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1.0 Introduction

1.1 Summary of Test Program

Cargill, Inc. (Cargill) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test on the EUTEMPBOILER1 at their facility located in Saint Clair, Michigan.

The test was conducted to meet the requirements of PTI No. 125-22 SC V.I

The specific objectives were to:

- Determine the concentration and emission rate of NO_x from the EUTEMPBOILER1
- Conduct the test program with a focus on safety

Montrose performed the test 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)
11/22/22	EUTEMPBOILER1	Velocity/Volumetric Flow	EPA 1 & 2	3	60
		O ₂ , CO ₂	EPA 3A	3	60
		Moisture	EPA 4	3	60
		NO _x	EPA 7E	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 location, 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 test was conducted according to Test Plan No. MW023AS-021273-PP-536 dated October 18, 2022.

**Table 1-2
 Summary of Average Compliance Results – EUTEMPBOILER1
 November 22, 2022**

Parameter/Units	Average Results	Emission Limits
Nitrogen Oxides (NO_x as NO₂)		
ppmvd	18.8	--
lb/hr	2.74	4.5
tons/yr	12.0	--

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location: Cargill, Inc.
 916 South Riverside Avenue
 Saint Clair, MI 48079

Project Contact: Neil Byers, MS, GSP
 Role: EHS Supervisor II
 Company: Cargill Salt
 Telephone: 810-989-7590
 Email: neil_byers@cargill.com

Agency Information

Regulatory Agency: Michigan Department of Environment, Great Lakes, and Energy
 Agency Contact: Karen Kajiya-Mills
 Telephone: 517-256-0880
 Email: kajiya-millsk@michigan.gov

Testing Company Information

Testing Firm: Montrose Air Quality Services, LLC
 Contact: Sean Wheeler
 Title: Field Project Manager
 Telephone: 630-860-4740
 Email: stwheeler@montrose-env.com

Test personnel and observers are summarized in Table 1-3.

Table 1-3
Test Personnel and Observers

Name	Affiliation	Role/Responsibility
John Nestor	Montrose	District Manager/Field Team Leader/ QI/Trailer Operator
Shane Rabideau, Roy Zimmer	Montrose	Field Support/Field Technician
Jack Hutchison	Montrose	Report Preparation
Neil Byers	Cargill	Client Liaison/Test Coordinator

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

Testing was conducted on the natural gas fired EUTEMPBOILER1 located at the Cargill facility located in Saint Clair, Michigan.

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.)	
EUTEMPBOILER1	48.0	108/2.3	336/7.0	Flow: 16 (8/port) Gaseous: 3

The sample location was verified in the field to conform to EPA Method 1. Absence of cyclonic flow conditions was confirmed following EPA Method 1, Section 11.4. See Appendix A.1 for more information.

2.3 Operating Conditions and Process Data

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.

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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 samples or 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.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - None
- Method Exceptions:
 - None

The sample port and traverse point locations are detailed in Appendix A.1.

3.1.2 EPA Method 2, Determination of 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. The molecular weight of the gas stream is determined from independent measurements of O₂, CO₂, and moisture. The stack gas volumetric flow rate is calculated using the measured average velocity head, the area of the duct at the measurement plane, the measured average temperature, the measured duct static pressure, the molecular weight of the gas stream, and the measured moisture.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - S-type pitot tube coefficient is 0.84

- Method Exceptions:
 - None

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

3.1.3 EPA Methods 3A and 7E, Determination of Oxygen, Carbon Dioxide, and Nitrogen Oxides Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

