1,300 psi	1,300 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	139.4 °C	139.3 °C	
19	Heated line Bypass	140 °C	139.4 °C	139.3 °C	

CHECK BY : Mr. Phuwanai

DATE : 8-November-2022



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ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MANUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.387669.9
UNIT NAME :	1SAA-IRK-1B	LOCATION :	HRS 12

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	82.5 ppm	27-Oct-2022	27-Oct-2025	D878359

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	3.7	4.30	-1%	3%	±30%	Passed
CO@7% 0 - 200 ppm	9.2	-	-	-		
NO _x 0 - 250 ppm	32.8	6.10	1%	-3%		Passed
NO _x @7% 0 - 250 ppm	81.3	-	-	-		
O ₂ 0 - 25 Vol%	15.32	13.80	0%	-1%		Passed

VALIDATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	-0.1	-0.10	0.05	164.6	164.8	0.20	-0.10	±5.0 %	Passed
NO	0 - 250	ppm	0.0	0.1	0.10	-0.04	82.5	81.9	-0.60	0.24	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.02	0.02	-0.02	20.95	20.92	-0.03	0.03	±0.5 %	Passed

CALIBRATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.0	0.00	0.00	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO	0 - 250	ppm	0.0	0.0	0.00	0.00	82.5	82.5	0.00	0.00	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	4.0	4.32	-1%	-2%	±30%	Passed
CO@7% 0 - 200 ppm	10.5	-	-	-		-
NO _x 0 - 250 ppm	34.1	6.18	1%	-3%		Passed
NO _x @7% 0 - 250 ppm	89.2	-	-	-		-
O ₂ 0 - 25 Vol%	15.62	14.00	0%	0%		Passed

* % Error Calculate from percent of range.

CHECK BY :	Mr. Phuwanai
DATE :	8-November-2022

CERTIFICATE OF STANDARD GAS

Certificate Of Analysis
Special Gases Mixture

Customer Details

Name: EGCO ENGINEERING AND SERVICE Address: 222 Moo. 8, A. Mabkha, A. King Aumphur Nikhom Pattana, Rayong 21180 Customer Tag No.:

Certificate Details

Number: 3218/22 Date of Issue: 27-Oct-2022 Expiry date: 27-Oct-2025
Material Details
Production Order: 90174084 Material Code: 431600-SV-44 Cylinder No.: D878359
Gas content: 1.25 M³ Filling pressure: 130.0 bar Valve: CGA 660 SS
Cylinder Owner: LINDE Cylinder Material: Spectra seal Cylinder Size: 10 L

Laboratory Report

Analytical Result

Component	Normal Concentration	Analysis Result ¹	Uncertainty ²	Method of Analysis ³	Assay Date
Nitric Oxide	85.0 ppm	82.5 ppm	± 1% relative	(6) I-PB-352	19-Oct & 26-Oct-22
Other NOx impurity In Nitrogen		Less than 4.1 ppm			

Reference Standard used in Assay

Reference Standard	Cylinder number	Concentration	Expiry date:
Nitric Oxide In Nitrogen	1228205G	50.87 ± 0.25 ppm	6-May-2023

Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
FTIR Spectrometers Nicolet iS50	FTIR-NO	1-Oct-2022

Recommend usage condition

Minimum utilization: 5% of actual content or before expire date whichever comes first.
Storage condition: Keep in well ventilation and secure area.

Comments

When reordering, please quote the material number

Note:

1. 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
2. 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.
3. (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Moisture Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

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



Airgas Specialty Gases
Airgas USA, LLC
600 Union Landing Road
Cinnaminson, NJ 08077-0000
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A3300	Reference Number:	82-401076401-1
Cylinder Number:	CC703275	Cylinder Volume:	144.3 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52017	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Dec 28, 2017

Expiration Date: Dec 28, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	160.0 PPM	164.6 PPM	G1	+/- 0.9% NIST Traceable	12/28/2017
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12062228	CC365471	97.56 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	May 25, 2018
ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration		
Nicolet 6700 AHR0801933 CO	FTIR		Dec 08, 2017		

