



AIR HYGIENE, INC.

Testing Solutions for a Better World

RECEIVED

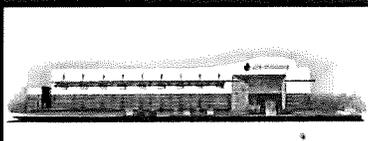
AUG 01 2022

AIR QUALITY DIVISION

RELATIVE ACCURACY TEST AUDIT
FOR THE
GENERAL ELECTRIC, COMBUSTION TURBINE,
UNIT #CTG2 CEMS
PREPARED FOR
INDECK NILES, LLC
AT THE
INDECK NILES ENERGY CENTER
NILES, MICHIGAN
JUNE 21, 2022

Permit to Install: 75-16B
Report Date: July 1, 2022

N6921_test_20220621(2)



Corporate Headquarters
1600 W Tacoma Street
Broken Arrow, Oklahoma 74012



AIR HYGIENE, INC.

(918) 307-8865 or (888) 461-8778
www.airhygiene.com

Remote Testing Offices

Las Vegas, NV 89156
Ft. Worth, TX 76028
Humble, TX 77338
Shreveport, LA 71115
Miami, FL 33101
Pittsburgh, PA 15205

RELATIVE ACCURACY TEST AUDIT
FOR THE
GENERAL ELECTRIC, COMBUSTION TURBINE,
UNIT #CTG2 CEMS
PREPARED FOR
INDECK NILES, LLC
AT THE
INDECK NILES ENERGY CENTER
NILES, MICHIGAN
JUNE 21, 2022

Prepared and Reviewed by:



Darin Grimes
Sr. Testing Solutions Specialist



Thomas K. Graham, PE, QSTI
Director of AHU



I, Cole McBride, QSTI
Sr. Project Manager

certify that this testing was conducted and
this report was created in conformance
with the requirements of ASTM D7036

(this page intentionally left blank)

CERTIFICATION OF INFORMATION

I certify under penalty of law that I believe the information provided in this document is true, accurate and complete. I am aware that there are significant civil and criminal penalties, including the possibility of fine or imprisonment or both, for submitting false, inaccurate or incomplete information.



Cole McBride, QSTI
Sr. Project Manager
Air Hygiene International, Inc.

July 4, 2022

Date

FACILITY CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attached documents and, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil and criminal penalties, including the possibility of fine or imprisonment or both, for submitting false, inaccurate or incomplete information.

I am the responsible official with direct knowledge and overall responsibility for the information contained in this report.

Thomas Krysiak

Name

Environmental, Health & Safety Manager

Title



Signature

7/19/2022

Date

Table of Contents

1.0	INTRODUCTION	1
1.1	TEST PURPOSE AND OBJECTIVES	1
1.2	SUMMARY OF TEST PROGRAM	2
1.2.1	Participating Organizations	2
1.2.2	Industry	2
1.2.3	Air Permit and Federal Requirements	2
1.2.4	Plant Location	2
1.2.5	Equipment Tested	2
1.2.6	Emission Points	2
1.2.7	Emission Parameters Measured	2
1.2.8	Date of Emission Test	2
1.2.9	Federal Certifications	2
1.3	KEY PERSONNEL	3
2.0	SUMMARY OF TEST RESULTS	3
3.0	SOURCE OPERATION	5
3.1	PROCESS DESCRIPTION	5
3.2	SAMPLING LOCATION	5
4.0	SAMPLING AND ANALYTICAL PROCEDURES	5
4.1	TEST METHODS	5
4.2	INSTRUMENT CONFIGURATION AND OPERATIONS FOR GAS ANALYSIS	6

APPENDICES

Appendix A	Test Results and Calculations
Appendix B	CEMS and Reference Method Data
Appendix C	Calibration Gas Certifications
Appendix D	Quality Assurance and Quality Control Data
Appendix E	Stratification Test Data

Relative Accuracy Test Audit
General Electric, Combustion Turbine, Unit #CTG2 CEMS
Indeck Niles, LLC
Indeck Niles Energy Center
Niles, Michigan
June 21, 2022

1.0 INTRODUCTION

Air Hygiene International, Inc. (Air Hygiene) has completed the Relative Accuracy Test Audit (RATA) for nitrogen oxides (NO_x), carbon monoxide (CO), and oxygen (O₂) from the exhaust of the General Electric, Combustion Turbine, Unit #CTG2 for Indeck Niles, LLC at the Indeck Niles Energy Center in Niles, Michigan. This report details the background, results, process description, and the sampling/analysis methodology of the stack sampling survey conducted on June 21, 2022.

The accumulated data from the RATA provides the figures for evaluating the acceptability of the operation of the on-site continuous emission monitoring system (CEMS) for the monitoring of NO_x, CO, and O₂ from the General Electric, Combustion Turbine, Unit #CTG2 for Indeck Niles, LLC at the Indeck Niles Energy Center in Niles, Michigan.

1.1 TEST PURPOSE AND OBJECTIVES

The purpose of the test was to perform the initial certification RATA on the CEMS that serves the General Electric, Combustion Turbine, Unit #CTG2 for Indeck Niles, LLC at the Indeck Niles Energy Center in Niles, Michigan. Reference method (RM) testing followed the Code of Federal Regulations (CFR), Title 40 (40 CFR), Part 60 (40 CFR 60), Appendix A, Methods 1, 3A, 7E, 10, and 19. RM values are compared with the on-site CEMS to document performance as required in the 40 CFR 60, Appendix B, Performance Specifications (PS) and 40 CFR 75 Appendix A and B. All relative accuracies were established on-site and were governed by the following sets of rules:

In accordance with 40 CFR 60, Appendix B, PS 2, Section 13.2, the NO_x RATA results are acceptable if the relative accuracy (RA) does not exceed 20.0 percent when average emissions during the test are greater than 50 percent of the emission standard or alternative relative accuracy (ARA) does not exceed 10.0 percent when the average emissions during the test are less than 50 percent of the emission standard. Part 60 further requires that the unit be operating at greater than 50 percent of normal load.

In accordance with 40 CFR 75, Appendix A, Section 3.3.2(a) and (b), the NO_x RATA results are acceptable if the relative accuracy (RA) does not exceed 10.0 percent or if during the RATA the average NO_x emission rate is less than or equal to 0.200 lb/MMBtu and the average difference between the CEMS and reference method (RM) values does not exceed 0.020 lb/MMBtu. Passing this set of criteria requires the CEMS to be retested after no more than two operating quarters. Alternatively, in accordance with 40 CFR 75, Appendix B, Section 2.3.1.2(a) and (f), and Appendix B, Figure 2, the NO_x RATA results are acceptable if the RA does not exceed 7.5 percent or if during the RATA the average NO_x emission rate is less than or equal to 0.200 lb/MMBtu and the average difference between the CEMS and RM values does not exceed 0.015 lb/MMBtu. Passing this set of criteria allows the CEMS to be retested after four operating quarters or at least within eight calendar quarters.

