

**Source Test Report for
2022 Annual QA CEMS RATA Testing
Boiler No. 9 (EUBOILER#9)**

**Graphic Packaging International, LLC
Kalamazoo, Michigan**

Prepared For:

**Graphic Packaging International, LLC
1500 North Pitcher Street
Kalamazoo, MI 49007**

Prepared By:

**Montrose Air Quality Services, LLC
10060 Brecksville Road
Brecksville, OH 44141**

For Submission To:

**Michigan Department of Environment, Great Lakes, and Energy
525 West Allegan
Lansing, MI 48909**

**Michigan Department of Environment, Great Lakes, and Energy
7953 Adobe Road
Kalamazoo, MI 49009-5026**

Document Number: MW011AS-015953-RT-1043

Test Date: June 10, 2022

Submittal Date: August 3, 2022

RECEIVED

AUG 11 2022

AIR QUALITY DIVISION



Review and Certification

All work, calculations, and other activities and tasks performed and presented in this document were carried out by me or under my direction and supervision. I hereby certify that, to the best of my knowledge, Montrose operated in conformance with the requirements of the Montrose Quality Management System and ASTM D7036-04 during this test project.

Signature: John Nestor **Date:** 08 / 02 / 2022

Name: John Nestor **Title:** District Manager

I have reviewed, technically and editorially, details, calculations, results, conclusions, and other appropriate written materials contained herein. I hereby certify that, to the best of my knowledge, the presented material is authentic, accurate, and conforms to the requirements of the Montrose Quality Management System and ASTM D7036-04.

Signature: robert j lisy jr **Date:** 08 / 03 / 2022

Name: Robert J. Lisy, Jr. **Title:** Reporting Hub Manager

Table of Contents

<u>Section</u>	<u>Page</u>
1.0 Introduction	5
1.1 Summary of Test Program	5
1.2 Key Personnel	6
2.0 Plant and Sampling Location Descriptions.....	8
2.1 Process Description, Operation, and Control Equipment.....	8
2.2 Facility and Reference Method (RM) CEMS Descriptions	8
2.3 Flue Gas Sampling Location	9
2.4 Operating Conditions and Process Data	9
3.0 Sampling and Analytical Procedures	10
3.1 Test Methods	10
3.1.1 EPA Method 1.....	10
3.1.2 EPA Method 3A.....	10
3.1.3 EPA Method 7E.....	10
3.1.4 EPA Method 19.....	11
3.1.5 EPA Performance Specification 2.....	12
3.1.6 EPA Performance Specification 3.....	12
3.2 Process Test Methods.....	12
4.0 Test Discussion and Results.....	13
4.1 Field Test Deviations and Exceptions.....	13
4.2 Presentation of Results.....	13
5.0 Internal QA/QC Activities	17
5.1 QA/QC Audits.....	17
5.2 QA/QC Discussion.....	17
5.3 Quality Statement	17

List of Appendices

A Field Data and Calculations	18
A.1 Sampling Locations.....	19

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

Graphic Packaging International operates two natural gas- and fuel oil-fired boilers (EUBOILER#8 and EUBOILER#9) to generate steam for use in facility operations. EUBOILER#9 is equipped with low NO_x burners and flue gas recirculation. It has a maximum heat input rate of 227 MMBtu/hr and was in operation for this test event.

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.	Range
O ₂	Horiba	CMA-EC622	42108510081	0-25.00%
NO _x	Horiba	CMA-EC622	42108510081	0-100 ppm

**Table 2-2
RM CEMS Information**

Analyzer Type	Manufacturer	Model No.	Serial No.	Range
O ₂	Teledyne	T802	197	0-20.48%
NO _x	Teledyne	T200H	84	0-90.83 ppm

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		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EUBOILER#9 Exhaust Stack (SVBOILER#9)	63.4 X 64.1	366.0 / 5.7	300.0 / 4.7	Gaseous: 3

See Appendix A.1 for more information.

2.4 Operating Conditions and Process Data

The CEMS RATA was performed while EUBOILER#9 was operating at greater than 50% of permitted capacity conditions.

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 RATA run
- Steam flow rate, klb/hr
- Gas flow rate, kscfh

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 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 O₂ and CO₂ in stack gas. The effluent gas is continuously or intermittently sampled and conveyed to analyzers that measure the concentration of O₂ and CO₂. The performance requirements of the method must be met to validate data.

