

## 1.0 INTRODUCTION

### 1.1 SUMMARY OF TEST PROGRAM

Packaging Corporation of America contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test program on the Boiler Operations (EUBOILER1 and EUBOILER2) at the Packaging Corporation of America facility located in Filer City, Michigan. The tests were conducted to satisfy the emissions testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy - Air Quality Division (EGLE) Permit-to-Install No. 209-18.

The specific objectives were to:

- Verify the nitrogen oxides (NO<sub>x</sub> (as NO<sub>2</sub>)) and carbon monoxide (CO) emissions from EUBOILER1
- Verify the CO emissions from EUBOILER2
- Conduct the test program with a focus on safety

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

**TABLE 1-1  
SUMMARY OF TEST PROGRAM**

Test Date(s)	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
3/11/2020	EUBOILER1	O <sub>2</sub>	EPA 3A	3	60
3/11/2020	EUBOILER1	NO <sub>x</sub>	EPA 7E, 19	3	60
3/11/2020	EUBOILER1	CO	EPA 10, 19	3	60
3/10/2020	EUBOILER2	O <sub>2</sub>	EPA 3A	3	60
3/10/2020	EUBOILER2	CO	EPA 10, 19	3	60

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 average emission test results are summarized and compared to their respective permit limits in Tables 1-2 and 1-3. 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 1-4. The tests were conducted according to the test plan (protocol) dated February 6, 2020 that was submitted to and approved by EGLE.

**TABLE 1-2  
 SUMMARY OF AVERAGE COMPLIANCE RESULTS -  
 EUBOILER1  
 MARCH 11, 2020**

<b>Parameter/Units</b>	<b>Average Results</b>	<b>Emission Limits</b>
<b>Nitrogen Oxides (NO<sub>x</sub> as NO<sub>2</sub>)</b> lb/hr	23.6	32.34
<b>Carbon Monoxide (CO)</b> lb/hr	8.71	19.40

**TABLE 1-3  
 SUMMARY OF AVERAGE COMPLIANCE RESULTS -  
 EUBOILER2  
 MARCH 10, 2020**

<b>Parameter/Units</b>	<b>Average Results</b>	<b>Emission Limits</b>
<b>Carbon Monoxide (CO)</b> lb/hr	8.72	15.04

## 1.2 KEY PERSONNEL

A list of project participants is included below:

### Facility Information

Source Location:	PCA 2246 Udell Street Filer City, MI 49634	
Project Contact:	Sara Kaltunas	Dyllan Walker
Role:	Environmental Manager	Environmental Engineer
Company:	PCA	PCA
Telephone:	231-723-9951 ext. 465	231-723-1434
Email:	SKaltunas@packagingcorp.com	DyllanWalker@packagingcorp.com

### Agency Information

Regulatory Agency:	EGLE	
Agency Contact:	Karen Kajiya-Mills	Rob Dickman
Telephone:	517-284-6780	231-878-4697
Email:	kajiya-millsk@michigan.gov	dickmanr@michigan.gov

### Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	Matthew Young	Steven Smith
Title:	District Manager	Client Project Manager
Telephone:	248-548-8070	248-548-8070
Email:	myoung@montrose-env.com	ssmith@montrose-env.com

Test personnel and observers are summarized in Table 1-4.

**TABLE 1-4  
TEST PERSONNEL AND OBSERVERS**

Name	Affiliation	Role/Responsibility
Steven Smith	Montrose	Client Project Manager, QI
Ben Durham	Montrose	Field Technician
Ryan McWhinnie	Montrose	Field Technician

## 2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

### 2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

PCA's boiler operations includes Boiler No.1 (EUBOILER1) rated at 240 MMBtu/hr and Boiler No.2 (EUBOILER2) rated at 186 MMBtu/hr. These boilers provide steam for various mill processes and electrical generation. These boilers can be fired with natural gas and/or biogas and are equipped with Low NO<sub>x</sub> burners. On the first day of testing (3/10/2020) EUBOILER2 was fired with natural gas. On the second day of testing (3/11/2020) EUBOILER1 was fired with natural gas.

### 2.2 FLUE GAS SAMPLING LOCATION(S)

Information regarding the sampling location(s) is presented in Table 2-1.