Triad Data Available Upon Request

NOTES:PO# 5217005382

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 2000.02

Approved for Release

PREVENTIVE MAINTENANCE PLAN

SCHEDULE PLAN FOR PREVENTIVE MAINTENANCE CIVIS														
Item	Part name	P/N	Unit	Qty	2023									
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	PM Schedule		1 M		N	N	N	N	N	N	N	N	N	N
	Sampling probe													
1	Ceramic filter	IT0001141	1 Y	2	pc			N						
2	Set of gaskets FPM	IT0001152	1 Y	2	set			N						
	Sample gas cooler SCC-C													
3	Sealing GL25-12mm (SCC-C)	IT0001130	1 Y	2	pc			N						
4	Sealing GL16-8mm (SCC-C)	IT0001131	1 Y	4	pc			N						
5	Driver complete	IT0001123	1 Y	2	pc			N						
6	Flexible tube	IT0001931	2 M	1	Pack	N								
	Acid filter unit													
7	Filter element for acid filter	IT0000732	-	4	pc									
8	O-ring 56 x 3, FPM	IT0000777	1 Y	2	pc			N						
	Gas feed unit SCC-F													
9	Spare parts set (for diaphragm pump)	IT0000716	1 Y	2	set									
10	O-ring 60x3.5mm, FPM70	IT0000810	1 Y	2	pc									
11	Filter membrane	IT0001128	-	1	Pack									
	Gas analyzer													
13	Oxygen sensor	IT0000792	1 Y	2	pc									
14	Disposable filter unit	IT0001136	3	4	pc									
15	Vision tube FPM-70-SW-4x1.5	IT0000741	1 Y	4	Meter									

กำหนดการเข้าปฏิบัติงานบำรุงรักษาประจำปีงบประมาณ

กำหนดการปฏิบัติงานซ่อมบำรุงตามแผนประจำปี



บริษัท เพทโร-อินสตรูเมนต์ จำกัด



SERVICE REPORT

Preventive Maintenance

For

Continuous Emission Monitoring System (CEMS)



EGCO COGENERATION CO., LTD



December, 2022 ^{12th}

JID2200029-011

BY:

PETRO-INSTRUMENTS CORP.,LTD

**PETRO-INSTRUMENTS CORP., LTD.**7/409 Soi Vibhavadi-Rangsit 36, Vibhavadi-Rangsit Rd., Chatuchak, Chatuchak
Bangkok 10900 Thailand

Tel.:(+66) 2939 5711 (12 Lines), (+66) 2513 2333 (12 Lines), Fax. : (+66) 939

SERVICE REPORT

DOC. NUMBER

REPORT DATE

EQUIPMENT: CEMs	SERIAL NUMBER / TAG NUMBER -	BRAND / MANUFACTURER ABB
CUSTOMER NAME: Egco cogeneration	LACATION: Rayong	JOB NUMBER / REQUESTED NUMBER JID2200029-011

REASON FOR VISIT

- Preventive maintenance CEMs unit 11, 12.

FOUND FAILURE & CORRECTIVE ACTION DETAILS

- Operation checked of the gas analyzer all units.
- Checked diagnostic of the gas analyzer all units.
- Checked the sample gas cooler all unit was normal operation.
- Checked the sample gas feed all unit was normal operation.
- Checked the automatic condensate drain was normal operation.
- Checked the sample flow and by pass flow were kept in set point.
- Validate zero and span gas for the gas analyzer was normal response.
- Calibration zero and span gas for the gas analyzer by feed gas direct to the sample gas cooler.

