Source Test Report for 2024 PEMS Relative Accuracy Test Audit

Regenerative Thermal Oxidizer and Heat Recovery Steam Generator (EU-RTO&HRSG)

Marysville Ethanol, LLC (SRN: N7493) Marysville, Michigan

Prepared For:

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For Submission To:

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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:	for the to	Date:	April 25, 2025	
Name:	John Nestor	Title:	District Manager	



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1.0 Introduction

1.1 Summary of Test Program

Marysville Ethanol, LLC contracted Montrose Air Quality Services, LLC (Montrose) to perform a RATA on the PEMS associated with the 125 MMBtu/hr, natural gas-fired regenerative thermal oxidizer (RTO) and heat recovery steam generator (C10) (EU-RTO&HRSG) located at the Marysville Ethanol facility in Marysville, Michigan.

Testing was performed on March 5, 2024, for the purpose of satisfying the emission testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit-to-Install No. 175-05D by evaluating the quality of the emissions data produced by Marysville Ethanol, LLC's PEMS in accordance with 40 CFR Part 60, Appendices B and F.

The specific objectives were to:

- Determine the relative accuracy (RA) of nitrogen oxides (NO_x) emissions (Ib/MMBtu as NO₂) for the EU-RTO&HRSG PEMS in accordance with Performance Specification 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)
2/5/2022		O ₂	EPA 3A	10	21
3/5/2023	EU-RIO&HSRG	NO _x	EPA 7E	10	21

For the Part 60 RATA, nine runs were used to determine the RA of the EU-RTO&HRSG PEMS.

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.

The testing was conducted by the Montrose personnel listed in Table 1-3. The tests were conducted according to the test plan (protocol) dated February 16, 2024 that was submitted to and approved by EGLE.

Table 1-2

Summary of Part 60 RA Test Results - EU-RTO&HRSG PEMS

March 5, 2024

Parameter/Units	Regulatory Reference	RA	Allowable		
Part 60					
Nitrogen Oxides (NO _x as NO ₂)					
lb/MMBtu (as NO ₂)	PS-16	7.83	≤ 20% of RM		

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location:	Marysville Ethanol, LLC
	2512 Busha Highway
	Marysville, MI 48040
Project Contact:	Susan Jack
Role:	Production Manager
Company:	Marysville Ethanol, LLC
Telephone:	810-479-8266
Email:	sjack@marysvilleethanol.com

Agency Information

Regulatory Agency:	EGLE
Agency Contact:	Jeremy Howe
Telephone:	517-355-3122
Email:	HoweJ1@michigan.gov

Testing Company Information

Testing Firm: Montrose Air Quality Services, LLC		Montrose Air Quality Services, LLC	
	Contact:	John Nestor	Matthew Libman
	Title:	District Manager	Vice President-Midwest
	Telephone:	248-548-8070	630-625-2114
	Email:	jonestor@montrose-env.com	mlibman@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	Project Manager/Field Team Leader/Qualified Individual (QI)/Trailer operator
Ryan Soehren	Montrose	Field Technician
Susan Swanson	Montrose	Calculations and report preparation
Susan Jack	Marysville Ethanol	Test Coordinator
Andrew Riley	EGLE	Observer

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

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The Marysville Ethanol facility operates two natural gas-fired 45 MMBtu/hr dryers and a 125 MMBtu/hr natural gas-fired regenerative thermal oxidizer (RTO) with a heat recovery steam generator (HRSG). The RTO controls emissions from several emission units. Low-NO_x combustors minimize the emissions of nitrogen oxides from the process. The EU-RTO&HRSG was in operation during this test event.