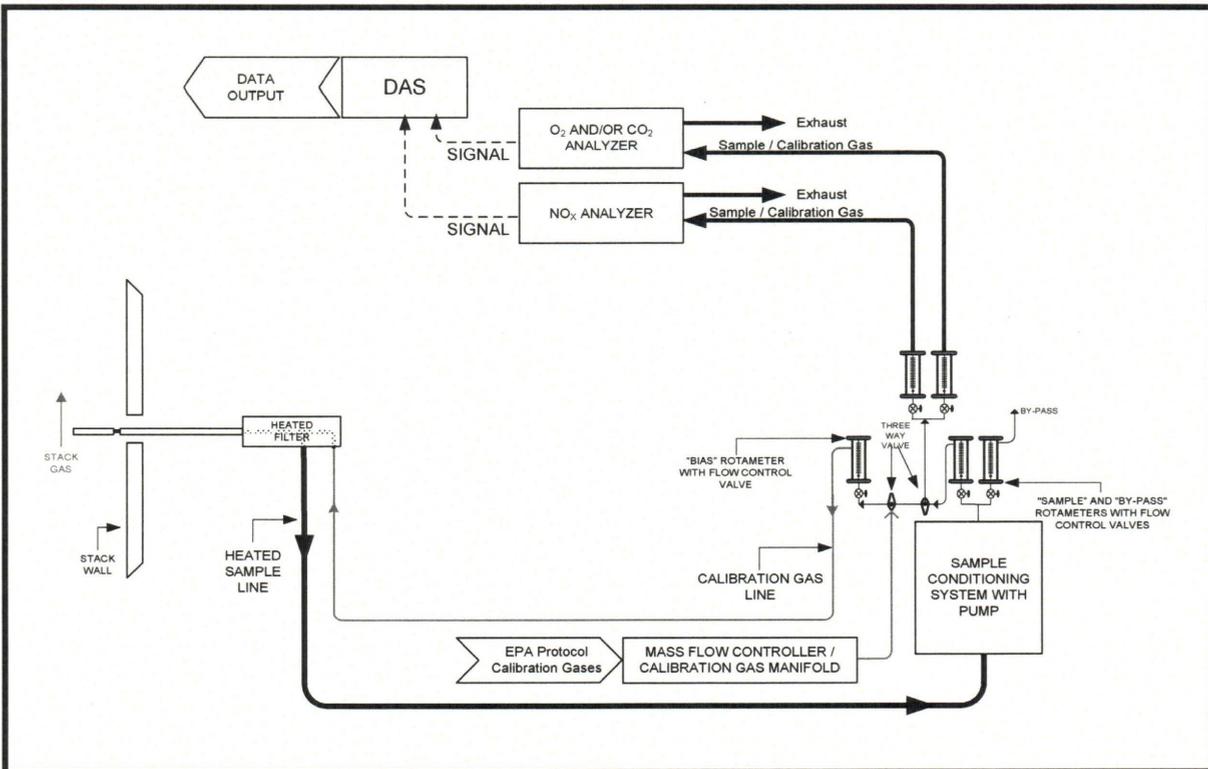
Concentrations of O₂, CO₂, and NO_x are measured simultaneously using EPA Methods 3A and 7E which are instrumental test methods. Conditioned gas is sent to a series of analyzers to measure the gaseous emission concentrations. The performance requirements of the method must be met to validate the data.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - A dry extractive sampling system is used to report emissions on a dry basis
 - A paramagnetic analyzer is used to measure O₂
 - A nondispersive infrared analyzer is used to measure CO₂
 - A chemiluminescent analyzer is used to measure NO_x
- Method Exceptions:
 - None
- Target and/or Minimum Required Sample Duration: 60 minutes

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 4, Determination of Moisture Content in Stack Gas

