1.0 Introduction

1.1 Summary of Test Program

Consumers Energy Company contracted Montrose Air Quality Services, LLC (Montrose) to perform the Annual Quality Assurance (QA) Relative Accuracy Test Audit (RATA) for the Continuous Emission Monitoring Systems (CEMS) associated with the natural gas and/or oil-fired Boilers 3 (EU-KARN3) and 4 (EU-KARN4) and Auxiliary Boilers A (EU-AUXBLRA-2) and B (EU-AUXBLRB-2) common stack (FG-KARN34-2) at the D.E Karn Generating Complex (Karn) located in Essexville, Michigan (State Registration No.: B2840). Testing was performed on August 15 and 28, 2023, for the purpose of satisfying the emission testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operation Permit No. MI-ROP-B2840-2022 by evaluating the quality of the emissions data produced by Karn's CEMS in accordance with 40 CFR Part 75, Appendices A and B.

1.1 Part 75 RATA

For the Part 75 RATA, the specific objectives were to:

- Verify the relative accuracy (RA) of the FG-KARN34-2 CEMS for nitrogen oxides (NO_x) emission rate (lb/mmBTU), carbon dioxide (CO_2) concentration (%-Wet) and volumetric flow rate (scfh) during normal load conditions in accordance with Performance Specifications in 40 CFR Part 75.
- Conduct the test program with a focus on safety.

Montrose performed the tests to measure the emission parameters listed in Tables 1-1.

Although not noted in Table 1-1, there was an initial gas and flow RATA attempt on 08/15/2023. Preliminary comparisons between the gaseous CEMS and reference method (RM) data led to the conclusion there was a likely issue with the CEMS sampling system. Regardless, the decision was made to proceed with the gaseous RATA, as NOx lb/mmBtu still appeared to be reasonably accurate despite NOx and CO2 concentrations clearly diverging. On the flow side, three trial runs were completed for the purpose of assessing whether changes to the look-up tables (similar to a K factor) were warranted. However, when reviewing that data, it was discovered that the RM temperature data was not accurate. This was traced to a mis-match between the flow probe and sampling line thermocouple types (Montorse was using a flow probe supplied by Consumers Energy). Ultimately, only 5 gas RATA runs were completed, and there were no additional flow RATA runs after resolving the thermocouple incompatibility, as an issue with the natural gas supply forced the units sharing the common stack offline later on 08/15/2023.

Table 1-1
Summary of Test Program – Normal Load

Test Date(s)	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
8/28/2023	FG-KARN34-2 CEMS	Velocity/Volumetric Flow Rate	EPA 1, 2 & 2H	12	10-17
8/28/2023	FG-KARN34-2 CEMS	O_2, CO_2	EPA 3A	10	21
8/28/2023	FG-KARN34-2 CEMS	Moisture	EPA 4	6	30-60
8/28/2023	FG-KARN34-2 CEMS	NO_x	EPA 7E	10	21

For each RATA load, nine RATA runs were used to determine the RA of the EU-BOILER CEMS.

To simplify this report, a list of Units and Abbreviations is included in Appendix C.1. Throughout this report, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. The RA test results are summarized and compared to their respective regulatory requirements in Table 1-2. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

The testing was conducted by the Montrose personnel listed in Table 1-5. The tests were conducted according to the test plan (protocol) that was submitted to EGLE.

Table 1-2
Summary of Part 75 RATA Results – FG-KARN34-2 CEMS – Normal Load

August 28, 2023

Parameter/Units	Regulatory Reference	RA	Allowable
Part 75 – Annual (Reduced Frequency)			
Nitrogen Oxides (NO_x)			
lb/mmBTU	App. B Sect. 2.3.1.2	5.51%	≤ 7.5% of RM
Carbon Dioxide (CO_2)			
% volume wet	App. B Sect. 2.3.1.2	6.12%	≤ 7.5% of RM
Volumetric Flow Rate (Primary System 940)			
kscfh	App. B Sect. 2.3.1.2	1.41%	≤ 7.5% of RM
Volumetric Flow Rate (Redundant Backup 941)			
kscfh	App. B Sect. 2.3.1.2	0.82%	≤ 7.5% of RM
Volumetric Flow Rate (Redundant Backup 942)			
kscfh	App. B Sect. 2.3.1.2	2.59%	≤ 7.5% of RM

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location:	D.E. Karn Generating Complex 2680 N. Weadock Highway Essexville, Michigan 48732
Project Contact:	Tashia Walraven
Role:	Senior Manager Maintenance
Company:	Consumers Energy Company
Telephone:	989-891-3357
Email:	Tashia.walraven@cmsenergy.com

Agency Information

Regulatory Agency:	EGLE
Agency Contact:	Daniel Droste
Telephone:	989-225-6052
Email:	DrosteD3@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC
Contact:	John Nestor
Title:	District Manager
Telephone:	248-765-5032
Email:	jonestor@montrose-env.com

Test personnel and observers are summarized in Table 1-5.

Table 1-5
Test Personnel and Observers

Name	Affiliation	Role/Responsibility
John Nestor	Montrose	District Manager (PM), QI
Shane Rabideau	Montrose	Field Technician
Tashia Walraven	D. E. Karn Generating Complex	Test Coordinator
Daniel Droste	EGLE	Observer

Qualified individual information is presented in Table 1-6.