In accordance with 40 CFR 60, Appendix B, PS 3, Section 13.2, the O₂ RATA results are acceptable if the relative accuracy (RA) does not exceed 20.0 percent or if the average difference between the CEMS and reference method (RM) values does not exceed plus or minus 1.0 percent of the measured value.

kie-22-niles.mi-start#1-CTG2-RATA-rpt

In accordance with 40 CFR 60, Appendix B, PS 4 and 4A, Sections 13.2 of each, the CO relative accuracy (RA) test results are acceptable if the RA does not exceed 10.0 percent, if the average difference between the CEMS and reference method (RM) values plus the 2.5 percent confidence coefficient (2.5%CC) does not exceed 5.0 parts per million (ppm), or if the alternative relative accuracy (ARA) does not exceed 5.0 percent. Part 60 further requires that the unit be operating at greater than 50 percent of normal load.

1.2 SUMMARY OF TEST PROGRAM

The following list details pertinent information related to this specific project:

- 1.2.1 Participating Organizations
 - Michigan Department of Environment, Great Lakes, and Energy (EGLE)
 - Indeck Niles, LLC
 - Kiewit Corporation
 - Air Hygiene
- 1.2.2 Industry
 - Electric Utility / Electric Services
- 1.2.3 Air Permit and Federal Requirements
 - Permit Number: 75-16B
 - 40 CFR 60, Appendix B, Performance Specifications (PS)
 - 40 CFR 75, Appendix A and B
- 1.2.4 Plant Location
 - Indeck Niles Energy Center in Niles, Michigan
 - GPS Coordinates [Latitude 41.85831, Longitude -86.22417]
 - Physical Address: 2200 Progressive Dr., Niles, Michigan 49120
 - Federal Registry System / Facility Registry Service (FRS) No. – 110017413985
 - Source Classification Code (SCC) – 20100201
- 1.2.5 Equipment Tested
 - General Electric, Combustion Turbine, Unit #CTG2
 - NOx Analyzer (Thermo 42IQLS-ABBNN, Serial No. 1201697941)
 - CO Analyzer (Thermo 48IQ-ABC, Serial No. 1201697933)
 - O₂ Analyzer (Thermo 48IQ-ABC, Serial No. 1201697933)
- 1.2.6 Emission Points
 - Exhaust from the General Electric, Combustion Turbine, Unit #CTG2
 - For all gases, one sample point in the exhaust duct from the General Electric, Combustion Turbine, Unit #CTG2, determined after conducting a stratification test
- 1.2.7 Emission Parameters Measured
 - NOx
 - CO
 - O₂
- 1.2.8 Date of Emission Test
 - June 21, 2022
- 1.2.9 Federal Certifications
 - Stack Testing Accreditation Council AETB Certificate No. 3796.02
 - International Standard ISO/IEC 17025:2005 Certificate No. 3796.01

1.3 KEY PERSONNEL

Indeck Niles, LLC:	Tom Krysiak (tkrysiak@indeckenergy.com)	716-225-6478
Kiewit Corporation:	Derek Goettemoeller (Derek.Goettemoeller@Kiewit.com)	913-905-9068
Air Hygiene:	Cole McBride (cmcbride@airhygiene.com)	918-307-8865
Air Hygiene:	Swanson Bierman	918-307-8865
Air Hygiene:	Colby Gniech	918-307-8865
Air Hygiene:	Harold Jones	918-307-8865
Air Hygiene:	Jason Hass	918-307-8865
Air Hygiene:	Trevor Thompson	918-307-8865
Air Hygiene:	Sean Barnes	918-307-8865

2.0 SUMMARY OF TEST RESULTS

Results from the sampling conducted on Indeck Niles, LLC's General Electric, Combustion Turbine, Unit #CTG2 located at the Indeck Niles Energy Center on June 21, 2022 are summarized in the following table and relate only to the items tested.

The RATA passed for all pollutants (NO_x, CO, and O₂) in all units (ppmvd, ppmvd@15%O₂, lb/hr, lb/MMBtu, and %vd) under all 40 CFR 60 and 40 CFR 75 criteria.

Specifically, NO_x in units of ppmvd, ppmvd@15%O₂, and lb/hr, passed 40 CFR 60 criteria with RAs less than 20 percent. NO_x in units of lb/MMBtu passed the 40 CFR 75 alternative annual incentive criteria with an emissions rate of less than 0.200 lb/MMBtu and a difference between the RM and CEMS analyzers of less than 0.015 lb/MMBtu. Also, the Bias Adjustment Factor test passed with an adjustment factor equal to 1.0 (no adjustment required). O₂ in units of %vd passed the 40 CFR 60 criteria with a RA less than 20 percent. CO in units of ppmvd passed the 40 CFR 60 alternative criteria with a concentration difference between the RM and CEMS analyzers plus the confidence coefficient of less than 5 ppm. CO in units of ppmvd@15%O₂ and lb/hr passed the 40 CFR 60 alternative criteria with ARAs less than 5 percent, based on the CO permit limit in the same units.

Unit load was within the 40 CFR 60 required criteria of greater than 50 percent of the maximum load and also fell within the normal or secondary normal load criteria as defined by the plants Quality Control and Monitoring Plan which defined the upper and lower boundary on the unit and the normal and secondary normal load ranges.

The results of all measured pollutant emissions were below the required limits. All testing was performed without any real or apparent errors. All testing was conducted according to the approved testing protocol.