**TABLE 2-1  
SAMPLING LOCATION(S)**

Sampling Location	Stack Inside Dimensions (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EUBOILER1 EXHAUST DUCT	51.5 X 72.0	12.0 / 0.2	75.0 / 1.2	CEMS Run 1: 12 (3/port), Runs 2-3 (3 points/1 port)
EUBOILER2 EXHAUST DUCT	48.0 X 48.0	96.0 / 2.0	96.0 / 2.0	CEMS Run 1: 12 (3/port), Runs 2-3 (3 points/1 port)

Sample location(s) were verified in the field to conform to EPA Method 1. See Appendix A.1 for more information.

### 2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while the source/units and air pollution control devices were operating at the conditions required by the permit. The unit(s) were tested when operating at normally operating capacity.

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

- Gas Flow (kscf/hr)
- Steam Rate (klb/hr)

### **3.0 SAMPLING AND ANALYTICAL PROCEDURES**

#### **3.1 TEST METHODS**

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

##### **3.1.1 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<sub>2</sub> and CO<sub>2</sub> in stack gas. The effluent gas is continuously or intermittently sampled and conveyed to analyzers that measure the concentration of O<sub>2</sub> and CO<sub>2</sub>. The performance requirements of the method must be met to validate data.

During this test, only O<sub>2</sub> analyzed.

This method was paired with EPA Methods 7E and 10 at EUBOILER1 Exhaust Duct and with EPA Method 10 at EUBOILER2 Exhaust Duct .The EUBOILER1 Exhaust Duct sampling system is detailed in Figure 3-1 and the sampling at EUBOILER2 Exhaust Duct Figure 3-2.

##### **3.1.2 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<sub>x</sub> as NO<sub>2</sub>. Conditioned gas is sent to a chemiluminescent analyzer to measure the concentration of NO<sub>x</sub>. NO and NO<sub>2</sub> can be measured separately or simultaneously together but, for the purposes of this method, NO<sub>x</sub> is the sum of NO and NO<sub>2</sub>. The performance requirements of the method must be met to validate the data.

The sampling system is detailed in Figure 3-1.

##### **3.1.3 EPA Method 10, Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)**

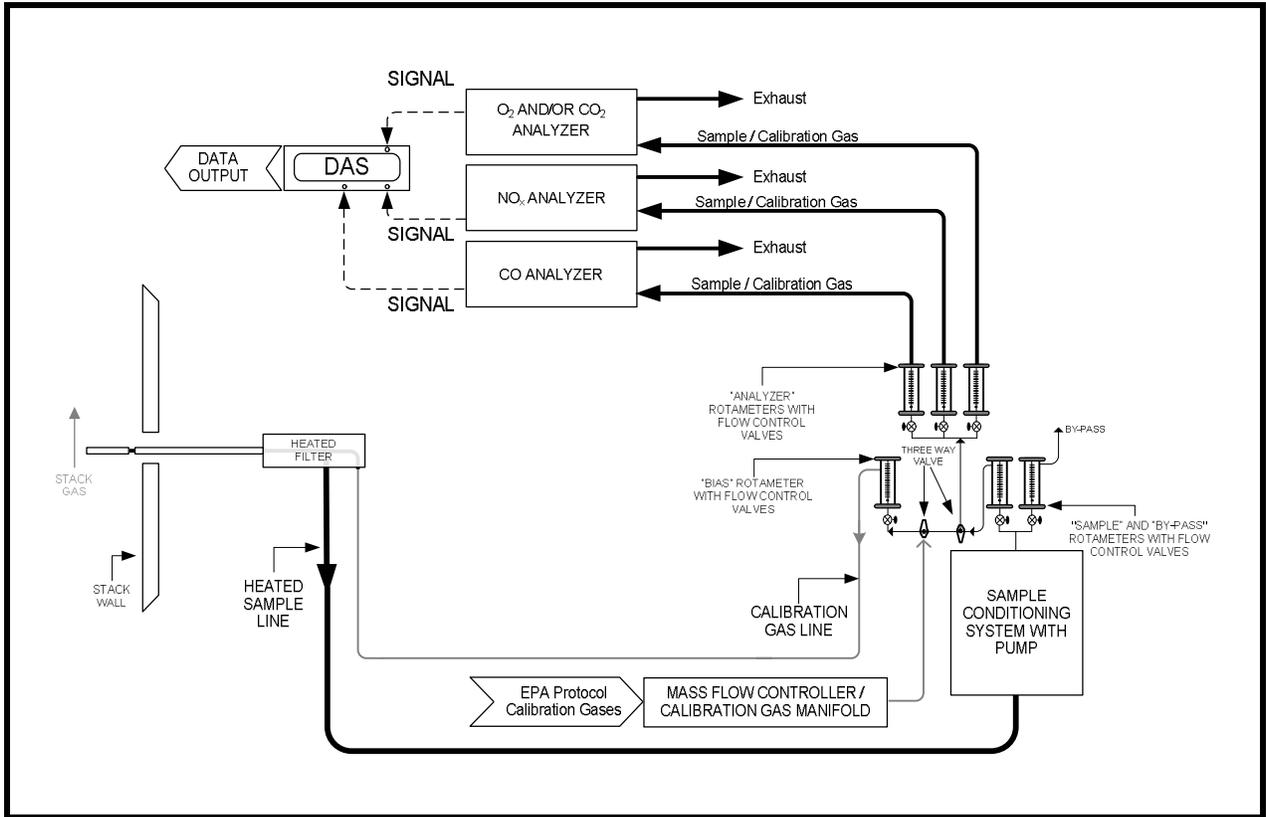
EPA Method 10 is an instrumental test method used to continuously measure emissions of CO. Conditioned gas is sent to a gas filter correlation NDIR analyzer to measure the concentration of CO. The performance requirements of the method must be met to validate the data.