Table 1-6
Part 75 Qualified Individual Information

Data Element	Information
QI Name	John Nestor
AETB Name	Montrose Air Quality Services, LLC
AETB Phone Number	440-262-3760
AETB Email Address	qualitymanagement@montrose-env.com
Exam Date	Group 1: 3/18/2023 Group 3: 3/16/2023
Provider Name	Source Evaluation Society
Provider Email Address	qstiprogram@gmail.com

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

The D.E. Karn 3 & 4 Plant operates natural gas and/or fuel oil (dual fuel) fired boilers EUKARN3-2 and EU-KARN4-2, each rated at 638 megawatts (MW) net output and a steam flow of 4,650 klbs/hour. The plant also operates the natural gas-fired auxiliary boilers EUAUXBLRA-2 and EU-AUXBLRB-2, with each boiler rated at a heat input of 302 mmBtu/hr and a steam output of 225 klbs/hr. Flue gas from the individual boiler exhausts are combined into a common duct or stack designated as SVKARN34 or CS0009. SO2 and NOx emissions from Units 3 and 4 are controlled by fuel blending and low NOx burner technology, respectively. The auxiliary boilers are also equipped with low NOx burner technology.

Being that all units that share the common stack are peaking units, the entire operating load range is considered normal, as stated in 40 CFR 75, Appendix A, section 6.5.2.1(d). During the gas RATA, the utility boilers generated approximately 2,067 klbs/hr of steam flow. Only Unit 4 was operating during the RATA testing.

Unit 4 was fired exclusively with natural gas during the RATA (Units A and B can only fire natural gas), and a CO2 based fuel factor (Fc) of 1,040 scf CO2/mmBtu was employed when calculating reference method lb/mmBtu emission rates.

Consistent with 40 CFR §75.21(a)(7), the common stack operating hours did not reach or exceed the 480-hr/yr exemption for high sulfur fuel firing, thus an SO2 RATA was not required. Information regarding specific operating hours on fuel oil is retained by Consumers Energy personnel.

The Thermo Scientific (Thermo) dilution-extractive CO2, SO2 and NOx-diluent CEMS and dual ultrasonic flow CEMS (Flow 1 and Flow 2) installed in the common stack continuously measure gas concentrations and exhaust gas velocity on a wet basis. The flow CEMS are configured in an X pattern, allowing the individual monitors to act in tandem as components of the primary flow system or as redundant backup flow systems, if necessary. Each of the CEMS are linked electronically to a StackVision© data acquisition handling system (DAHS) which records various process, concentration, exhaust gas flow rate and emission rate data. The DAHS is manufactured by ESC Spectrum (ESC).

The common stack sampling test ports are installed at 3.09 stack diameters downstream from the nearest flow disturbance (where the Unit A and B exhaust ductwork enters the

Common Stack breeching from the east side), and 3.84 stack diameters upstream from the stack exit. A schematic depicting the common stack test port locations and individual exhaust duct breeching elevations is shown in Figure 1.

2.2 Facility and Reference Method (RM) CEMS Descriptions

The Facility CEMS analyzer information is presented in Table 2-1, and the RM CEMS analyzer information is presented in Table 2-2.

Table 2-1
Facility CEMS Information

Analyzer Type	Manufacturer	Model No.	Serial No.
CO_2	Thermo Scientific	410i	0709421281
NO_x	Thermo Scientific	42i	0709421280
Flow	Teledyne	150	1500496
Flow	Teledyne	150	1500506

Table 2-2
RM CEMS Information

Analyzer Type	Manufacturer	Model No.	Serial No.
CO_2	Servomex	Servpro 1440	01440D1-5222
NO_x	Teledyne	T200H	84

2.3 Flue Gas Sampling Location

Information regarding the sampling location is presented in Table 2-3.

Table 2-3
Sampling Location

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	Number of Traverse Points
EU-BOILER Exhaust Stack (SVBOILER)	414	1280 / 3.09	1590/ 3.84	Flow: 16 (4/port) Gaseous: 3

The sampling location was verified in the field to conform to EPA Method 1. Acceptable cyclonic flow conditions were confirmed prior to testing using EPA Method 1, Section 11.4. See Appendix A.1 for more information. For gaseous traverses, the short measurement line was used in accordance with 40 CFR Part 75, Appendix A, Section 6.5.6 (b) (2), with sampling points 0.4, 1.0, and 2.0 meters from the stack wall.

2.4 Operating Conditions and Process Data

The CEMS RATAs were performed while EU-BOILER was operating at Normal Load in accordance with 40 CFR Part 75.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The Facility CEMS and process data that was provided is presented in Appendix B. Data collected includes the following parameters:

- Facility CEMS data for each 21-minute gas RATA run or each 5 minute or longer flow RATA run.
- Steam Flow, klb/hr

3.0 Sampling and Analytical Procedures

3.1 Test Methods

The test methods for this test program have been presented in Table 1-1. Additional information regarding specific applications or modifications to standard procedures is presented below.

3.1.1 EPA Method 1, Sample and Velocity Traverses for Stationary Sources

EPA Method 1 is used to assure that representative measurements of volumetric flow rate are obtained by dividing the cross-section of the stack or duct into equal areas, and then locating a traverse point within each of the equal areas. Acceptable sample locations must be located at least two stack or duct equivalent diameters downstream from a flow disturbance and one-half equivalent diameter upstream from a flow disturbance.

The sample port and traverse point locations are detailed in Appendix A.