Standard gas CO supply by PICO

WORK CONCLUSION

<input checked="" type="checkbox"/> COMPLETED		<input type="checkbox"/> IN COMPLETED	PARTS REPLACEMENT		
<input checked="" type="checkbox"/> CHARGE	<input type="checkbox"/> NO CHARGE		PARTS NAME	P/N	QTY.
<input type="checkbox"/> SERVICE FEE	<input type="checkbox"/> PROJECT WARRANTY	<input type="checkbox"/> TAKE TO OFFICE			
<input type="checkbox"/> TRAVELLING	<input type="checkbox"/> SERVICE WARRANTY	<input type="checkbox"/> WAIT FOR PARTS			
<input type="checkbox"/> SPARE PARTS	<input type="checkbox"/> PARTS WARRANTY	<input type="checkbox"/> IN PROCESS			
<input type="checkbox"/> OTHER	<input checked="" type="checkbox"/> SERVICE CONTRACT	<input type="checkbox"/> OTHER			

TIME SPENT (HOURS)

YEAR	2022								TOTAL HOURS	TRAVELING DETAILS	
MONTH	12									TRAVEL BY	
DATE	9								6	FROM	Pico
SERVICE TIME	6								-	TO	Rayong
OVERTIME	-								4	TOTAL ROUND TRIP	1
TRAVELING TIME	4								10	DISTANCE (KM.)	360
TOTAL HOURS	10										

SERVICE CREW

NAME		NAME	
1.	Mr. Phuwanai N.	3.	
2.		4.	

CUSTOMER'S NAME 	CUSTOMER'S SIGNATURE นาย นันทน งาม	DATE 13-12-2022
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UNIT 1A



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

SERVICE REPORT

Job No. :	JID2200029-011	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1A
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.345753.3	Telephone :	038-637-051-57 #9241
Working date :	9-December-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1A.
PHYSICAL & FUNCTION CHECK	<p>Sampling system.</p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set point. - Checked the condensate alarm for cut-off pump was normal operation. <p>Gas analyzer</p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition such as temperature, pressure. - Validate zero and span for the gas analyzer found normal responding.
CORRECT ACTION	<p>Gas analyzer</p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	- No part replacement.
RECOMMENDATION	-

Internal information: ID Warranty.

Gas analyzer (Uras26) : 1360

Gas cooler (SCC-C) : 7703

Gas feed unit (SCC-F) : 7705

NO_x Converter : 7707

Sampling system 1A : 4156



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

CHECK BY :	Mr. Phuwanai	DATE :	9-December-2022
APPROVE BY:	Mr. Nadthapong	DATE:	13-December-2022
CUSTOMER SIGN :		DATE :	



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GENERAL CHECK

UNIT NAME :	1SAA-IRK-1A	LOCATION :	HRSG 11
-------------	-------------	------------	---------

ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	20.7 °C	24.7 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	73 %	44 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	61 l/h	60 l/h	
12	Bypass flow	60 l/h	60 l/h	60 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	1,800 psi	1,800 psi	
15	Span gas CO cylinder	> 300 psi	1,300 psi	1,300 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	137.7 °C	137.7 °C	
19	Heated line Bypass	140 °C	137.7 °C	137.7 °C	

CHECK BY :	Mr. Phuwana
DATE :	9-December-2022

ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MANUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.345753.3
UNIT NAME :	1SAA-IRK-1A	LOCATION :	HRSO 11

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	82.5 ppm	27-Oct-2021	27-Oct-2025	D878359

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	23.9	5.91	1%	-6%	±30%	Passed
CO@7% 0 - 200 ppm	55.2	-	-	-		
NO _x 0 - 250 ppm	22.4	5.43	3%	21%		Passed
NO _x @7% 0 - 250 ppm	51.7	-	-	-		
O ₂ 0 - 25 Vol%	14.91	13.54	0%	3%		Passed

VALIDATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.3	0.30	-0.15	164.6	164.3	-0.30	0.15	±5.0 %	Passed
NO	0 - 250	ppm	0.0	-0.2	-0.20	0.08	82.5	82.1	-0.40	0.16	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.02	0.02	-0.02	20.95	20.90	-0.05	0.05	±0.5 %	Passed