The sampling system is detailed in Figures 3-1 and 3-2.

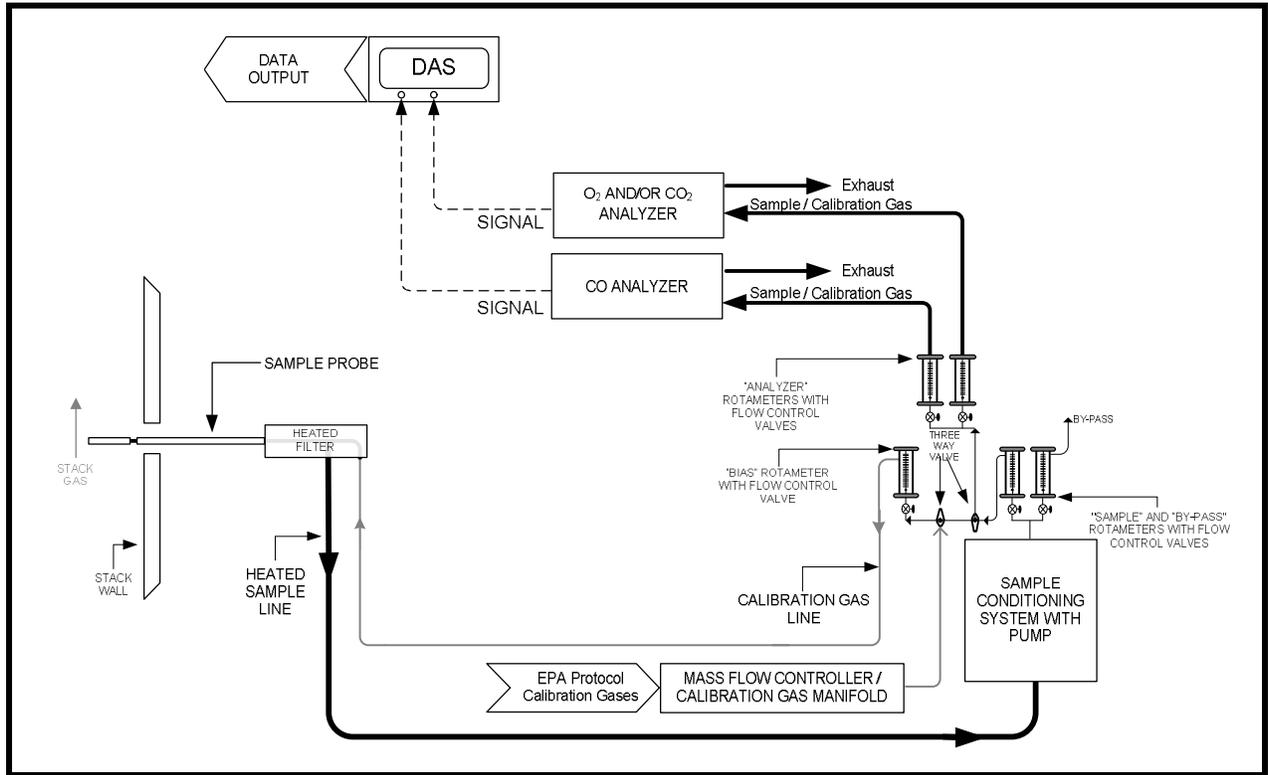
##### **3.1.4 EPA Method 19, Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates**