3.1.2 EPA Method 2, Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

EPA Method 2 is used to measure the gas velocity using an S-type pitot tube connected to a pressure measurement device, and to measure the gas temperature using a calibrated thermocouple connected to a thermocouple indicator. Typically, Type S (Stauβcheibe) pitot tubes conforming to the geometric specifications in the test method are used, along with an inclined manometer. The measurements are made at traverse points specified by EPA Method 1.

The typical sampling system is detailed in Figure 3-1.

3.1.3 EPA Method 2H, Determination of Stack Gas Velocity Taking into Account Velocity Decay Near the Stack Wall

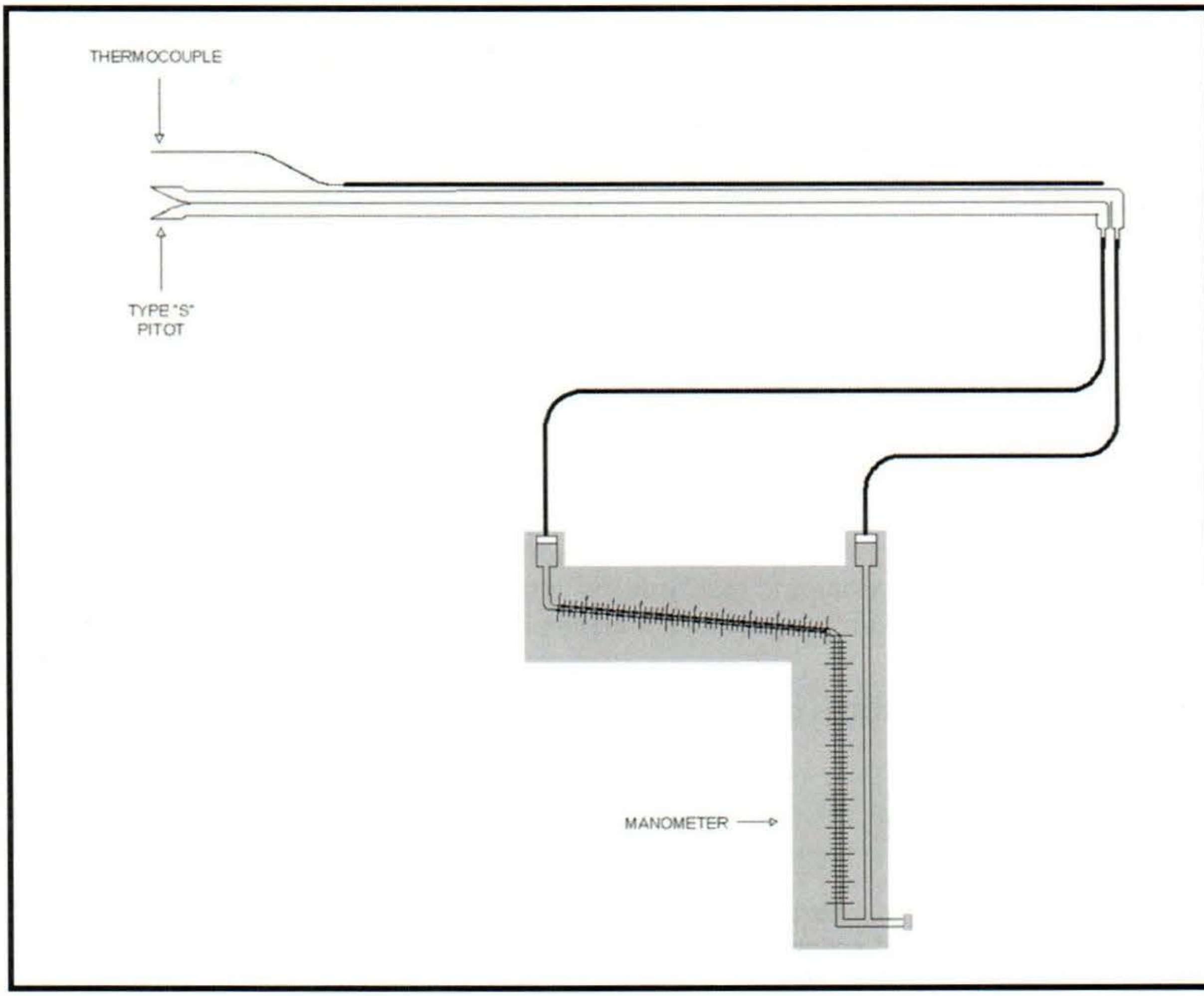
EPA Method 2H is used to measure the velocity decay of the gas due to friction of the stack wall. Per EPA Method 2H Section 2.2.2, a default wall adjustment factor (WAF) of 0.99 for brick and mortar was applied to the RM flow values.

3.1.4 EPA Method 3A, Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 3A is an instrumental test method used to measure the concentration of O_2 and CO_2 in stack gas. The effluent gas is continuously or intermittently sampled and conveyed to analyzers that measure the concentration of O_2 and CO_2. The performance requirements of the method must be met to validate data.

The typical sampling system is detailed in Figure 3-3.