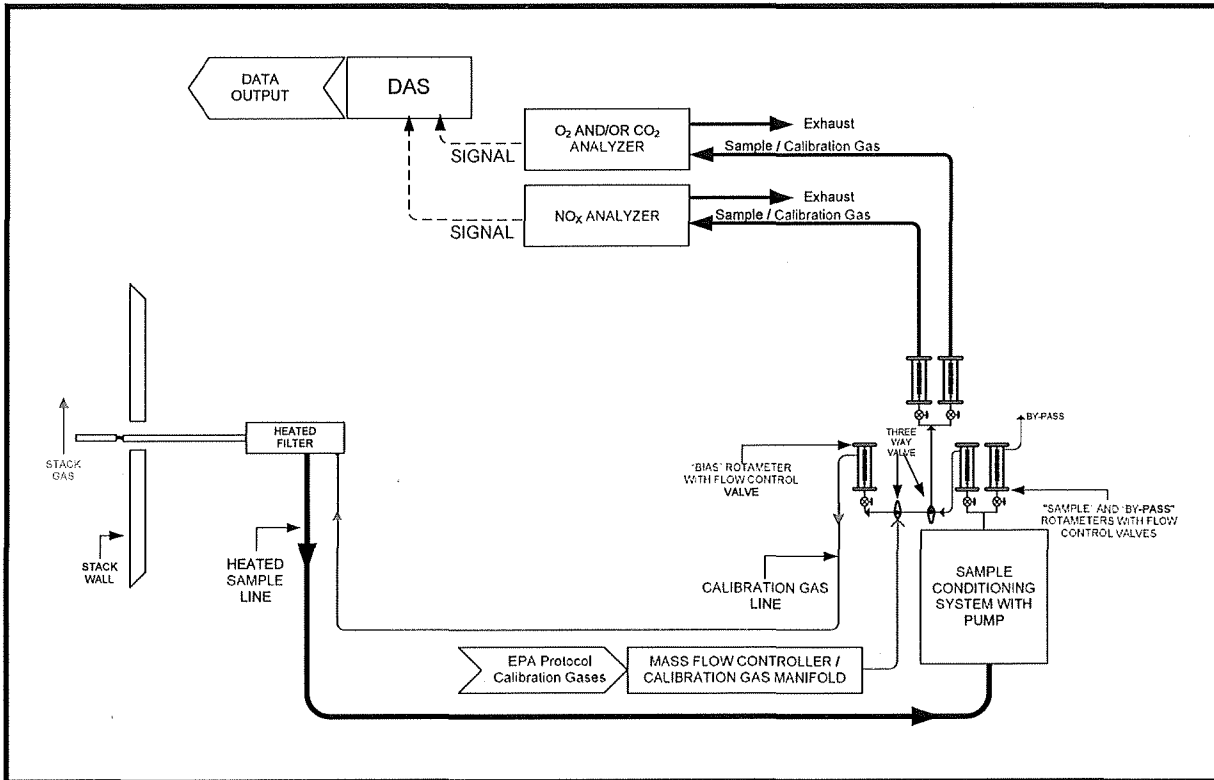
The typical sampling system is detailed in Figure 3-1.

3.1.3 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 NO₂. Conditioned gas is sent to an analyzer to measure the concentration of NO_x. NO and NO₂ can be measured separately or simultaneously together but, for the purposes of this method, NO_x is the sum of NO and NO₂. The performance requirements of the method must be met to validate the data.

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

**Figure 3-1
EPA Method 3A and 7E Sampling Train**



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

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.

3.1.5 EPA Performance Specification 2, Specifications and Test Procedures for SO₂ and NO_x for Continuous Emission Monitoring Systems in Stationary Sources

EPA Performance Specification 2 is a specification used to evaluate the acceptability of SO₂ and NO_x CEMS. The evaluation is conducted at the time of installation or soon after, and whenever specified in the regulations. The CEMS may include, for certain stationary sources, a diluent (O₂ or CO₂) monitor. The RA and CD tests are conducted to determine conformance of the CEMS to the specification.

3.1.6 EPA Performance Specification 3, Specifications and Test Procedures for O₂ and CO₂ Continuous Monitoring Systems in Stationary Sources

EPA Performance Specification 3 is a specification used to evaluate the acceptability of O₂ and CO₂ CEMS. The evaluation is conducted at the time of installation or soon after, and whenever specified in the regulations. This specification applies to O₂ or CO₂ monitors that are not included under PS-2. The RA and CD tests are conducted to determine conformance of the CEMS to the specification.

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 or exceptions from the test plan or test methods occurred during this test 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 are presented in Tables 4-1 through 4-3. 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.