TABLE 2.1
SUMMARY OF GENERAL ELECTRIC, COMBUSTION TURBINE, UNIT #CTG2 RATA RESULTS

Pollutant	Units	Criteria			Results	Passed / Test Frequency
		CFR	Specification / Section	Standard		
NOx	ppmvd	Part 60	Appendix B, Performance Specification 2, Section 13.2	RA ≤ 20%, or ARA ≤ 10%	RA = 3.23%	YES / ANNUAL
NOx	ppmvd@15%O ₂	Part 60	Appendix B, Performance Specification 2, Section 13.2	RA ≤ 20%, or ARA ≤ 10%	RA = 3.20%	YES / ANNUAL
NOx	lb/hr	Part 60	Appendix B, Performance Specification 2, Section 13.2	RA ≤ 20%, or ARA ≤ 10%	RA = 5.17%	YES / ANNUAL
NOx	lb/MMBtu	Part 75	Appendix A, Section 3.3.2(a),(b) Appendix B, Section 2.3.1.2(a),(f), Figure 2	RA ≤ 10%, or if lb/MMBtu ≤ 0.200, d ≤ ±0.020 lb/MMBtu Annual Incentive RA ≤ 7.5%, or if lb/MMBtu ≤ 0.2, d ≤ ±0.015 lb/MMBtu	RM = 0.01 lb/MMBtu d = -0.001 lb/MMBtu BAF=1.000	YES / ANNUAL
O ₂	%vd	Part 60	Appendix B, Performance Specification 3, Section 13.2	RA ≤ 20%, or d ≤ ±1.0%	RA = 0.71%	YES / ANNUAL
CO	ppmvd	Part 60	Appendix B, Performance Specification 4, 4A, from all Section 13.2	RA ≤ 10%, or d + 2.5% CC ≤ ±5 ppmv, or ARA ≤ 5%	d +2.5%CC = 0.1 ppm	YES / ANNUAL
CO	ppmvd@15%O ₂	Part 60	Appendix B, Performance Specification 4, 4A, from all Section 13.2	RA ≤ 10%, or d + 2.5% CC ≤ ±5 ppmv, or ARA ≤ 5%	ARA = 1.43%	YES / ANNUAL
CO	lb/hr	Part 60	Appendix B, Performance Specification 4, 4A Section 13.2	RA ≤ 10%, or d + 2.5% CC ≤ ±5 ppmv, or ARA ≤ 5%	ARA = 2.35%	YES / ANNUAL
Load	MW	Part 60	Appendix B, Performance Specifications	> 50% max load	536.9	WITHIN TOLERANCE
Load	MW	Part 75	Appendix A and B	normal or secondary normal load range	536.9	WITHIN TOLERANCE

Notes: Changes pending confirmation of CEMS data, RA = relative accuracy, ARA = alternative relative accuracy, RM = reference method value, d = difference between RM and CEMS value, CC = confidence coefficient, BAF = bias adjustment factor

3.0 SOURCE OPERATION

3.1 PROCESS DESCRIPTION

Indeck Niles, LLC owns and operates the Indeck Niles Energy Center located at 2200 Progressive Dr., in Niles, Michigan. The facility includes two combined-cycle natural gas fired combustion turbine generators (CTGs). The two CTGS are rated at 3,651 million British thermal unit per hour (MMBtu/hr) and are coupled with heat recovery steam generators (HRSG) in a two-on-one configuration with a steam turbine generator. Each HRSG is equipped with a natural gas-fired duct burner rated at 71 MMBtu/hr to provide heat for additional steam production. The HRSGs are not capable of operating independently from each CTG. Each CTG/HRSG is equipped with dry low NOx burners (DLNB), selective catalytic reduction (SCR), and an oxidation catalyst.

3.2 SAMPLING LOCATION

The stacks are vertical, circular, and measure 21.7 feet (ft) (260 inches) in diameter at the test ports which are approximately 159 ft above grade level with an exit elevation of approximately 170 ft above grade level. The test ports are located approximately 55.2 ft (662 inches) [2.5 dia] downstream and approximately 11 ft (132 inches) [0.5 dia] upstream from the nearest disturbances. Air Hygiene has field verified the measurable dimensions. Non-field verified dimensions are provided by Indeck Niles, LLC. All exhaust samples for gaseous emissions were continuously drawn from the exhaust system at the sample ports from a single point determined after conducting a stratification test. During the stratification test three points were traversed from each of the four ports. The probe was allowed to remain at a point for at least two times the system response time.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 TEST METHODS

The emission test on the General Electric, Combustion Turbine, Unit #CTG2 at the Indeck Niles Energy Center was performed following United States Environmental Protection Agency (EPA) methods described by the Code of Federal Regulations (CFR). Table 4.1 outlines the specific methods performed on June 21, 2022.

**TABLE 4.1
SUMMARY OF SAMPLING METHODS**

Pollutant or Parameter	Sampling Method	Analysis Method
Sample Point Location	EPA Method 1	Equal Area Method
Oxygen	EPA Method 3A	Paramagnetic Cell
Nitrogen Oxides	EPA Method 7E	Chemiluminescent Analyzer
Carbon Monoxide	EPA Method 10	Nondispersive Infrared Analyzer
Stack Flow Rate	EPA Method 19	Dry Oxygen F Factor

4.2 INSTRUMENT CONFIGURATION AND OPERATIONS FOR GAS ANALYSIS

The sampling and analysis procedures used during these tests conform with the methods outlined in the Code of Federal Regulations (CFR), Title 40, Part 60, Appendix A, Methods 1, 3A, 7E, 10, and 19.

Figure 4.1 depicts the sample system used for the real-time gas analyzer tests. The gas sample was continuously pulled through the probe and transported, via heat-traced Teflon® tubing, to a stainless-steel minimum-contact condenser designed to dry the sample. Transportation of the sample, through Teflon® tubing, continued into the sample manifold within the mobile laboratory via a stainless steel/Teflon® diaphragm pump. From the manifold, the sample was partitioned to the real-time analyzers through rotameters that controlled the flow rate of the sample.

Figure 4.1 shows that the sample system was also equipped with a separate path through which a calibration gas could be delivered to the probe and back through the entire sampling system. This allowed for convenient performance of system bias checks as required by the testing methods.

All instruments were housed in a climate controlled, trailer-mounted mobile laboratory. Gaseous calibration standards were provided in aluminum cylinders with the concentrations certified by the vendor. EPA Protocol No. 1 was used to determine the cylinder concentrations where applicable (i.e., NO_x calibration gases).

Table 4.2 provides a description of the analyzers used for the instrument portion of the tests. All data from the continuous monitoring instruments were recorded on a Logic Beach Portable Data Logging System which retrieves calibrated electronic data from each instrument every one second and reports an average of the collected data every 30 seconds.

The stack gas analysis for O₂ concentrations was performed in accordance with procedures set forth in EPA Method 3A. The O₂ analyzer uses a paramagnetic cell detector.

EPA Method 7E was used to determine concentrations of NO_x. A chemiluminescent analyzer was used to determine the nitrogen oxides concentration in the gas stream. A NO₂ in nitrogen certified gas cylinder was used to verify at least a 90 percent NO₂ conversion on the day of the test.

CO emission concentrations were quantified in accordance with procedures set forth in EPA Method 10. A continuous nondispersive infrared (NDIR) analyzer was used for this purpose.