Figure 3-1
EPA Method 2 Sampling Train

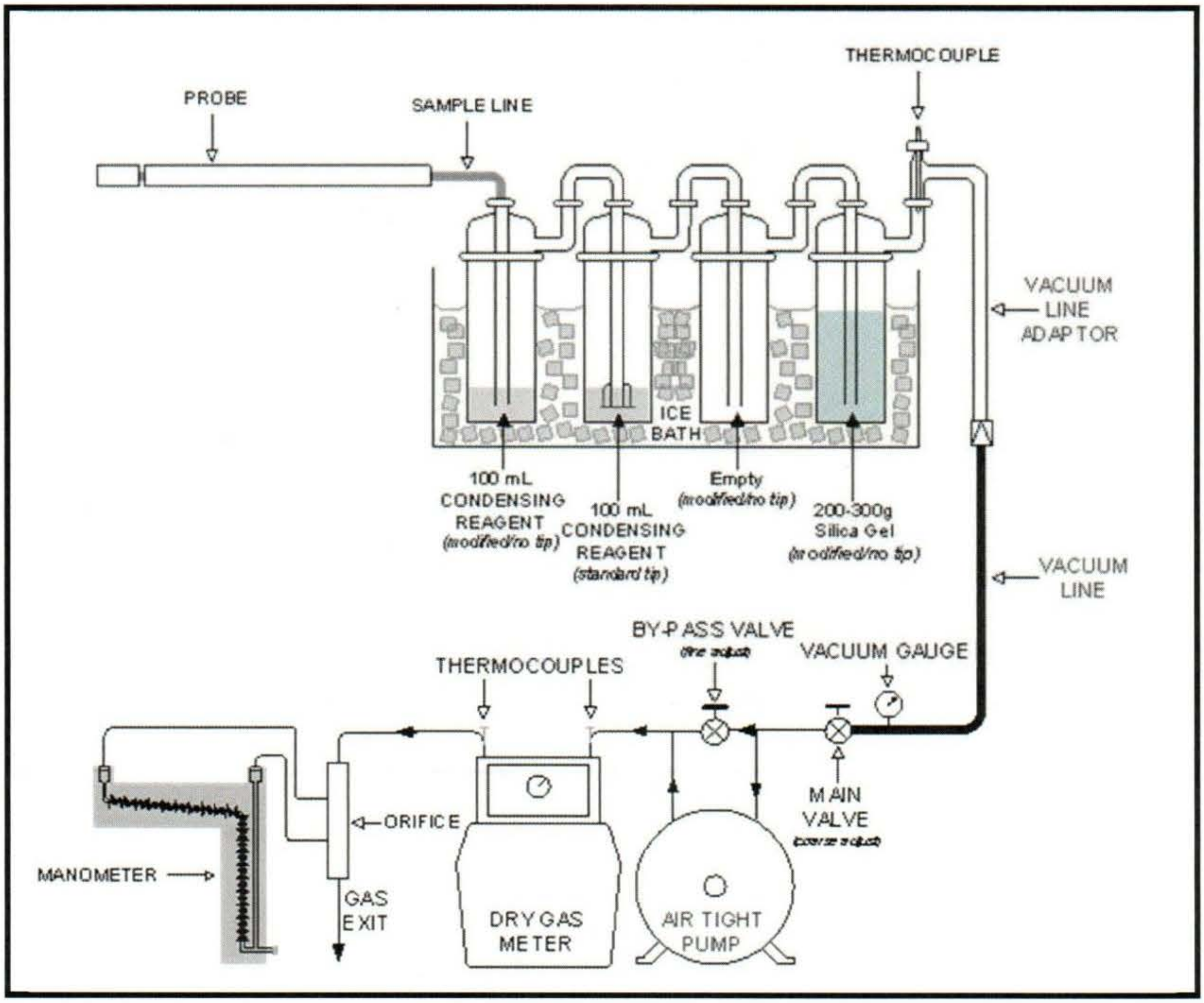


3.1.5 EPA Method 4, Determination of Moisture Content in Stack Gas

EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodologyspecific liquids and silica gel immersed in an ice water bath. The impingers are weighed after each run to determine the percent moisture.

The typical sampling system is detailed in Figure 3-2.

