

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:  **Date:** 07 / 31 / 2023

Name: Brian Romani **Title:** Client Project 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:  **Date:** 08 / 01 / 2023

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

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1.0 Introduction

1.1 Summary of Test Program

UP Paper, LLC contracted Montrose Air Quality Services, LLC (Montrose) to perform the Relative Accuracy Audit (RAA) for the Predictive Emission Monitoring Systems (PEMS) associated with the BOILER NO. 4 (EUBLR004) at the UP Paper-Manistique Mill facility (State Registration No.: A6475) located in Manistique, Michigan. Testing was performed on June 27, 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-A6475-2019 by evaluating the quality of the emissions data produced by UP Paper's PEMS in accordance with 40 CFR Part 60, Appendices B and F.

The specific objectives were to:

- Verify the relative accuracy of oxygen (%-dry as O₂), nitrogen oxides (NO_x) (ppmvd) and (lb/MMBtu) (as NO₂) at the exhaust stack serving EUBLR004 in accordance with Performance Specifications 16 (PS-16)
- 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)
6/27/2023	EUBLR004	O ₂	EPA 3A	3	30
6/27/2023	EUBLR004	NO _x	EPA 7E	3	30

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.

Table 1-2
Summary of Part 60 PEMS RATA Results – EUBLR004
June 27, 2023

Parameter/Units	Regulatory Reference	RA	Allowable
Part 60			
Oxygen (O₂)			
% volume dry	PS-16	0.060	≤ 1.0% O ₂
Nitrogen Oxides (NO_x)			
ppmvd	PS-16	4.40	≤ 20% of RM
lb/MMBtu (as NO ₂)	PS-16	4.44	NA *

* RA is not applicable because emissions were ≤0.05 lb/MMBtu. See Section 4.2 for details.

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location: UP Paper, LLC
 Manistique Mill
 402 West Elk Street
 Manistique, MI 49854

Project Contact: Mark Ozoga
 Role: Environmental Manager
 Company: UP Paper, LLC
 Telephone: 260-729-8213
 Email: markozoga@uppaperllc.com

Testing Company Information

Testing Firm: Montrose Air Quality Services, LLC

Contact: John Nestor	Brian Romani
Title: District Manager	Field Project Manager
Telephone: 248-548-8070	440-262-3760
Email: jnestor@montrose-env.com	bromani@montrose-env.com

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

Table 1-3
Test Personnel and Observers

Name	Affiliation	Role/Responsibility
Brian Romani	Montrose	Client Project Manager, QI
Trevor Bennett	Montrose	Field Technician
Mark Ozoga	UP Paper	Test Coordinator

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

Boiler 4 (EUBLR004) generates steam for use in mill operations. The boiler is rated for a maximum heat input capacity of 186.8 MMBtu/hr and is equipped with low-NO_x burners and flue gas recirculation for NO_x emissions control.

2.2 Facility PEMS and Reference Method (RM) CEMS Descriptions

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

**Table 2-1
Facility PEMS Information**

Measurement Type	Manufacturer	Model No.	Serial No.
EUBLR004 PEMS	CMC Solutions	SmartCEMS®-60	EUBLR004.9995

**Table 2-2
RM CEMS Information**

Analyzer Type	Manufacturer	Model No.	Serial No.	Range
O ₂	Teledyne	T803	61	0-9.979%
NO _x	Thermo	T200H	12202615657	0-45.63 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.)	
EUBLR004 Exhaust Stack	72.0	~168.0/2.3	~432.0/6.0	Gaseous: 3

See Appendix A.1 for more information.

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2.4 Operating Conditions and Process Data

The PEMS RAA was performed while the EUBLR004 was operating at normal capacity.