**TABLE 4.2
ANALYTICAL INSTRUMENTATION**

Parameter	Manufacturer and Model	Range	Sensitivity	Detection Principle
NO _x	THERMO 42 series	User may select up to 5,000 ppm	0.1 ppm	Thermal reduction of NO ₂ to NO. Chemiluminescence of reaction of NO with O ₃ . Detection by PMT. Inherently linear for listed ranges.
CO	THERMO 48 series	User may select up to 10,000 ppm	0.1 ppm	Infrared absorption, gas filter correlation detector, microprocessor-based linearization.
O ₂	SERVOMEX 1440	0-25%	0.1%	Paramagnetic cell, inherently linear.

kie-22-niles.mi-start#1-CTG2-RATA-rpt

RECEIVED

AUG 01 2022

AIR QUALITY DIVISION

APPENDIX A
TEST RESULTS AND CALCULATIONS

**TABLE A.1:
EMISSIONS TESTING SCHEDULE**

Unit	Load	Test Type	Run	Date	Start	Stop	Time Sync	Duration
CTG2	Normal	Stratification Test	1	06/21/22	8:15:23	8:55:23	DAHS	0:40:30
CTG2	Normal	Gas RATA	1	06/21/22	9:03:23	9:23:53	DAHS	0:21:00
CTG2	Normal	Gas RATA	2	06/21/22	10:14:23	10:34:53	DAHS	0:21:00
CTG2	Normal	Gas RATA	3	06/21/22	10:42:23	11:02:53	DAHS	0:21:00
CTG2	Normal	Gas RATA	4	06/21/22	11:11:23	11:31:53	DAHS	0:21:00
CTG2	Normal	Gas RATA	5	06/21/22	15:09:23	15:29:53	DAHS	0:21:00
CTG2	Normal	Gas RATA	6	06/21/22	15:37:23	15:57:53	DAHS	0:21:00
CTG2	Normal	Gas RATA	7	06/21/22	16:05:23	16:25:53	DAHS	0:21:00
CTG2	Normal	Gas RATA	8	06/21/22	16:34:23	16:54:53	DAHS	0:21:00
CTG2	Normal	Gas RATA	9	06/21/22	23:28:23	23:48:53	DAHS	0:21:00
CTG2	Normal	Gas RATA	10	06/21/22	23:55:23	0:15:53	DAHS	0:21:00

Indeck Niles, LLC
June 21, 2022
General Electric, Combustion Turbine, Unit #CTG2
NOx RATA Data Sheet
Indeck Niles Energy Center

RUN #	RUN TIME	USED	UNIT LOAD	RM	CEMS	RM-CEMS	
			(MW)	(ppmvd)	(ppmvd)	(diff)	(diff ²)
1	09:03 - 09:23	YES	548.0	2.50	2.60	-0.1000	0.01
2	10:14 - 10:34	YES	544.8	2.50	2.60	-0.1000	0.01
3	10:42 - 11:02	NO	542.5	2.50	2.70		
4	11:11 - 11:31	YES	534.5	2.60	2.70	-0.1000	0.01
5	15:09 - 15:29	YES	533.7	2.70	2.70	0.0000	0.00
6	15:37 - 15:57	YES	518.9	2.70	2.70	0.0000	0.00
7	16:05 - 16:25	YES	532.4	2.60	2.70	-0.1000	0.01
8	16:34 - 16:54	YES	532.8	2.70	2.70	0.0000	0.00
9	23:28 - 23:48	YES	539.8	2.70	2.70	0.0000	0.00
10	23:55 - 00:15	YES	541.6	2.70	2.70	0.0000	0.00
11		NO					
12		NO					
Total			4826.5	23.70	24.10	-0.40000	0.040000
Average			536.3	2.63	2.68	-0.044444	
Number of Runs				9			
Standard Deviation				0.052705			
T-value				2.306			
Confidence Coefficient				0.040512			
Relative Accuracy = 3.2%							

Part 60, Appendix B, Performance Specification 2,

8.4.1 RA Test Period. Conduct the RA test according to the procedure given in Sections 8.4.2 through 8.4.6 while the affected facility is operating at more than 50 percent of normal load, or as specified in an applicable subpart.

13.2 Relative Accuracy Performance Specification. The RA of the CEMS must be no greater than 20 percent when RM is used in the denominator of Eq. 2-6 (average emissions during test are greater than 50 percent of the emission standard) or 10 percent when the applicable emission standard (permit limit) is used in the denominator of Eq. 2-6 (average emissions during test are less than 50 percent of the emission standard).

Eq. 2.6 $RA = (|d| + |CC| * 100) / RM$

Indeck Niles, LLC
June 21, 2022
General Electric, Combustion Turbine, Unit #CTG2
CO RATA Data Sheet
Indeck Niles Energy Center

RUN #	RUN TIME	USED	UNIT LOAD	RM	CEMS	RM-CEMS		
			(MW)	(ppmvd)	(ppmvd)	(diff)	(diff ²)	
1	09:03 - 09:23	YES	548.0	0.20	0.20	0.0000	0.00	
2	10:14 - 10:34	YES	544.8	0.10	0.20	-0.1000	0.01	
3	10:42 - 11:02	YES	542.5	0.10	0.20	-0.1000	0.01	
4	11:11 - 11:31	YES	534.5	0.00	0.20	-0.2000	0.04	
5	15:09 - 15:29	YES	533.7	0.20	0.20	0.0000	0.00	
6	15:37 - 15:57	YES	518.9	0.10	0.20	-0.1000	0.01	
7	16:05 - 16:25	YES	532.4	0.10	0.20	-0.1000	0.01	
8	16:34 - 16:54	YES	532.8	0.10	0.20	-0.1000	0.01	
9	23:28 - 23:48	NO	539.8	0.00	0.20			
10	23:55 - 00:15	YES	541.6	0.10	0.20	-0.1000	0.01	
11		NO						
12		NO						
Total			4829.2	1.00	1.80	-0.800000	0.100000	
Average			536.6	0.11	0.20	-0.088889		
Number of Runs				9				
Standard Deviation				0.060093				
T-value				2.306				
Confidence Coefficient				0.046191				
<table border="1" style="margin: auto;"> <tr> <td style="padding: 5px;"> Relative Accuracy = 121.6% d (difference in ppm) + CC = 0.1 </td> </tr> </table>								Relative Accuracy = 121.6% d (difference in ppm) + CC = 0.1
Relative Accuracy = 121.6% d (difference in ppm) + CC = 0.1								

Part 60, Appendix B, Performance Specification 4,

1.2.1 This specification is for evaluating the acceptability of carbon monoxide (CO) continuous emission monitoring systems (CEMS) at the time of installation or soon after and whenever specified in an applicable subpart of the regulations. This specification was developed primarily for CEMS having span values of 1,000 ppmv CO.