Figure 3-2
EPA Method 4 (Detached) Sampling Train

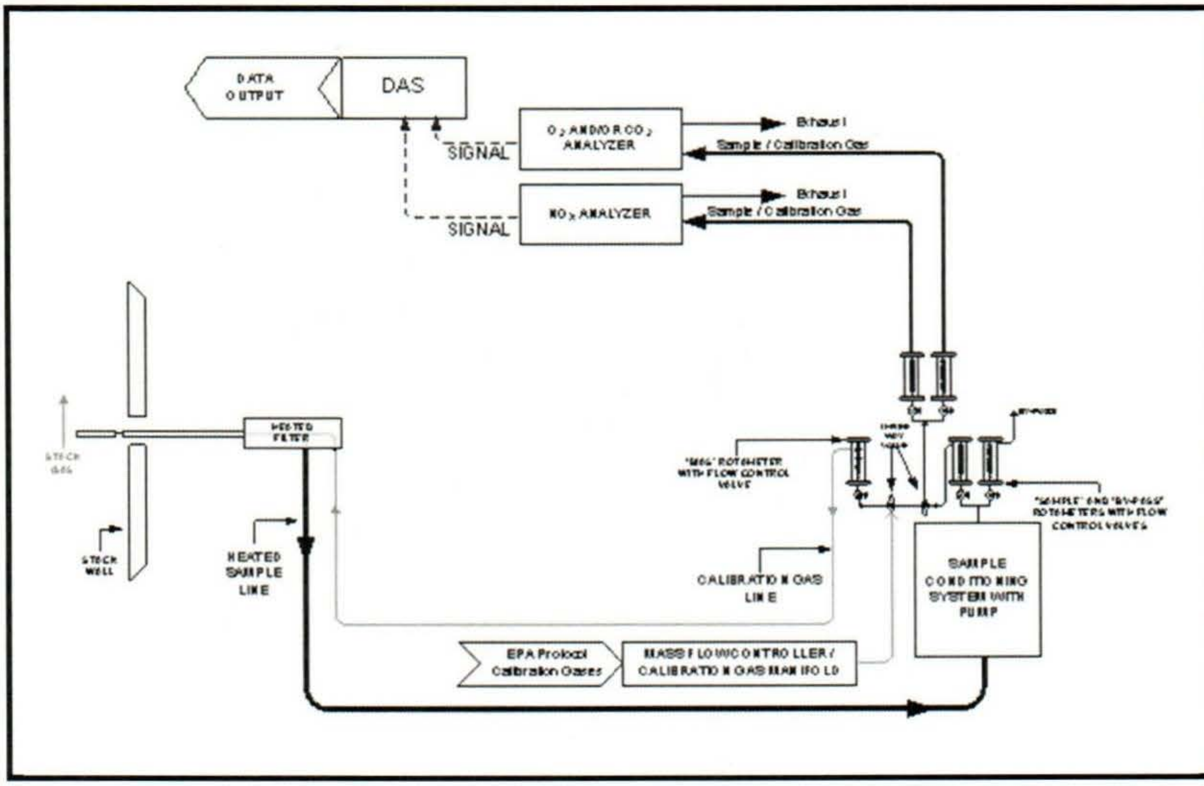


3.1.6 EPA Method 7E, Determination of Nitrogen Oxides Emissions from Stationary Source (Instrumental Analyzer Procedure)

EPA Method 7E is an instrumental test method used to continuously measure emissions of NO_x as NO_2. Conditioned gas is sent to an analyzer to measure the concentration of NO_x. NO and NO_2 can be measured separately or simultaneously together but, for the purposes of this method, NO_x is the sum of NO and NO_2. The performance requirements of the method must be met to validate the data.

The typical sampling system is detailed in Figure 3-3.

Figure 3-3
EPA Methods 3A and 7E



3.1.7 EPA Method 19, Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates

EPA Method 19 is a manual method used to determine (a) PM, SO_2, and NO_x emission rates; (b) sulfur removal efficiencies of fuel pretreatment and SO_2 control devices; and (c) overall reduction of potential SO_2 emissions. This method provides data reduction procedures, but does not include any sample collection or analysis procedures.

EPA Method 19 is used to calculate mass emission rates in units of lb/MMBtu. EPA Method 19, Table 19-2 contains a list of assigned fuel factors for different types of fuels, which can be used for these calculations.

3.2 Process Test Methods

The test plan did not require that process samples be collected during this test program; therefore, no process sample data are presented in this test report.

4.0 Test Discussion and Results

4.1 Field Test Deviations and Exceptions

No field deviations occurred during the RATA program.

4.2 Presentation of Results

The RA results are compared to the regulatory requirements in Table 1-2. The results of individual test runs performed during the Normal Load Gaseous Pollutant RATA and flow RATA are presented in Tables 4-1 through 4-4. Emissions are reported in units consistent with those in the applicable regulations or requirements. Additional information is included in the appendices as presented in the Table of Contents.

As noted previously, the attempted gas and flow RATAs on 08/15/2023 were abandoned due to a myriad of issues including problems with the flow reference method temperature measurements, the gaseous CEMS sampling system and eventual loss of sufficient natural gas fuel supply. Data collected from the 8/15/2023 RATA is presented in appendix A.2.

It should also be noted that three trial flow RATA runs were conducted between 8:45-9:25 on 08/28/2023. For the primary flow monitoring system 940 and redundant backup flow monitoring systems 941 and 942, each individual run met the trial flow RATA criteria of an error no more than 10% of the average reference method value [75.20(b)(3)(viii)(E)(2)]. However, to optimize the performance of the flow CEMS, Consumers Energy still chose to adjust the flow CEMS before proceeding with additional flow RATA testing. The look-up table values for both flow monitors were adjusted,probationary calibration error tests were run, and flow RATAs were then passed later the same day. Data is presented in Appendix A.2.

Table 4-1
NOx (lb/MMBtu) RATA Results -
FG-KARN34-2 CEMS– Normal Load

Run #	Date	Time	RM	CEMS	Difference	Run Used (Y/N)	Unit Load (klbs steam)
1	8/28/2023	10:50-11:10	0.176	0.186	-0.010	Y	2,069
2	8/28/2023	11:30-11:50	0.173	0.183	-0.010	Y	2,067
3	8/28/2023	12:05-12:25	0.174	0.183	-0.009	Y	2,070
4	8/28/2023	12:40-13:00	0.176	0.184	-0.008	Y	2,069
5	8/28/2023	13:15-13:35	0.175	0.184	-0.009	Y	2,067
6	8/28/2023	13:50-14:10	0.177	0.186	-0.009	Y	2,063
7	8/28/2023	14:25-14:45	0.180	0.190	-0.010	Y	2,062
8	8/28/2023	15:00-15:20	0.178	0.190	-0.012	N	2,065
9	8/28/2023	15:35-15:55	0.179	0.187	-0.008	Y	2,065
10	8/28/2023	16:15-16:35	0.177	0.186	-0.009	Y	2,069
Averages			0.176	0.185	-0.009		2,067
Standard Deviation			0.00078				
Confidence Coefficient (CC)			0.00060				
Unit Load			Normal				
RA based on mean RM value			5.51	%			
Bias Test			Pass	-			
BAF			1.000	-			

