1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

Packaging Corporation of American (PCA) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test program on the Copeland Reactor (EUCOPELAND+DISTANK) at the PCA 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 (EGLE) Renewable Operating Permit No. MI-ROP-B3692-2015b.

The specific objectives were to:

- Measure the emissions of filterable particulate matter (PM) at the outlet of the EUCOPELAND+DISTANK
- 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	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
8/25/2020	EUCOPELAND+DISTANK	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	60
8/25/2020	EUCOPELAND+DISTANK	O_2, CO_2	EPA 3	3	60
8/25/2020	EUCOPELAND+DISTANK	Moisture	EPA 4	3	60
8/25/2020	EUCOPELAND+DISTANK	PM	EPA 5	3	60

To simplify this report, a list of Units and Abbreviations is included in Appendix D-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 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 1-3. The tests were conducted according to the test plan (protocol) that was submitted to and approved by EGLE on July 20, 2020.

TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
EUCOPELAND+DISTANK
AUGUST 25, 2020

Parameter/Units	Average Results	Emission Limits
Total Particulate Matter (PM)		
lb/1000-lb dry air	0.04	-
lb/1000-lb dry air @50%EA	0.05	0.2

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	Angela Wang
Role:	Environmental Manager	Environmental Engineer
Company:	PCA	PCA
Telephone:	231-723-9951 ext. 465	231-723-9951 ext. 347
Email:	SKaltunas@packagingcorp.com	angelawang@packagingcorp.com

Agency Information

Regulatory Agency:	EGLE	
Agency Contact:	Karen Kajiya-Mills	Jeremy Howe
Telephone:	517-284-6780	231-878-6687
Email:	kajiya-millsk@michigan.gov	HoweJ@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	Matthew Young	Mason Sakshaug
Title:	District Manager	Field Project Manager
Telephone:	248-548-8070	248-548-8070
Email:	myoung@montrose-env.com	msakshaug@montrose-env.com

Laboratory Information

Laboratory:	Montrose
City, State:	Royal Oak, MI
Method:	5

TABLE 1-3
TEST PERSONNEL AND OBSERVERS

Name	Affiliation	Role/Responsibility
Mason Sakshaug	Montrose	Field Project Manager, QI
David Trahan	Montrose	Field Technician
Sara Kaltunas	PCA	Client Liaison/Test Coordinator
Angela Wang	PCA	Client Liaison/Test Coordinator
Jeremy Howe	EGLE	Observer

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

The Copeland Reactor at the PCA facility is a fluidized bed design, which recovers sodium carbonate from the spent pulping liquor, or black liquor. Black liquor is fired into the Copeland Reactor at approximately 50% solids. Organic material in the liquor burns and the resultant sodium forms sodium carbonate pellets. Pellets are drawn off to maintain the proper fluidized bed height.

Exhaust gases are conveyed to two parallel cyclones, then to a venturi scrubber, and a separator vessel equipped with a demister section before being exhausted to a wet electrostatic precipitator (WESP) followed by an RTO to reduce HAPS emissions from the Copeland Reactor.

2.2 FLUE GAS SAMPLING LOCATION

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

TABLE 2-1
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.)	
EUCOPELAND + DISTANK	78.5	225 / 2.9	711 / 9.1	Isokinetic: 24 (12/port);

Sample location(s) were 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.

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while the Copeland Reactor and air pollution control devices were operating at the conditions required by the permit. The WESP was not operating during this test event. The reactor was tested when firing 65 gallons per minute (gpm) of black liquor.

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:

- Venturi Scrubber pressure drop
- Liquor feed rate to the Copeland nozzle, gpm

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 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 (Stausscheibe) 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.

3.1.3 EPA Method 3, Gas Analysis for the Determination of Dry Molecular Weight

EPA Method 3 is used to calculate the dry molecular weight of the stack gas using one of three methods. The first choice is to measure the percent O_2 and CO_2 in the gas stream. A gas sample is extracted from a stack by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent CO_2 and percent O_2 using either an Orsat or a Fyrite analyzer. The second choice is to use stoichiometric calculations to calculate dry molecular weight. The third choice is to use an assigned value of 30.0, in lieu of actual measurements, for processes burning natural gas, coal, or oil.