13.2 Relative Accuracy. The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA or 5 percent when the applicable emission standard (permit limit) is used to calculate RA.

Part 60, Appendix B, Performance Specification 4A,

1.2.1 This specification is for evaluating the acceptability of carbon monoxide (CO) continuous emission monitoring systems (CEMS) at the time of installation or soon after and whenever specified in an applicable subpart of the regulations. This specification was developed primarily for CEMS that comply with low emission standards (less than 200 ppmv).

13.2 Relative Accuracy. The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA, 5 percent when the applicable emission standard (permit limit) is used to calculate RA, or within 5 ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

Indeck Niles, LLC
June 21, 2022
General Electric, Combustion Turbine, Unit #CTG2
O₂ RATA Data Sheet
Indeck Niles Energy Center

RUN #	RUN TIME	USED	UNIT LOAD	RM	CEMS	RM-CEMS		
			(MW)	(%vd)	(%vd)	(diff)	(diff ²)	
1	09:03 - 09:23	YES	548.0	11.90	12.00	-0.1000	0.01	
2	10:14 - 10:34	YES	544.8	11.90	12.00	-0.1000	0.01	
3	10:42 - 11:02	YES	542.5	11.90	12.00	-0.1000	0.01	
4	11:11 - 11:31	YES	534.5	12.00	12.00	0.0000	0.00	
5	15:09 - 15:29	NO	533.7	11.90	12.00			
6	15:37 - 15:57	YES	518.9	12.10	12.10	0.0000	0.00	
7	16:05 - 16:25	YES	532.4	12.00	12.00	0.0000	0.00	
8	16:34 - 16:54	YES	532.8	12.00	12.00	0.0000	0.00	
9	23:28 - 23:48	YES	539.8	11.90	12.00	-0.1000	0.01	
10	23:55 - 00:15	YES	541.6	12.00	12.00	0.0000	0.00	
11		NO						
12		NO						
Total			4835.3	107.70	108.10	-0.400000	0.040000	
Average			537.3	11.97	12.01	-0.044444		
Number of Runs				9				
Standard Deviation				0.052705				
T-value				2.306				
Confidence Coefficient				0.040512				
<table border="1" style="margin: auto;"> <tr> <td style="padding: 5px;"> Average Difference = 0.0 Relative Accuracy = 0.7% </td> </tr> </table>								Average Difference = 0.0 Relative Accuracy = 0.7%
Average Difference = 0.0 Relative Accuracy = 0.7%								

Part 60, Appendix B, Performance Specification 3,
13.2 CEMS Relative Accuracy Performance Specification. The RA of the CEMS must be no greater than 20 percent of the mean value of the reference method (RM) data. The results are also acceptable if the absolute value of the difference between the mean RM value and the mean CEMS value is less than or equal to 1.0 percent O₂ (or CO₂).

RECEIVED
AUG 01 2022
 App. A
AIR QUALITY DIVISION

Indeck Niles, LLC
June 21, 2022
General Electric, Combustion Turbine, Unit #CTG2
NOx RATA Data Sheet
Indeck Niles Energy Center

RUN #	RUN TIME	USED	UNIT LOAD	RM	CEMS	RM-CEMS		
			(MW)	(ppmvd@15%O ₂)	(ppmvd@15%O ₂)	(diff)	(diff ²)	
1	09:03 - 09:23	YES	548.0	1.70	1.70	0.0000	0.00	
2	10:14 - 10:34	YES	544.8	1.70	1.70	0.0000	0.00	
3	10:42 - 11:02	NO	542.5	1.70	1.80			
4	11:11 - 11:31	YES	534.5	1.70	1.80	-0.1000	0.01	
5	15:09 - 15:29	YES	533.7	1.80	1.80	0.0000	0.00	
6	15:37 - 15:57	YES	518.9	1.80	1.80	0.0000	0.00	
7	16:05 - 16:25	YES	532.4	1.80	1.80	0.0000	0.00	
8	16:34 - 16:54	YES	532.8	1.80	1.80	0.0000	0.00	
9	23:28 - 23:48	YES	539.8	1.70	1.80	-0.1000	0.01	
10	23:55 - 00:15	YES	541.6	1.80	1.80	0.0000	0.00	
11		NO						
12		NO						
Total			4826.5	15.80	16.00	-0.200000	0.020000	
Average			536.3	1.76	1.78	-0.022222		
Number of Runs				9				
Standard Deviation				0.044096				
T-value				2.306				
Confidence Coefficient				0.033895				
<table border="1" style="margin: auto;"> <tr> <td style="padding: 5px;"> Relative Accuracy = 3.2% Applicable Standard = 2.00 Alternative Relative Accuracy = 2.8% </td> </tr> </table>								Relative Accuracy = 3.2% Applicable Standard = 2.00 Alternative Relative Accuracy = 2.8%
Relative Accuracy = 3.2% Applicable Standard = 2.00 Alternative Relative Accuracy = 2.8%								

Part 60, Appendix B, Performance Specification 2,

8.4.1 RA Test Period. Conduct the RA test according to the procedure given in Sections 8.4.2 through 8.4.6 while the affected facility is operating at more than 50 percent of normal load, or as specified in an applicable subpart.

13.2 Relative Accuracy Performance Specification. The RA of the CEMS must be no greater than 20 percent when RM is used in the denominator of Eq. 2-6 (average emissions during test are greater than 50 percent of the emission standard) or 10 percent when the applicable emission standard (permit limit) is used in the denominator of Eq. 2-6 (average emissions during test are less than 50 percent of the emission standard).

Eq. 2.6 $RA = (|d| + |CC| * 100) / RM$

Indeck Niles, LLC
June 21, 2022
General Electric, Combustion Turbine, Unit #CTG2
CO RATA Data Sheet
Indeck Niles Energy Center

RUN #	RUN TIME	USED	UNIT LOAD	RM	CEMS	RM-CEMS	
			(MW)	(ppmvd@15%O ₂)	(ppmvd@15%O ₂)	(diff)	(diff ²)
1	09:03 - 09:23	YES	548.0	0.10	0.10	0.0000	0.00
2	10:14 - 10:34	YES	544.8	0.10	0.10	0.0000	0.00
3	10:42 - 11:02	YES	542.5	0.00	0.10	-0.1000	0.01
4	11:11 - 11:31	YES	534.5	0.00	0.10	-0.1000	0.01
5	15:09 - 15:29	YES	533.7	0.20	0.10	0.1000	0.01
6	15:37 - 15:57	YES	518.9	0.10	0.10	0.0000	0.00
7	16:05 - 16:25	YES	532.4	0.10	0.10	0.0000	0.00
8	16:34 - 16:54	YES	532.8	0.10	0.10	0.0000	0.00
9	23:28 - 23:48	NO	539.8	0.00	0.20		
10	23:55 - 00:15	YES	541.6	0.10	0.10	0.0000	0.00
11		NO					
12		NO					
Total			4829.2	0.80	0.90	-0.10000	0.030000
Average			536.6	0.09	0.10	-0.011111	
Number of Runs				9			
Standard Deviation				0.060093			
T-value				2.306			
Confidence Coefficient				0.046191			
Relative Accuracy = 64.5% Applicable Standard = 4.00 Alternative Relative Accuracy = 1.4% d (difference in ppm) + CC = 0.1							