Table 4-2
CO_2 (%-Wet) Part 75 RATA Results -
FG-KARN34-2 CEMS– Normal Load

Run #	Date	Time	RM	CEMS	Difference	Run Used (Y/N)	Unit Load (klbs steam)
1	8/28/2023	10:50-11:10	4.7	4.4	0.3	N	2,069
2	8/28/2023	11:30-11:50	4.7	4.4	0.3	Y	2,067
3	8/28/2023	12:05-12:25	4.7	4.4	0.3	Y	2,070
4	8/28/2023	12:40-13:00	4.7	4.4	0.3	Y	2,069
5	8/28/2023	13:15-13:35	4.7	4.4	0.2	Y	2,067
6	8/28/2023	13:50-14:10	4.7	4.5	0.2	Y	2,063
7	8/28/2023	14:25-14:45	4.7	4.5	0.2	Y	2,062
8	8/28/2023	15:00-15:20	4.7	4.5	0.2	Y	2,065
9	8/28/2023	15:35-15:55	4.7	4.5	0.2	Y	2,065
10	8/28/2023	16:15-16:35	4.7	4.6	0.1	Y	2,069
Averages			4.7	4.5	0.2		2,067
Standard Deviation			0.071				
Confidence Coefficient (CC)			0.054				
Unit Load			Normal				
RA based on mean RM value			6.12	%			

Table 4-3
Volumetric Flow Rate (kscfh) Part 75 RATA Results -
FG-KARN34-2 CEMS Analyzer 940 (Primary System)- Normal Load

Run #	Date	Time	RM	CEMS	Difference	Run Used (Y/N)	Unit Load (klbs steam)
1	8/28/2023	14:30-14:44	77,114	76,306	808	Y	2,062
2	8/28/2023	14:45-14:55	77,129	75,920	1,209	N	2,062
3	8/28/2023	14:56-15:10	78,103	76,538	1,565	N	2,061
4	8/28/2023	16:15-16:29	77,052	76,629	423	Y	2,069
5	8/28/2023	16:30-16:44	76,396	76,357	39	Y	2,070
6	8/28/2023	16:45-16:59	77,033	76,328	705	Y	2,071
7	8/28/2023	17:00-17:14	77,179	76,478	701	Y	2,070
8	8/28/2023	17:25-17:39	77,573	76,131	1,442	N	2,067
9	8/28/2023	17:40-17:54	76,454	76,428	26	Y	2,070
10	8/28/2023	17:55-18:09	76,810	76,377	433	Y	2,068
11	8/28/2023	18:10-18:24	76,230	76,654	-424	Y	2,066
12	8/28/2023	18:35-18:49	78,309	76,204	2,105	Y	2,067
Averages			76,953	76,418	535		2,067
Standard Deviation			711				
Confidence Coefficient (CC)			546				
Unit Load			Normal				
RA based on mean RM value			1.41	%			
Bias Test			Pass	-			
BAF			1.000	-			

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Table 4-4
Volumetric Flow Rate (kscfh) Part 75 RATA Results -
FG-KARN34-2 CEMS Analyzer 941 (Redundant Backup) – Normal Load

Run #	Date	Time	RM	CEMS	Difference	Run Used (Y/N)	Unit Load (klbs steam)
1	8/28/2023	14:30-14:44	77,114	77,071	43	Y	2,062
2	8/28/2023	14:45-14:55	77,129	77,530	-401	Y	2,062
3	8/28/2023	14:56-15:10	78,103	78,400	-297	Y	2,061
4	8/28/2023	16:15-16:29	77,052	78,130	-1,078	N	2,069
5	8/28/2023	16:30-16:44	76,396	77,827	-1,431	N	2,070
6	8/28/2023	16:45-16:59	77,033	77,021	12	Y	2,071
7	8/28/2023	17:00-17:14	77,179	78,034	-855	Y	2,070
8	8/28/2023	17:25-17:39	77,573	76,951	622	Y	2,067
9	8/28/2023	17:40-17:54	76,454	76,983	-529	Y	2,070
10	8/28/2023	17:55-18:09	76,810	77,485	-675	Y	2,068
11	8/28/2023	18:10-18:24	76,230	78,337	-2,107	N	2,066
12	8/28/2023	18:35-18:49	78,309	76,773	1,536	Y	2,067
Averages			77,300.44	77,361.89	-60.44		2,067
Standard Deviation			744				
Confidence Coefficient (CC)			572				
Unit Load			Normal				
RA based on mean RM value			0.82	%			
Bias Test			Pass	-			
BAF			1.000	-			

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Table 4-5
Volumetric Flow Rate (kscfh) Part 75 RATA Results -
FG-KARN34-2 CEMS Analyzer 942 (Redundant Backup) – Normal Load