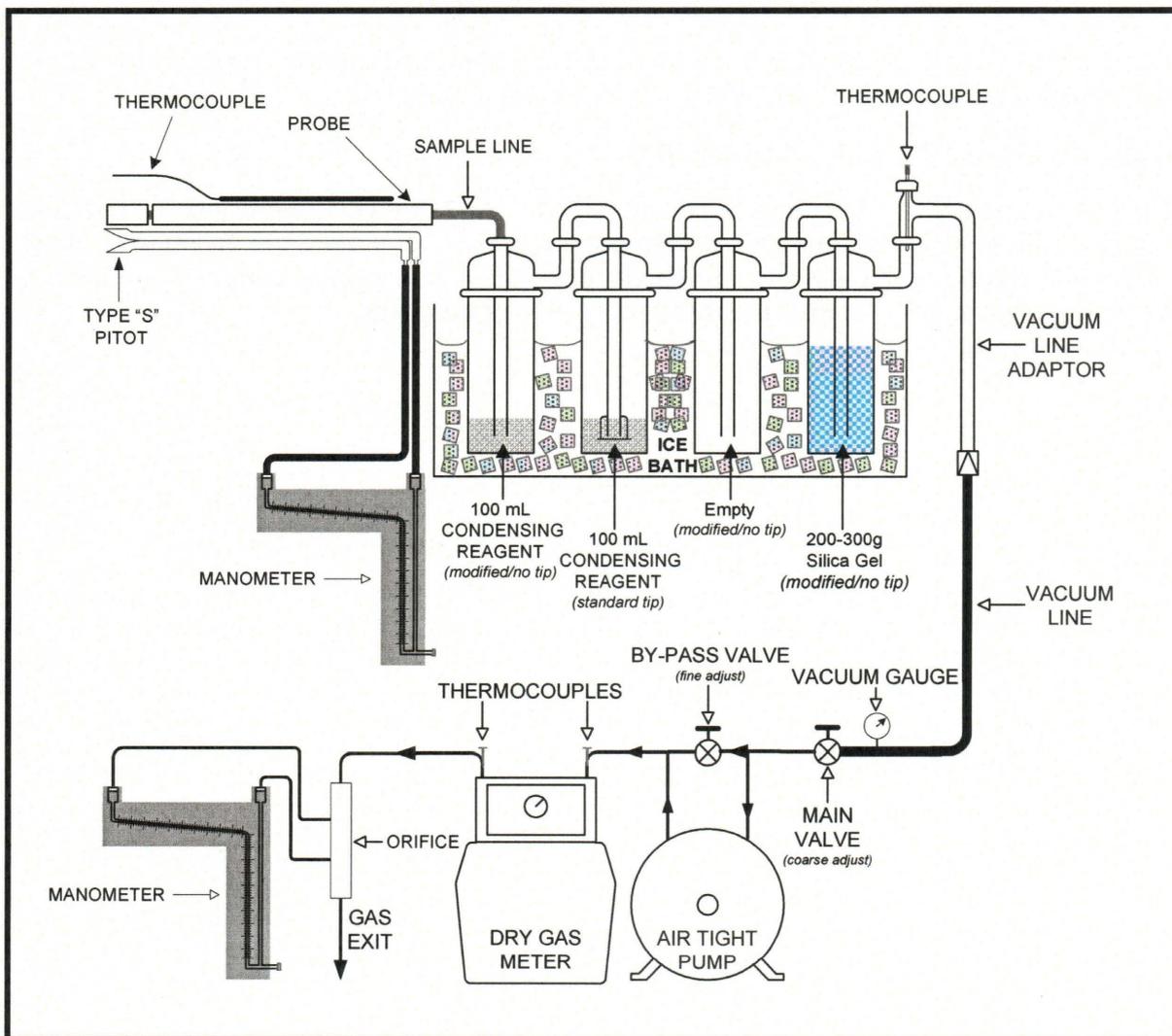
EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodology-specific liquids and silica gel immersed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

Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - The reference method is used to measure moisture
- Method Exceptions:
 - Moisture sampling is performed as a stand-alone method at a single point in the centroid of the stack
- Target and/or Minimum Required Sample Duration: 60 minutes

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

Figure 3-2
EPA Method 4 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.

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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 other than the EPA Method 4 exceptions in Section 3.1.4.

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
NO_x Emissions Results -
EUTEMPBOILER1**

Parameter/Units	Run 1	Run 2	Run 3	Average
Date	11/22/2022	11/22/2022	11/22/2022	--
Time	09:15-10:15	10:36-11:36	12:11-13:11	--
Sampling & Flue Gas Parameters				
sample duration, minutes	60	60	60	--
flue gas temperature, °F	577	581	578	579
volumetric flow rate, acfm	45,440	45,531	44,967	45,313
volumetric flow rate, scfm	23,407	23,369	23,141	23,306
volumetric flow rate, dscfm	20,452	20,458	20,013	20,308
CO ₂ , % volume dry	8.4	8.5	8.5	8.5
O ₂ , % volume dry	6.4	6.3	6.2	6.3
moisture content, % volume	12.7	12.5	13.6	12.9
Nitrogen Oxides (NO_x)				
ppmvd	18.5	18.8	19.1	18.8
lb/hr	2.71	2.76	2.74	2.74
tons/yr	11.9	12.1	12.0	12.0

5.0 Internal QA/QC Activities

5.1 QA/QC Audits

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, and minimum sample durations 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 NO₂ 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 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).