**Table 4-1
NO_x (lb/MMBtu) RATA Results -
EUBOILER#9 CEMS**

Run #	Date	Time	RM	CEMS	Difference	Run Used (Y/N)	Steam Flow (klb/hr)
1	6/10/2022	9:50-10:11	0.034	0.035	-0.002	Y	123.4
2	6/10/2022	10:12-10:33	0.034	0.035	-0.001	Y	121.0
3	6/10/2022	10:33-10:54	0.033	0.034	-0.001	Y	119.1
4	6/10/2022	11:13-11:34	0.033	0.034	-0.002	Y	119.3
5	6/10/2022	11:34-11:55	0.033	0.035	-0.001	Y	119.8
6	6/10/2022	11:55-12:16	0.033	0.034	-0.001	Y	118.9
7	6/10/2022	12:36-12:57	0.033	0.035	-0.002	Y	119.3
8	6/10/2022	12:57-13:18	0.034	0.035	-0.001	Y	118.8
9	6/10/2022	13:18-13:39	0.033	0.035	-0.002	N	116.9
10	6/10/2022	14:00-14:21	0.033	0.034	-0.001	Y	115.5
Averages			0.033	0.035	-0.001		119.5
Standard Deviation			0.0004				
Confidence Coefficient (CC)			0.0003				
Unit Load			Normal	>50% of maximum rated capacity			
RA based on mean RM value			4.76	%			

Table 4-2
NO_x (ppmvd) RATA Results -
EUBOILER#9 CEMS

Run #	Date	Time	RM	CEMS	Difference	Run Used (Y/N)	Steam Flow (klb/hr)
1	6/10/2022	9:50-10:11	26.73	28.20	-1.48	Y	123.4
2	6/10/2022	10:12-10:33	27.12	27.73	-0.61	Y	121.0
3	6/10/2022	10:33-10:54	26.32	27.41	-1.09	Y	119.1
4	6/10/2022	11:13-11:34	25.94	27.56	-1.62	Y	119.3
5	6/10/2022	11:34-11:55	26.41	27.62	-1.21	Y	119.8
6	6/10/2022	11:55-12:16	26.59	27.60	-1.01	Y	118.9
7	6/10/2022	12:36-12:57	26.63	28.10	-1.47	Y	119.3
8	6/10/2022	12:57-13:18	26.67	27.93	-1.26	Y	118.8
9	6/10/2022	13:18-13:39	26.07	27.73	-1.66	N	116.9
10	6/10/2022	14:00-14:21	26.37	27.47	-1.10	Y	115.5
Averages			26.53	27.74	-1.20		119.5
Standard Deviation			0.3009				
Confidence Coefficient (CC)			0.2313				
Unit Load			Normal	>50% of maximum rated capacity			
RA based on mean RM value			5.41	%			

**Table 4-3
O₂ (%-Dry) RATA Results -
EUBOILER#9 CEMS**

Run #	Date	Time	RM	CEMS	Difference	Run Used (Y/N)	Steam Flow (klb/hr)
1	6/10/2022	9:50-10:11	3.59	3.50	0.09	Y	123.4
2	6/10/2022	10:12-10:33	3.62	3.50	0.12	Y	121.0
3	6/10/2022	10:33-10:54	3.62	3.45	0.17	Y	119.1
4	6/10/2022	11:13-11:34	3.62	3.49	0.13	Y	119.3
5	6/10/2022	11:34-11:55	3.54	3.53	0.02	Y	119.8
6	6/10/2022	11:55-12:16	3.55	3.49	0.06	Y	118.9
7	6/10/2022	12:36-12:57	3.58	3.53	0.05	Y	119.3
8	6/10/2022	12:57-13:18	3.64	3.47	0.18	N	118.8
9	6/10/2022	13:18-13:39	3.65	3.59	0.05	Y	116.9
10	6/10/2022	14:00-14:21	3.66	3.54	0.12	Y	115.5
Averages			3.60	3.51	0.09		119.2
Unit Load			Normal	>50% of maximum rated capacity			
RA based on mean difference			0.09	% as O ₂			

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 60 Gas Cylinder Information**

Gas Type	Gas Concentrations	Cylinder ID	Expiration Date
O ₂ , Balance N ₂	10.18%	CC469780	3/14/2030
O ₂ , Balance N ₂	20.48%	CC21126	5/17/2029
NO _x , Balance N ₂	49.94 ppmv	ALM-066662	11/19/2023
NO _x , Balance N ₂	90.83 ppmv	CC194558	6/3/2029

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 NO₂ to NO converter efficiency check of the 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).



MONTROSE
AIR QUALITY SERVICES

Appendix A

Field Data and Calculations