Run #	Date	Time	RM	CEMS	Difference	Run Used (Y/N)	Unit Load (klbs steam)
1	8/28/2023	14:30-14:44	77,114	75,541	1,573	Y	2,062
2	8/28/2023	14:45-14:55	77,129	74,310	2,819	N	2,062
3	8/28/2023	14:56-15:10	78,103	74,675	3,428	N	2,061
4	8/28/2023	16:15-16:29	77,052	75,128	1,924	Y	2,069
5	8/28/2023	16:30-16:44	76,396	74,887	1,509	Y	2,070
6	8/28/2023	16:45-16:59	77,033	75,635	1,398	Y	2,071
7	8/28/2023	17:00-17:14	77,179	74,923	2,256	Y	2,070
8	8/28/2023	17:25-17:39	77,573	75,312	2,261	Y	2,067
9	8/28/2023	17:40-17:54	76,454	75,873	581	Y	2,070
10	8/28/2023	17:55-18:09	76,810	75,269	1,541	Y	2,068
11	8/28/2023	18:10-18:24	76,230	74,972	1,258	Y	2,066
12	8/28/2023	18:35-18:49	78,309	75,634	2,675	N	2,067
Averages			76,871	75,282	1589		2,067

Standard Deviation	522	
Confidence Coefficient (CC)	401	
Unit Load	Normal	
RA based on mean RM value	2.59	%
Bias Test	Fail	-
BAF	1.021	-

5.0 Internal QA/QC Activities

5.1 QA/QC Audits

Table 5-1 presents a summary of the gas cylinder information.

Table 5-1
Part 75 Gas Cylinder Information

Gas Type	Gas Concentrations	Cylinder ID	Expiration Date
O_2, Balance N_2	20.00%	CC469833	12/17/2029
O_2, Balance N_2	10.05%	EB0164468	4/20/2031
CO_2, Balance N_2	20.78%	CC469833	12/17/2029
CO_2, Balance N_2	10.01%	EB0164468	4/20/2031
NO_x, Balance N_2	90.05 ppmv	SG9103440BAL	4/27/2031
NO_x, Balance N_2	200.0 ppmv	CC403388	5/30/2031

The meter box and sampling train used during sampling performed within the requirements of their respective methods. All post-test leak checks, minimum metered volumes, ect met the applicable QA/QC criteria.

EPA Method 3A, and 7E calibration audits were all within the measurement system performance specifications for the calibration drift checks, system calibration bias checks, and calibration error checks.

The NO_2 to NO converter efficiency check of the NOx analyzer was conducted per the procedures in EPA Method 7E, Section 16.2.2. The conversion efficiency met the criteria.

5.2 QA/QC Discussion

All QA/QC criteria were met during this test program.