CALIBRATION RESULT												
Parameter			Zero				Span				% Error Acceptance	Note
			Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200	ppm	0.0	0.0	0.00	0.00	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO	0 - 250	ppm	0.0	0.0	0.00	0.00	82.5	82.5	0.00	0.00	±2.5 %	Passed
O ₂	0 - 25	Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	7.1	4.57	1%	-7%	±30%	Passed
CO@7% 0 - 200 ppm	16.4	-	-	-		-
NO _x 0 - 250 ppm	40.1	6.57	0%	0%		Passed
NO _x @7% 0 - 250 ppm	105.3	-	-	-		-
O ₂ 0 - 25 Vol%	15.64	14.01	-1%	1%		Passed

* % Error Calculate from percent of range.

CHECK BY :	Mr. Phuwanai
DATE :	9-December-2022

UNIT 1B



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http : // www.pico.co.th E-mail-address : combustion@pico.co.th

SERVICE REPORT

Job No. :	JID2200029-011	Customer name :	EGCO COGENERATION
Equipment :	CEMS	Unit name :	1SAA-IRK-1B
Manufacturer :	ABB	Location :	Rayong
Model :	URAS 26	Contact name :	K. Pipat Udom
Serial No. :	3.387669.9	Telephone :	038-637-051-57 #9241
Working date :	9-December-2022	Fax. :	081-862-4780
Traveling hour :	4 Hr.	Email address :	Pipat.udo@egco.com
Mileage :	360 km.	Working Hour :	2 Hr.

SCOPE OF WORK	Preventive maintenance continuous emission monitoring system unit 1SAA-IRK-1B.
PHYSICAL & FUNCTION CHECK	<p><u>Sampling system.</u></p> <ul style="list-style-type: none"> - Checked the heated line was normal condition. - Checked the sample gas cooler was normal operation. - Checked the automatic condensate drain was normal operation. - Checked the acid filter was clean. - Checked the sample gas feed unit was normal operation. - Checked the filter membrane was clean. - Checked the sample flow and bypass flow were kept in set point. - Checked the condensate alarm for cut-off pump was normal operation. <p><u>Gas analyzer</u></p> <ul style="list-style-type: none"> - Diagnostics checked of the gas analyzer before calibration found were normal condition. - Validate zero and span for the gas analyzer was normal responding.
CORRECT ACTION	<p><u>Gas analyzer</u></p> <ul style="list-style-type: none"> - Performed zero and span calibration for the gas analyzer by feed standard gas direct to the sample gas cooler. - Diagnostics checked of the gas analyzer after calibrations were normal condition.
PART REPLACEMENT	- No part replacement.
RECOMMENDATION	-

Internal information: ID Warranty.

Sampling system 1B : 4157
 Gas analyzer (Uras26) : 4723
 Gas cooler (SCC-C) : 7704
 Gas feed unit (SCC-F) : 7706
 NO_x Converter : 7708



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CHECK BY :	Mr. Phuwanai	DATE :	9-December-2022
APPROVE BY:	Mr. Nadthapong	DATE:	13-December-2022
CUSTOMER SIGN :		DATE :	



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GENERAL CHECK

UNIT NAME :

1SAA-IRK-1B

LOCATION :

HRSG 12

ITEM	DESCRIPTION	SET-POINT VALUE	STATUS/VALUE		REMARK
			BEFORE	AFTER	
	Inside cabinet				
1	Temperature in Cabinet	20-25 °C	24.3 °C	25.1 °C	
2	Air conditioner	Operate	OK	OK	
3	Humidity in Cabinet	-	38 %	58 %	
4	Sample gas cooler temperature	3.0 °C	3.0 °C	3.0 °C	
5	Automatic Condensate Drain	Drain	Drain	Drain	
6	Flexible tube	Normal	Normal	Normal	
7	Acid filter	Clean	Clean	Clean	
8	Sample gas feed pump operate	Run	Run	Run	
9	Condensate filter	Clean	Clean	Clean	
10	Condensate monitor	Normal	Normal	Normal	
11	Sample flow	60 l/h	60 l/h	60 l/h	
12	Bypass flow	≈20 l/h	20 l/h	20 l/h	
13	Disposable filter unit.	Clean	Clean	Clean	
14	Span gas NO cylinder	> 300 psi	1,800 psi	1,800 psi	
15	Span gas CO cylinder	> 300 psi	1,300 psi	1,300 psi	
	On stack				
16	Heated sample probe	Hot	Hot	Hot	
17	Filter probe	Clean	Clean	Clean	
18	Heated line Main	140 °C	139.4 °C	139.3 °C	
19	Heated line Bypass	140 °C	139.4 °C	139.3 °C	