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

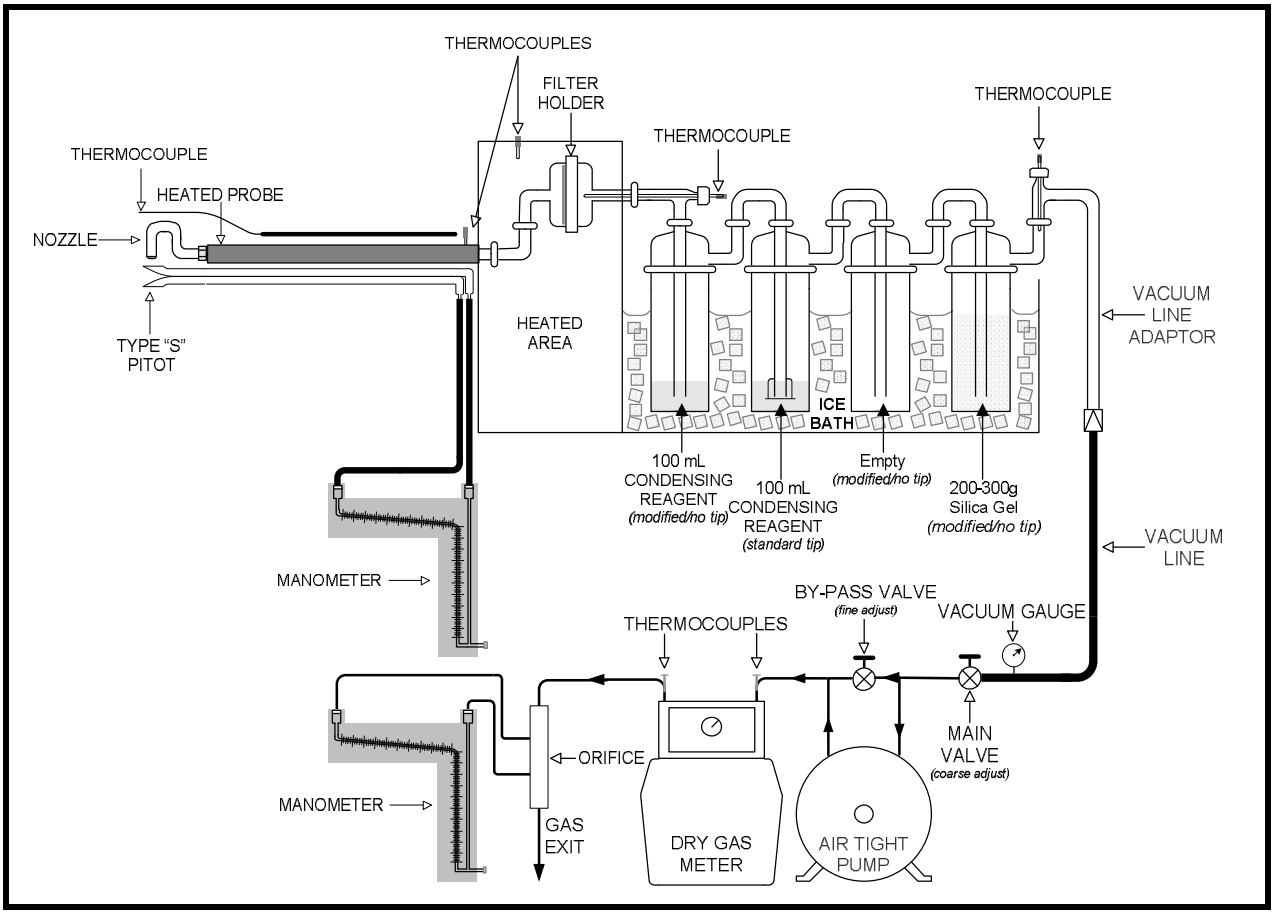
EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodology-specific liquids and silica gel immersed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

3.1.5 EPA Method 5, Determination of Particulate Matter from Stationary Sources

EPA Method 5 is a manual, isokinetic method used to measure FPM emissions. The samples are analyzed gravimetrically. This method is performed in conjunction with EPA Methods 1 through 4. The stack gas is sampled through a nozzle, probe, filter, and impinger train. FPM results are reported in emission concentration and emission rate units.

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

FIGURE 3-1
US EPA METHOD 5 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

Due to safety concerns, the EPA Method 5 sampling probe was not heated during Runs 2 and 3. This in-field method modification was approved by the on-site regulatory representative, Jeremy Howe, EGLE.

4.2 PRESENTATION OF RESULTS

The average results are compared to the permit limits in Table 1-2. The results of individual compliance test runs performed are presented in Table 4-1. 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
FILTERABLE PM EMISSIONS RESULTS -
EUCOPELAND+DISTANK

Run Number	1	2	3	Average
Date	8/25/2020	8/25/2020	8/25/2020	--
Time	10:10 - 11:37	15:52 - 17:13	17:51 -19:35	--
Flue Gas Parameters				
O_2, % volume dry	10	10	10	10
CO_2, % volume dry	10	10	10	10
flue gas temperature, °F	465	459	428	451
moisture content, % volume	50.1	51.3	50.9	50.8
volumetric flow rate, dscfm	25192	22341	25532	24355
excess air, %	89.9	89.9	89.9	89.9
Filterable PM				
lb/1000-lb dry air	0.0292	0.0494	0.0287	0.0358
lb/1000-lb dry air @50%EA	0.0369	0.0625	0.0364	0.0453

5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA/QC AUDITS

The meter box and sampling trains used during sampling performed within the requirements of their respective methods. All post-test leak checks and percent isokinetics met the applicable QA/QC criteria.

Fyrite analyzer audits were performed during this test in accordance with EPA Method 3, Section 10.1 requirements. The results were within ± 0.5% of the respective audit gas concentrations.

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).