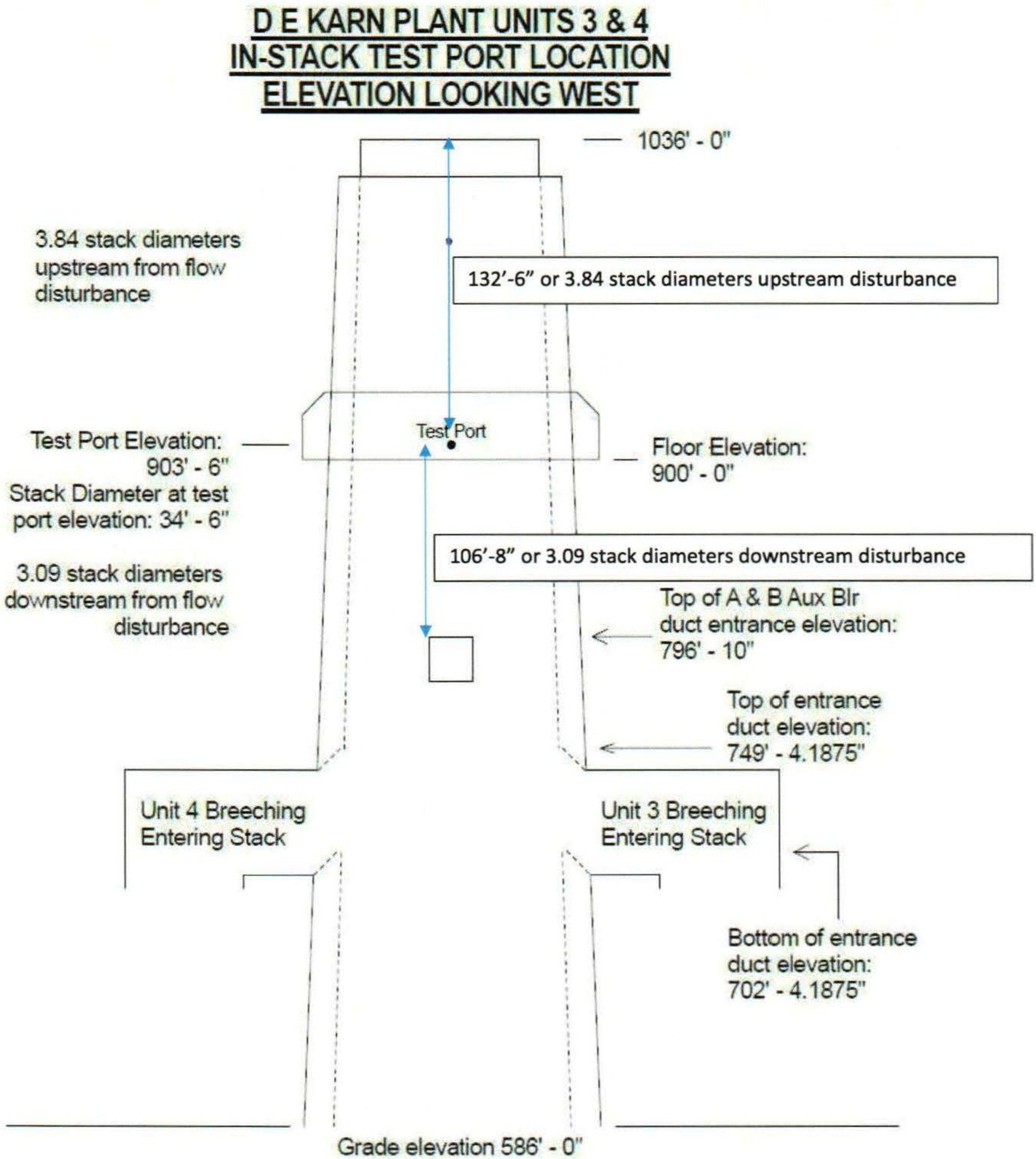
5.3 Quality Statement

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is included in the report appendices. The content of this report is modeled after the EPA Emission Measurement Center Guideline Document (GD-043).

Appendix A
Field Data and Calculations

Appendix A.1
Sampling Locations

Figure 1 - D.E Karn Units 3 & 4 Sampling In-Stack Port Location



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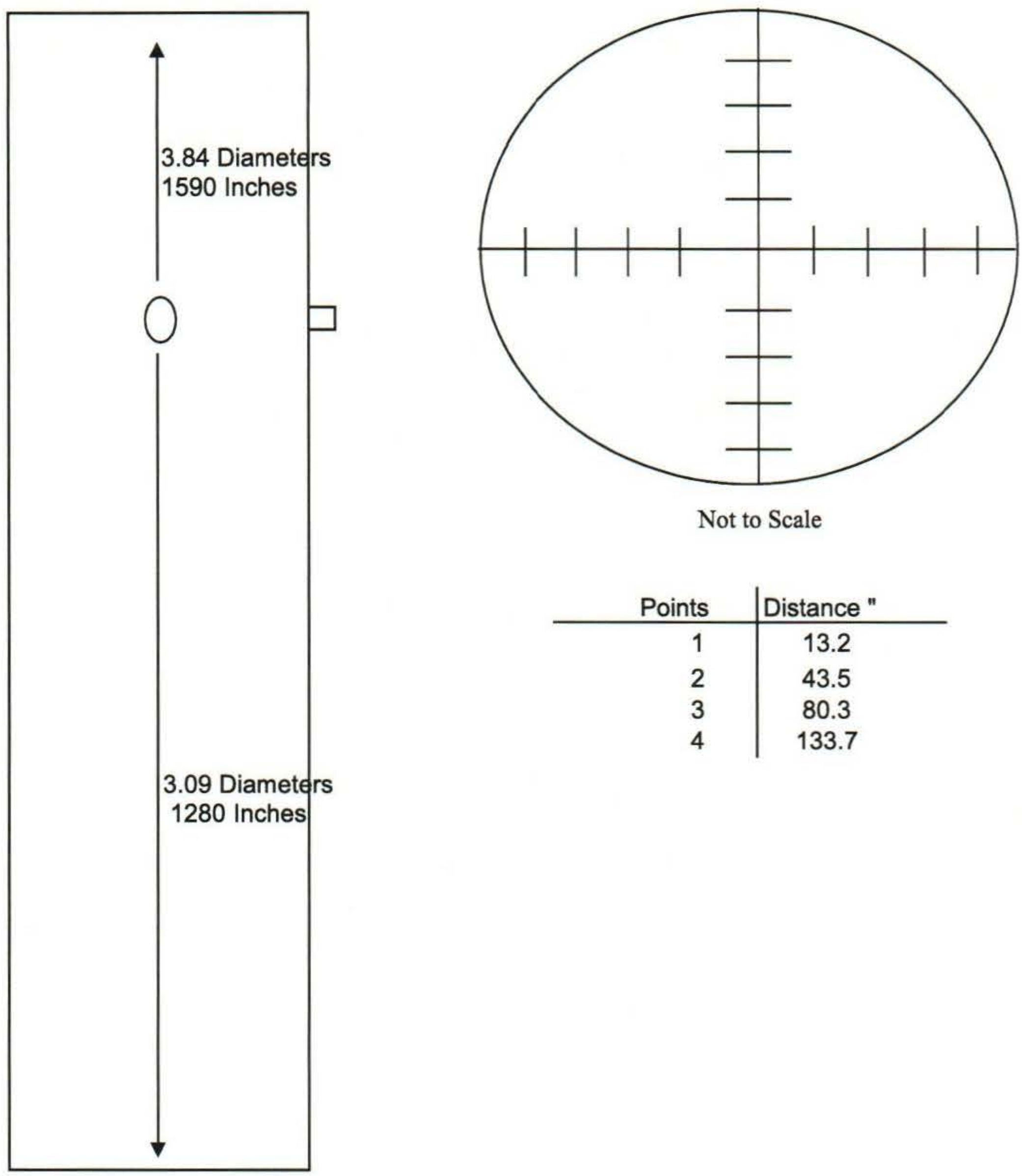
diameter = 414



Not to Scale

Points	Distance "
1	13.2
2	43.5
3	80.3
4	133.7

Site:	Sampling Dates:	
Consumers Energy Company D. E. Karn Generating Facility Essexville, MI	8/28/2023	**Montrose Air Quality Services, LLC** 4949 Fernlee Royal Oak, Michigan

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Appendix A.2
FG-KARN34-2 Field Data Sheets