EPA Method 19 is used to calculate mass emission rates in units of lb/MMBtu.

**FIGURE 3-1**  
**US EPA METHOD 3A, 7E, AND 10 SAMPLING TRAIN**



**FIGURE 3-2  
US EPA METHOD 3A AND 10 SAMPLING TRAIN**



### 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**

EGLE (email dated 2/21/2020) approved the use of utilizing the fuel flow rate (kscf/hr) of natural gas, oxygen-based F factor on a dry basis (Fd) of 8710 ft<sup>3</sup>/MMBtu, and gross calorific value (GCV) of 1050 Btu/ft<sup>3</sup> in determining the NO<sub>x</sub> (as NO<sub>2</sub>) and CO emissions in lieu of utilizing EPA Methods 2 and 4 proposed in the test plan for each boiler. See Appendix D.3 for details.

The sampling location at the EUBOILER1 Exhaust Duct did not meet US EPA Method 1, Section 11.1.1 criteria which requires that the sample ports be located at a position at least two duct diameters downstream and a half-diameter upstream from any flow disturbance. The sampling location at the EUBOILER1 Exhaust Duct was located 0.2 duct diameters downstream from the nearest flow disturbance.

### **4.2 PRESENTATION OF RESULTS**

The average results are compared to the permit limits in Tables 1-2 and 1-3. The results of individual compliance test runs performed are presented in Tables 4-1 and 4-2. 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<sub>x</sub> and CO EMISSIONS RESULTS -  
EUBOILER1**

Run Number	1	2	3	Average
<b>Date</b>	3/11/2020	3/11/2020	3/11/2020	--
<b>Time</b>	8:10-9:20	9:35-10:35	10:50-11:50	--
<b>Process Data</b>				
Gas Flow (kscf/hr)	222.9	222.7	222.3	212.2
Steam Rate (klb/hr)	191.4	190.8	191.0	201.6
<b>Flue Gas Parameters</b>				
O <sub>2</sub> , % volume dry	7.29	7.48	7.39	7.39
<b>Nitrogen Oxides (NO<sub>x</sub>) (as NO<sub>2</sub>)</b>				
ppmvd	63.1	62.1	62.9	62.7
lb/hr	23.6	23.5	23.6	23.6
<b>Carbon Monoxide (CO)</b>				
ppmvd	36.5	36.2	41.4	38.1
lb/hr	8.30	8.36	9.47	8.71

**TABLE 4-2  
CO EMISSIONS RESULTS -  
EUBOILER2**

Run Number	1	2	3	Average
<b>Date</b>	3/10/2020	3/10/2020	3/10/2020	--
<b>Time</b>	10:50-11:56	12:08-13:08	13:20-14:20	--
<b>Process Data</b>				
Gas Flow (kscf/hr)	155.0	155.0	155.0	155.0
Steam Rate (klb/hr)	114.8	114.7	114.9	114.8
<b>Flue Gas Parameters</b>				
O <sub>2</sub> , % volume dry	5.87	5.90	5.90	5.89
<b>Carbon Monoxide (CO)</b>				
ppmvd	60.8	59.9	61.7	60.8
lb/hr	8.71	8.59	8.86	8.72

## **5.0 INTERNAL QA/QC ACTIVITIES**

### **5.1 QA/QC AUDITS**

EPA Method 3A, 7E, and 10 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<sub>2</sub> to NO converter efficiency check of the analyzer was conducted per the procedures in EPA Method 7E, Section 8.2.4. 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).