CHECK BY :

Mr. Phuwana

DATE :

9-December-2022

ANALYZER TEST REPORT

ANALYZER TYPE :	GAS ANALYZER	MENUFACTURER :	ABB
MODEL :	URAS 26	SERIAL NO. :	3.387669.9
UNIT NAME :	1SAA-IRK-1B	LOCATION :	HRSG 12

Standard gas concentration

Parameter	Concentration	Start date	Expire date	Cylinder No.
CO	164.6 ppm	28-Dec-2017	28-Dec-2025	CC703275
NO	82.5 ppm	27-Oct-2022	27-Oct-2025	D878359

Use ambient air for calibrate span point O₂ 20.95 Vol%.

MEASUREMENT RESULT BEFORE CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	5.0	4.40	-1%	3%	±30%	Passed
CO@7% 0 - 200 ppm	12.7	-	-	-		
NO _x 0 - 250 ppm	27.8	5.78	1%	9%		Passed
NO _x @7% 0 - 250 ppm	70.6	-	-	-		
O ₂ 0 - 25 Vol%	15.46	13.89	0%	2%		Passed

VALIDATION RESULT											
Parameter		Zero				Span				% Error Acceptance	Note
		Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200 ppm	0.0	-0.1	-0.10	0.05	164.6	164.8	0.20	-0.10	±5.0 %	Passed
NO	0 - 250 ppm	0.0	0.1	0.10	-0.04	82.5	81.9	-0.60	0.24	±2.5 %	Passed
O ₂	0 - 25 Vol%	0.00	0.02	0.02	-0.02	20.95	20.92	-0.03	0.03	±0.5 %	Passed

CALIBRATION RESULT											
Parameter		Zero				Span				% Error Acceptance	Note
		Ideal	Actual	Drift	% Error	Ideal	Actual	Drift	% Error		
CO	0 - 200 ppm	0.0	0.0	0.00	0.00	164.6	164.6	0.00	0.00	±5.0 %	Passed
NO	0 - 250 ppm	0.0	0.0	0.00	0.00	82.5	82.5	0.00	0.00	±2.5 %	Passed
O ₂	0 - 25 Vol%	0.00	0.00	0.00	0.00	20.95	20.95	0.00	0.00	±0.5 %	Passed

MEASUREMENT RESULT AFTER CALIBRATE						
Parameter	Measurement Value		Status Reactive Calibration Drifts		Offset&Amplify Acceptance	Note
	Reading	Analog (mA)	Offset (%)	Amplify (%)		
CO 0 - 200 ppm	4.5	4.36	-1%	-1%	±30%	Passed
CO@7% 0 - 200 ppm	12.0	-	-	-		-
NO _x 0 - 250 ppm	31.0	5.98	1%	0%		Passed
NO _x @7% 0 - 250 ppm	82.4	-	-	-		-
O ₂ 0 - 25 Vol%	15.70	14.05	0%	0%		Passed

* % Error Calculate from percent of range.