Part 60, Appendix B, Performance Specification 4,

1.2.1 This specification is for evaluating the acceptability of carbon monoxide (CO) continuous emission monitoring systems (CEMS) at the time of installation or soon after and whenever specified in an applicable subpart of the regulations. This specification was developed primarily for CEMS having span values of 1,000 ppmv CO.

13.2 Relative Accuracy. The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA or 5 percent when the applicable emission standard (permit limit) is used to calculate RA.

Part 60, Appendix B, Performance Specification 4A,

1.2.1 This specification is for evaluating the acceptability of carbon monoxide (CO) continuous emission monitoring systems (CEMS) at the time of installation or soon after and whenever specified in an applicable subpart of the regulations. This specification was developed primarily for CEMS that comply with low emission standards (less than 200 ppmv).

13.2 Relative Accuracy. The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA, 5 percent when the applicable emission standard (permit limit) is used to calculate RA, or within 5 ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

Indeck Niles, LLC
June 21, 2022
General Electric, Combustion Turbine, Unit #CTG2
NOx RATA Data Sheet
Indeck Niles Energy Center

RUN #	RUN TIME	USED	UNIT LOAD	RM	CEMS	RM-CEMS							
			(MW)	(lb/hr)	(lb/hr)	(diff)	(diff ²)						
1	09:03 - 09:23	YES	548.0	20.90	21.90	-1.0000	1.00						
2	10:14 - 10:34	YES	544.8	20.70	21.90	-1.2000	1.44						
3	10:42 - 11:02	NO	542.5	20.80	22.30								
4	11:11 - 11:31	YES	534.5	21.10	22.30	-1.2000	1.44						
5	15:09 - 15:29	YES	533.7	21.70	22.60	-0.9000	0.81						
6	15:37 - 15:57	YES	518.9	21.70	22.70	-1.0000	1.00						
7	16:05 - 16:25	YES	532.4	21.60	22.40	-0.8000	0.64						
8	16:34 - 16:54	YES	532.8	21.70	22.60	-0.9000	0.81						
9	23:28 - 23:48	YES	539.8	21.50	22.60	-1.1000	1.21						
10	23:55 - 00:15	YES	541.6	21.90	22.70	-0.8000	0.64						
11		NO											
12		NO											
Total			4826.5	192.80	201.70	-8.900000	8.990000						
Average			536.3	21.42	22.41	-0.988889							
Number of Runs				9									
Standard Deviation				0.153659									
T-value				2.306									
Confidence Coefficient				0.118113									
<table border="1" style="margin: auto;"> <tr> <td>Relative Accuracy =</td> <td>5.2%</td> </tr> <tr> <td>Applicable Standard =</td> <td>27.40</td> </tr> <tr> <td>Alternative Relative Accuracy =</td> <td>4.0%</td> </tr> </table>								Relative Accuracy =	5.2%	Applicable Standard =	27.40	Alternative Relative Accuracy =	4.0%
Relative Accuracy =	5.2%												
Applicable Standard =	27.40												
Alternative Relative Accuracy =	4.0%												

Part 60, Appendix B, Performance Specification 2,

8.4.1 RA Test Period. Conduct the RA test according to the procedure given in Sections 8.4.2 through 8.4.6 while the affected facility is operating at more than 50 percent of normal load, or as specified in an applicable subpart.

13.2 Relative Accuracy Performance Specification. The RA of the CEMS must be no greater than 20 percent when RM is used in the denominator of Eq. 2-6 (average emissions during test are greater than 50 percent of the emission standard) or 10 percent when the applicable emission standard (permit limit) is used in the denominator of Eq. 2-6 (average emissions during test are less than 50 percent of the emission standard).

Eq. 2.6 $RA = \frac{(|d| + |CC|)}{RM} * 100$

Indeck Niles, LLC
June 21, 2022
General Electric, Combustion Turbine, Unit #CTG2
CO RATA Data Sheet
Indeck Niles Energy Center

RUN #	RUN TIME	USED	UNIT LOAD	RM	CEMS	RM-CEMS									
			(MW)	(lb/hr)	(lb/hr)	(diff)	(diff ²)								
1	09:03 - 09:23	YES	548.0	0.80	1.00	-0.2000	0.04								
2	10:14 - 10:34	YES	544.8	0.50	1.00	-0.5000	0.25								
3	10:42 - 11:02	YES	542.5	0.30	1.00	-0.7000	0.49								
4	11:11 - 11:31	YES	534.5	0.20	1.00	-0.8000	0.64								
5	15:09 - 15:29	YES	533.7	1.20	1.00	0.2000	0.04								
6	15:37 - 15:57	YES	518.9	0.70	1.00	-0.3000	0.09								
7	16:05 - 16:25	YES	532.4	0.70	1.00	-0.3000	0.09								
8	16:34 - 16:54	YES	532.8	0.70	1.00	-0.3000	0.09								
9	23:28 - 23:48	NO	539.8	0.00	1.00										
10	23:55 - 00:15	YES	541.6	0.70	1.00	-0.3000	0.09								
11		NO													
12		NO													
Total			4829.2	5.80	9.00	-3.20000	1.820000								
Average			536.6	0.64	1.00	-0.355556									
Number of Runs				9											
Standard Deviation				0.292024											
T-value				2.306											
Confidence Coefficient				0.224469											
<table border="1" style="margin: auto;"> <tr> <td>Relative Accuracy =</td> <td>90.0%</td> </tr> <tr> <td>Applicable Standard =</td> <td>24.70</td> </tr> <tr> <td>Alternative Relative Accuracy =</td> <td>2.3%</td> </tr> <tr> <td> d (difference in ppm) + CC =</td> <td>0.1</td> </tr> </table>								Relative Accuracy =	90.0%	Applicable Standard =	24.70	Alternative Relative Accuracy =	2.3%	 d (difference in ppm) + CC =	0.1
Relative Accuracy =	90.0%														
Applicable Standard =	24.70														
Alternative Relative Accuracy =	2.3%														
 d (difference in ppm) + CC =	0.1														

Part 60, Appendix B, Performance Specification 4,

1.2.1 This specification is for evaluating the acceptability of carbon monoxide (CO) continuous emission monitoring systems (CEMS) at the time of installation or soon after and whenever specified in an applicable subpart of the regulations. This specification was developed primarily for CEMS having span values of 1,000 ppmv CO.