2.2 CEMS Description

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

Table 2-1

Facility PEMS Information

Measurement Type	Manufacturer	Model No.	Serial No.
EU-RTO&HRSG PEMS	CMC Solutions	SmartCEMSTM-60	S10.65175

Table 2-2

RM CEMS Information

Analyzer Type	Manufacturer	Model No.	Serial No.	Range
O ₂	Servomex	Servopro 1440	01440D1-5222	0-19.69
NO _x	Teledyne	Т200Н	727	0-90.28

2.3 Flue Gas Sampling Location

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

Table 2-2 Sampling Location

		Distance from Nea		
Sampling Location	Stack Inside Diameter (in.)	Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	Number of Traverse Points
EU-RTO&HRSG Exhaust Stack	83.0	360 / 4.3	780 / 9.4	Gaseous: 3

See Appendix A.1 for more information.

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2.4 Operating Conditions and Process Data

The PEMS RATA was performed while the EU-RTO&HRSG was operating at greater than 50% of normal operating load.

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

- Facility PEMS data for each 21-minute RATA run
- Steam flow, lb/hr
- Natural gas usage, MMBtu/hr



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 O_2 and CO_2 in stack gas. The effluent gas is continuously or intermittently sampled and conveyed to analyzers that measure the concentrations of O_2 and CO_2 . 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:
 - Calibration span value was 19.69% O2
- Method Exceptions:
 - None
- Target and/or Minimum Required Sample Duration: 21 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 NO_2 . Conditioned gas is sent to a chemiluminescent analyzer to measure the concentration of NO_x . NO and NO_2 can be measured separately or simultaneously together but, for the purposes of this method, NO_x is the sum of NO and NO_2 . 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 90.28 ppmvd NOx
- Method Exceptions:
 - None
- Target and/or Minimum Required Sample Duration: 21 minutes

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

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

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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 O₂-based F_d factor in EPA Method 19, Table 19-2
- 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, Semi-Annual 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 NOx:
 - When average RM results are > 0.02 lb/MMBtu and \leq 0.2 lb/MMBtu, RA calculated with RM in the denominator must be \leq 20%



Figure 3-1 EPA Methods 3A and 7E 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

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 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 (lb/MMBtu) RATA Results -EU-RTO&HRSG PEMS

Run				DEMOX	P.10	Run used	Steam Flow
NO.	Date	Time	RM	PEMS*	Difference	(Y/N)	(ID/hr)
1	3/5/2024	9:35-9:55	0.052	0.053	-0.0006	Y	100,038
2	3/5/2024	10:10-10:30	0.051	0.053	-0.0016	Y	100,242
3	3/5/2024	10:40-11:00	0.052	0.054	-0.0017	Y	99,552
4	3/5/2024	11:10-11:30	0.052	0.055	-0.0028	Y	99,381
5	3/5/2024	11:45-12:05	0.053	0.058	-0.0047	Y	98,383
6	3/5/2024	12:15-12:35	0.053	0.058	-0.0054	N	98,927
7	3/5/2024	12:45-13:05	0.053	0.058	-0.0051	Y	98,558
8	3/5/2024	13:10-13:30	0.052	0.056	-0.0035	Y	98,150
9	3/5/2024	13:45-14:05	0.053	0.057	-0.0043	Y	98,156
10	3/5/2024	14:15-14:35	0.052	0.053	-0.0007	Y	99,953
Averages		0.052	0.0552	-0.00278		99,134	
Standard Deviation		0.00173					
Confidence Coefficient (CC)		0.00133					
RA based on mean RM value		7.83	%				





5.0 Internal QA/QC Activities

Table 5-1 presents a summary of the gas cylinder information.

Table 5-1

Gas Cylinder Information

Gas Type	Gas Concentrations	Cylinder ID	Expiration Date
O ₂ , Balance N ₂	10.08 %v	EB0164485	4/20/2031
O ₂ , Balance N ₂	19.69 %v	SG9183487BAL	3/19/2028
NO _x , Balance N ₂	50.28 ppmv	CC75067	4/27/2031
NO _x , Balance N ₂	90.28 ppmv	XC021268B	8/27/2030
NO ₂ , Balance Air	50.32 ppmv	EB0147946	9/14/2025

5.1 QA/QC Audits

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 NO_2 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).