CHECK BY :	Mr. Phuwanai
DATE :	9-December-2022

CERTIFICATE OF STANDARD GAS

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E02NI99E15A3300	Reference Number: 82-401076401-1
Cylinder Number: CC703275	Cylinder Volume: 144.3 CF
Laboratory: 124 - Riverton (SAP) - NJ	Cylinder Pressure: 2015 PSIG
PGVP Number: B52017	Valve Outlet: 350
Gas Code: CO, BALN	Certification Date: Dec 28, 2017

Expiration Date: Dec 28, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	160.0 PPM	164.6 PPM	G1	+/- 0.9% NIST Traceable	12/28/2017
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12062228	CC365471	97.56 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	May 25, 2018

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801933 CO	FTIR	Dec 08, 2017

Triad Data Available Upon Request

NOTES: PO# 5217005382

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 2000.02

Approved for Release

Certificate Of Analysis
Special Gases Mixture

Customer Details

Name: EGCO ENGINEERING AND SERVICE
Address: 222 Moo. 8, A. Mabkha, A. King Aumphur
Nikhom Pattana, Rayong 21180
Customer Tag No.:

Certificate Details

Number:	3218/22	Date of Issue:	27-Oct-2022	Expiry date:	27-Oct-2025
Material Details					
Production Order:	90174084	Material Code:	431600-SV-44	Cylinder No.:	D878359
Gas content:	1.25 M ³	Filling pressure:	130.0 bar	Valve:	CGA 660 SS
Cylinder Owner:	LINDE	Cylinder Material:	Spectra seal	Cylinder Size:	10 L

Laboratory Report

Analytical Result

Component	Normal Concentration	Analysis Result ¹	Uncertainty ²	Method of Analysis ³	Assay Date
Nitric Oxide	85.0 ppm	82.5 ppm	± 1% relative	(6) I-PB-352	19-Oct & 26-Oct-22
Other NOx impurity In Nitrogen		Less than 4.1 ppm			

Reference Standard used in Assay

Reference Standard	Cylinder number	Concentration	Expiry date:
Nitric Oxide In Nitrogen	122820SG	50.87 ± 0.25 ppm	6-May-2023

Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
FTIR Spectrometers Nicolet iS50	FTIR-NO	1-Oct-2022

Recommend usage condition

Minimum utilization: 5% of actual content or before expire date whichever comes first.
Storage condition: Keep in well ventilation and secure area.

Comments

When reordering, please quote the material number

Note:

1. 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
2. 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.
3. (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.

PREVENTIVE MAINTENANCE PLAN

SCHEDULE PLAN FOR PREVENTIVE MAINTENANCE CMIS																	
2022																	
Item	Part name	P/N	Interval	Q	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PM Schedule																	
Sampling probe																	
1	Ceramic filter	IT0001141	1 Y	2	pc				X								
2	Set of gaskets PFM	IT0001152	1 Y	2	set				X								
Sample gas cooler SCC-C																	
3	sealing GL25x12mm (SCC-C)	IT0001830	1 Y	2	pc				X								
4	sealing GL18x8mm (SCC-C)	IT0001831	1 Y	4	pc				X								
5	Driver complete	IT0001823	1 Y	2	pc				X								
6	Flexible tube	IT0001931	3 M	1	Pack		X								X		
Acid filter unit																	
7	Filter element for acid filter	IT0000732	-	4	pc												
8	O-ring 56 x 3, PFM	IT0000777	1 Y	2	pc				X								
Gas feed unit SCC-F																	
9	Spare parts set (for diaphragm pump)	IT0000716	1 Y	2	set												
10	O-ring 40x3.5mm, PFM70	IT0000808	1 Y	2	pc								X				
11	Filter membrane	IT0001128	-	1	Pack												
Gas analyzer																	
13	Oxygen sensor	IT0000702	1 Y	2	pc												
14	Disposable filter unit	IT0001136	3	4	pc												
15	Viton tube PFM-70-SW 3x1.5	IT0000741	1 Y	4	Meter			X									

X

กำหนดการเข้าปฏิบัติงานการบำรุงรักษาประจำปีตามแผน
กำหนดการป้องกันวัสดุสิ้นเปลืองตามแผนแต่ละปีตามท

กำหนดการบำรุงรักษาประจำปี
กำหนดการเปลี่ยนวัสดุสิ้นเปลืองตามแผนแต่ละรายการ