13.2 Relative Accuracy. The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA or 5 percent when the applicable emission standard (permit limit) is used to calculate RA.

Part 60, Appendix B, Performance Specification 4A,

1.2.1 This specification is for evaluating the acceptability of carbon monoxide (CO) continuous emission monitoring systems (CEMS) at the time of installation or soon after and whenever specified in an applicable subpart of the regulations. This specification was developed primarily for CEMS that comply with low emission standards (less than 200 ppmv).

13.2 Relative Accuracy. The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA, 5 percent when the applicable emission standard (permit limit) is used to calculate RA, or within 5 ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

Indeck Niles, LLC
June 21, 2022
General Electric, Combustion Turbine, Unit #CTG2
NOx RATA Data Sheet
Indeck Niles Energy Center

RUN #	RUN TIME	USED	UNIT LOAD	RM	CEMS	RM-CEMS				
			(MW)	(lb/MMBtu)	(lb/MMBtu)	(diff)	(diff ²)			
1	09:03 - 09:23	YES	548.0	0.006	0.006	0.0000	0.0000			
2	10:14 - 10:34	YES	544.8	0.006	0.006	0.0000	0.0000			
3	10:42 - 11:02	NO	542.5	0.006	0.007					
4	11:11 - 11:31	YES	534.5	0.006	0.007	-0.0010	0.0000			
5	15:09 - 15:29	YES	533.7	0.006	0.007	-0.0010	0.0000			
6	15:37 - 15:57	YES	518.9	0.007	0.007	0.0000	0.0000			
7	16:05 - 16:25	YES	532.4	0.006	0.007	-0.0010	0.0000			
8	16:34 - 16:54	YES	532.8	0.006	0.007	-0.0010	0.0000			
9	23:28 - 23:48	YES	539.8	0.006	0.007	-0.0010	0.0000			
10	23:55 - 00:15	YES	541.6	0.007	0.007	0.0000	0.0000			
11		NO								
12		NO								
Total			4826.5	0.056	0.061	-0.005000	0.000005			
Average			536.3	0.006	0.007	-0.000556				
Number of Runs				9						
Standard Deviation				0.000527						
T-value				2.306						
Confidence Coefficient				0.000405						
Relative Accuracy = 15.44%										
<p>If the mean difference is less than or equal to the absolute value of the confidence coefficient, then the Bias Test passes and the bias adjustment factor is not applicable.</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 5px;"> Mean Difference = -0.0006 Confidence Coefficient = 0.0004 </td> </tr> <tr> <td style="text-align: center; padding: 5px;"> BAF = 1 + (abs. value mean difference/avg. CEMS reading) </td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;"> Average CEMS Reading = 0.007 BAF = 1.000 </td> </tr> </table>								Mean Difference = -0.0006 Confidence Coefficient = 0.0004	BAF = 1 + (abs. value mean difference/avg. CEMS reading)	Average CEMS Reading = 0.007 BAF = 1.000
Mean Difference = -0.0006 Confidence Coefficient = 0.0004										
BAF = 1 + (abs. value mean difference/avg. CEMS reading)										
Average CEMS Reading = 0.007 BAF = 1.000										

Part 75, Appendix A,

3.3.2 Relative Accuracy for NOX-Diluent Continuous Emission Monitoring Systems

(a) The relative accuracy for NOX-diluent continuous emission monitoring systems shall not exceed 10.0 percent.

(b) For affected units where the average of the reference method measurements of NOX emission rate (this means lb/MMBtu) during the relative accuracy test audit is less than or equal to 0.200 lb/mmBtu, the difference between the mean value of the continuous emission monitoring system measurements and the reference method mean value shall not exceed ±0.020 lb/mmBtu, wherever the relative accuracy specification of 10.0 percent is not achieved.

7.6.5 Bias Adjustment

(b) For single-load RATAs of SO2 pollutant concentration monitors, NOX concentration monitoring systems, and NOX-diluent monitoring systems and for the single-load flow RATAs required or allowed under section 6.5.2 of this appendix and sections 2.3.1.3(b) and 2.3.1.3(c) of Appendix B to this part, the appropriate BAF is determined directly from the RATA results at normal load, using Equation A-12. Notwithstanding, when a NOX concentration CEMS or an SO2 CEMS or a NOX-diluent CEMS installed on a low-emitting affected unit (i.e., average SO2 or NOX concentration during the RATA &IE; 250 ppm or average NOX emission rate &IE; 0.200 lb/mmBtu) meets the normal 10.0 percent relative accuracy specification (as calculated using Equation A-10) or the alternate relative accuracy specification in section 3.3 of this appendix for low-emitters, but fails the bias test, the BAF may either be determined using Equation A-12, or a default BAF of 1.111 may be used.

Part 75, Appendix B,

2.3.1.2 Reduced RATA Frequencies. Relative accuracy test audits of primary and redundant backup SO2 pollutant concentration monitors, CO2 pollutant concentration monitors (including O2 monitors used to determine CO2 emissions), CO2 or O2 diluent monitors used to determine heat input, moisture monitoring systems, NOX concentration monitoring systems, flow monitors, NOX-diluent monitoring systems or SO2-diluent monitoring systems may be performed annually (i.e., once every four successive QA operating quarters, rather than once every two successive QA operating quarters) if any of the following conditions are met for the specific monitoring system involved:

(a) The relative accuracy during the audit of an SO2 or CO2 pollutant concentration monitor (including an O2 pollutant monitor used to measure CO2 using the procedures in appendix F to this part), or of a CO2 or O2 diluent monitor used to determine heat input, or of a NOX concentration monitoring system, or of a NOX-diluent monitoring system, or of an SO2-diluent continuous emissions monitoring system is ≤ 7.5 percent;

(f) For units with low NOX emission rates (average NOX emission rate measured by the reference method during the RATA ≤ 0.200 lb/mmBtu), when a NOX-diluent continuous emission monitoring system fails to achieve a relative accuracy ≤ 7.5 percent, but the monitoring system mean value from the RATA, calculated using Equation A-7 in appendix A to this part, is within ± 0.015 lb/mmBtu of the reference method mean value;

Figure 2 to Appendix B of Part 75_Relative Accuracy Test Frequency Incentive System.