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

- Facility PEMS data for each 30-minute RAA run
- Heat input rate, MMBtu/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 3A, Determination of Oxygen and Carbon Dioxide 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 concentrations of O₂ and CO₂. The performance requirements of the method must be met to validate 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
 - Calibration span value is 9.979% O₂
- Method Exceptions:
 - None
- Target and/or Minimum Required Sample Duration: 30 minutes

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

3.1.2 EPA Method 7E, Determination of Nitrogen Oxides Emissions from Stationary Sources (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 a chemiluminescent 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.

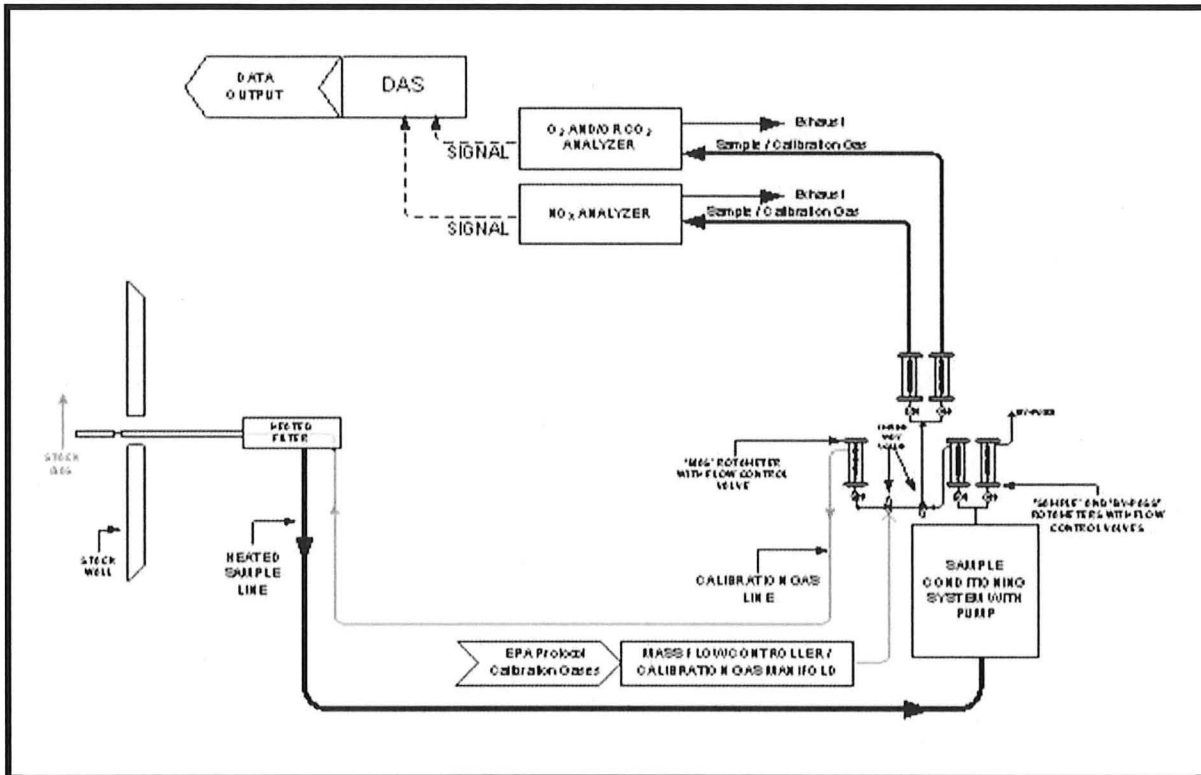
Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - A dry extractive sampling system is used to report emissions on a dry basis
 - Calibration span value is 45.63 ppmvd NO_x

- Method Exceptions:
 - None
- Target and/or Minimum Required Sample Duration: 30 minutes

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

Figure 3-1
Figure Name



3.1.3 EPA Method 19, Measurement 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, SO₂, and NO_x emission rates; (b) sulfur removal efficiencies of fuel pretreatment and SO₂ control devices; and (c) overall reduction of potential SO₂ 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.

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

- Method Options:
 - F factor is the published oxygen-based F factor (F_d) for natural gas in EPA Method 19, Table 2
- Method Exceptions:
 - None

3.1.4 EPA Performance Specification 16, Specifications and Test Procedures for Predictive Emission Monitoring Systems in Stationary Sources

EPA Performance Specification 16 is a specification used to evaluate the acceptability of Predictive Emission Monitoring Systems (PEMS) to show compliance with an emission limitation under 40 CFR 60, 61, or 63. These procedures are used to certify a PEMS after initial installation and periodically thereafter to ensure the system is operating properly and meets the requirements of all applicable regulations. Ongoing QA/QC tests include sensor evaluation, bias correction, quarterly Relative Accuracy Audits (RAA), and annual Relative Accuracy Test Audits (RATA).

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

- Method Options:
 - None
- Method Exceptions:
 - None
- Applicable Performance Specifications:
 - When average RM results are between 10 ppm and 100 ppm, the RAA calculated with RM in the denominator must be < 20.0%
 - When average RM results are < 0.05 lb/MMBtu, the RA is not applicable under PS-16
 - For diluent PEMS, the absolute difference between the RM and PEMS must not exceed 1%

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.

Since NO_x emissions displayed in Table 4-2 were below 0.05 lb/MMBtu, the lb/MMBtu RA is not applicable under PS-16. The NO_x lb/MMBtu data in their respective tables are displayed for informational purposes only.

Table 4-1
NO_x (ppmvd) RAA Results -
EUBLR004 PEMS

Run No.	Date	Time	RM	PEMS*	Difference	Heat Input (MMBtu/hr)
1	6/27/2023	8:24-8:54	24.316	25.048	0.732	122.5
2	6/27/2023	9:06-9:36	25.062	26.291	1.229	118.8
3	6/27/2023	9:49-10:19	24.437	25.726	1.289	123.1
Averages			24.605	25.688	1.083	121.5
Unit Load			Normal			
RA based on mean RM value			4.40	%		

* PEMS data provided by CMC Solutions, LLC.

Table 4-2
NO_x (lb/MMBtu) RAA Results -
EUBLR004 PEMS

Run No.	Date	Time	RM	PEMS*	Difference	Heat Input (MMBtu/hr)
1	6/27/2023	8:24-8:54	0.0312	0.0320	0.0008	122.5
2	6/27/2023	9:06-9:36	0.0324	0.0340	0.0016	118.8
3	6/27/2023	9:49-10:19	0.0312	0.0330	0.0018	123.1
Averages			0.0316	0.0330	0.0014	121.5
Unit Load			Normal			
RA based on mean RM value †			4.44	%		

* PEMS data provided by CMC Solutions, LLC.

† RA not applicable because emissions were <0.05 lb/MMBtu.

Table 4-3
O₂ (%-Dry) RAA Results -
EUBLR004 PEMS

Run No.	Date	Time	RM	PEMS*	Difference	Heat Input (MMBtu/hr)
1	6/27/2023	8:24-8:54	3.948	4.019	0.071	122.5
2	6/27/2023	9:06-9:36	4.110	4.078	-0.032	118.8
3	6/27/2023	9:49-10:19	3.856	3.997	0.141	123.1
Averages			3.972	4.031	0.060	121.5
Unit Load			Normal			
RA based on mean difference			0.060	% as O ₂		

* PEMS data provided by CMC Solutions, LLC.

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	9.979%	CC441839	12/12/2030
O ₂ , Balance N ₂	4.856%	CC233976	10/3/2030
NO _x , Balance N ₂	45.63 ppmv	CC353784	12/16/2025
NO _x , Balance N ₂	25.13 ppmv	CC473213	9/16/2024
NO ₂ , Balance Air	50.92 ppmv	CC503290	4/10/2026

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 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).



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Appendix A

Field Data and Calculations

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Appendix A.1

Sampling Locations

EUBLR004 EXHAUST TRAVERSE POINT LOCATION DRAWING