RATA	Semiannual(percent)(1)	Annual(1)
SO2 or NOX(3)	$7.5\% < RA \leq 10.0\%$ or ± 15.0 ppm(2)	$RA \leq 7.5\%$ or ± 12.0 ppm(2)
SO2-diluent	$7.5\% < RA \leq 10.0\%$ or ± 0.030 lb/mmBtu(2)	$RA \leq 7.5\%$ or ± 0.025 lb/mmBtu(2)
NOX-diluent	$7.5\% < RA \leq 10.0\%$ or ± 0.020 lb/mmBtu(2)	$RA \leq 7.5\%$ or ± 0.015 lb/mmBtu(2)
Flow	$7.5\% < RA \leq 10.0\%$ or ± 2.0 fps(2)	$RA \leq 7.5\%$ or ± 1.5 fps
CO2 or O2	$7.5\% < RA \leq 10.0\%$ or $\pm 1.0\%$ CO2/O2(2)	$RA \leq 7.5\%$ or $\pm 0.7\%$ CO2/O2(2)
Moisture	$7.5\% < RA \leq 10.0\%$ or $\pm 1.5\%$ H2O(2)	$RA \leq 7.5\%$ or $\pm 1.0\%$ H2O(2)

(1) The deadline for the next RATA is the end of the second (if semiannual) or fourth (if annual) successive QA operating quarter following the quarter in which the CEMS was last tested. Exclude calendar quarters with fewer than 168 unit operating hours (or, for common stacks and bypass stacks, exclude quarters with fewer than 168 stack operating hours) in determining the RATA deadline. For SO2 monitors, QA operating quarters in which only very low sulfur fuel as defined in § 72.2, is combusted may also be excluded. However, the exclusion of calendar quarters is limited as follows: the deadline for the next RATA shall be no more than 8 calendar quarters after the quarter in which a RATA was last performed.

(2) The difference between monitor and reference method mean values applies to moisture monitors, CO2, and O2 monitors, low emitters, or low flow, only.

(3) A NOX concentration monitoring system used to determine NOX mass emissions under § 75.71.

Calculations, Formulas, and Constants

The following information supports the spreadsheets for this testing project.

Given Data:

Ideal Gas Conversion Factor = 385.23 SCF/lb-mol at 68 deg F & 14.696 psia

Fuel Heating Value is based upon Air Hygiene's fuel gas calculation sheet. All calculations are based upon a correction to 68 deg F & 14.696 psia

High Heating Values (HHV) are used for the Fuel Heating Value, F-Factor, and Fuel Flow Data per EPA requirements.

ASTM D 3588

Molecular Weight of NOx (lb/lb-mole) = 46.01
 Molecular Weight of CO (lb/lb-mole) = 28.00
 Molecular Weight of SO₂ (lb/lb-mole) = 64.00
 Molecular Weight of THC (propane) (lb/lb-mole) = 44.00
 Molecular Weight of VOC (methane) (lb/lb-mole) = 16.00
 Molecular Weight of NH₃ (lb/lb-mole) = 17.03
 Molecular Weight of HCHO (lb/lb-mole) = 30.03
 Molecular Weight of CO₂ (lb/lb-mole) = 44.01

Formulas:

1. Corrected Raw Average (C_{Gas}), 40CFR60, App. A, RM 7E, Eq. 7E-5 (08/15/06)

$$C_{Gas} = (C_{Avg} - C_o) \times \left(\frac{C_{M1} - C_o}{C_M - C_o} \right)$$

2. Correction to % O₂, 40CFR60, App. A, RM 20, Eq. 20-5 (11/26/02)

$$C_{adj} = C_{Gas(T arg or)} \times \left(\frac{20.9\% - AdjFactor}{20.9\% - C_{Gas(O_2)}} \right)$$

3. Correction to % O₂ and ISO Conditions

$$C_{ISO} = C_{adj} \times \sqrt{\frac{P_r}{P_o}} \times e^{(19 \times (H_o - 0.00633))} \times \left(\frac{288}{T_a} \right)^{1.53}$$

4. Method 19 stack exhaust flow (scfm) [ref. EPA EMC FAQ Method 19]

$$Q_s = \left(\frac{FFactor \times Q_f \times HHV}{1,000,000} \right) \times \left(\frac{20.9\%}{20.9\% - C_{Gas(O_2)}} \right)$$

RATA SHEET CALCULATIONS

d = Reference Method Data - CEMS Data

S_d = Standard Deviation

CC = Confident Coefficient

n = number of runs

t_{0.025} = 2.5 percent confidence coefficient T-values

RA = relative accuracy

ARA = alternative relative accuracy

BAF = Bias adjustment factor

n	t	n	t	n	t
2	12.706	7	2.447	12	2.201
3	4.303	8	2.365	13	2.179
4	3.182	9	2.306	14	2.160
5	2.776	10	2.262	15	2.145
6	2.571	11	2.228	16	2.131

1. Difference

$$d = \sum_{i=1}^n d_i$$

2. Standard Deviation

$$S_d = \sqrt{\frac{\sum_{i=1}^n d_i^2 - \frac{\left(\sum_{i=1}^n d_i \right)^2}{n}}{n-1}}$$

3. Confident Coefficient

$$CC = t_{0.025} \times \frac{S_d}{\sqrt{n}}$$

40CFR60, App. A, RM 19, Table 19-1

Conversion Constant for NOx = 0.0000001194351

Conversion Constant for CO = 0.000000726839

Conversion Constant for SO₂ = 0.0000001661345

Conversion Constant for THC = 0.0000001142175

Conversion Constant for VOC (methane) = 0.000000415336

Conversion Constant for NH₃ = 0.000000442074

Conversion Constant for HCHO = 0.000000779534

Conversion Constant for CO₂ = 0.0000001142434

NOTE: units are lb/ppm*ft³

5. Emission Rate in lb/hr

$$E_{lb/hr} = \frac{C_{Gas}}{10^6} \times \frac{Q_s \times MW}{G}$$

6. Emission Rate in tons per year

$$E_{ton/yr} = \frac{E_{lb/hr} \times hr_{year}}{2000}$$

7. Emission Concentration in lb/MMBtu (O₂ based)

$$E_{lb/MMBtu} = \frac{C_{Gas} \times F_d Factor \times Conv_c \times 20.9\%}{20.9\% - C_{Gas(O_2)}}$$

8. Emission Concentration in g/hp*hr

$$E_{g/hp-hr} = \frac{E_{lb/hr} \times 453.6}{mmv \times 1341.022} \text{ or } \frac{E_{lb/hr} \times 453.6}{hp}$$