

1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

Wisconsin Public Service (WPS) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test program on one natural gas fired compressor engine (EU-COMP) at the Bluewater Booster Station located in Ray Township, Michigan. The test was conducted to satisfy the requirements of the EPA, 40 CFR 63.6640 (c), Subpart ZZZZ.

The specific objectives were to:

- Determine the CO concentration (ppmvd and ppmvd @15% O₂) from one natural gas fired compressor engine
- 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)
12/08/20	Compressor Engine	O ₂ CO	EPA 3A EPA 10	3 3	15 15

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 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.

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TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
EU-COMP
DECEMBER 8, 2020

Parameter/Units	Average Results	Emission Limits
Carbon Monoxide (CO)		
ppmvd	27.3	--
ppmvd @ 15% O ₂	8.0	47

1.2 KEY PERSONNEL

A list of project participants is included below.

Facility Information

Source Location: Bluewater Gas Storage
Booster Station
333 S. Wales Center
Columbus, MI 48063
Project Contact: Shelly Heston
Telephone: 920-433-1294

Testing Company Information

Testing Firm: Montrose Air Quality Services, LLC
Contact: Brandon Check
Title: Client Project Manager
Telephone: 630-860-4740
Email: bcheck@montrose-env.com

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

**TABLE 1-3
TEST PERSONNEL AND OBSERVERS**

Name	Affiliation	Role/Responsibility
Brandon Check	Montrose	QSTI/Project Manager/Field Team Leader/Trailer Operator
Matthew Libman	Montrose	Project Manager/Field Team Leader/Trailer Operator
Debbie Olsen	Montrose	Report Preparation
Shelly Heston	WPS	Client Liaison/Test Coordinator

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

EU-COMP is a 10.1 MMBtu/hr heat input Caterpillar G3516 natural gas fired 4-stroke lean burn reciprocating internal combustion engine driving a compressor. It is controlled with a catalytic oxidation system.

2.2 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while the source and air pollution control devices were operating at the conditions required by the permit. The process data is presented in Tables 2-1 and 2-2.

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.

**TABLE 2-1
 PROCESS DATA**

Run	RPM/BHP	% Load	Catalyst Pressure Drop (in)	Catalyst Inlet Temperature (°F)	Heating Value (Btu)	Fuel Flow (MSCFH)	Fuel Consumed (MSCF)
1	997 / 234	25	0.02	713	1,071.24	2.45	0.61
2	998 / 234	25	0.01	712	1,071.26	2.43	0.61
3	998 / 239	25	0.01	713	1,071.15	2.45	0.61

**TABLE 2-2
 PROCESS DATA**

Run	Temperature (F)	Humidity (%)	Pressure (in)
1	37 F	58 %	29.32 in.
2	38 F	59 %	29.29 in.
3	38 F	60 %	29.28 in.

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 Methods 3A and 10, Determination of Oxygen and Carbon Monoxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedures)

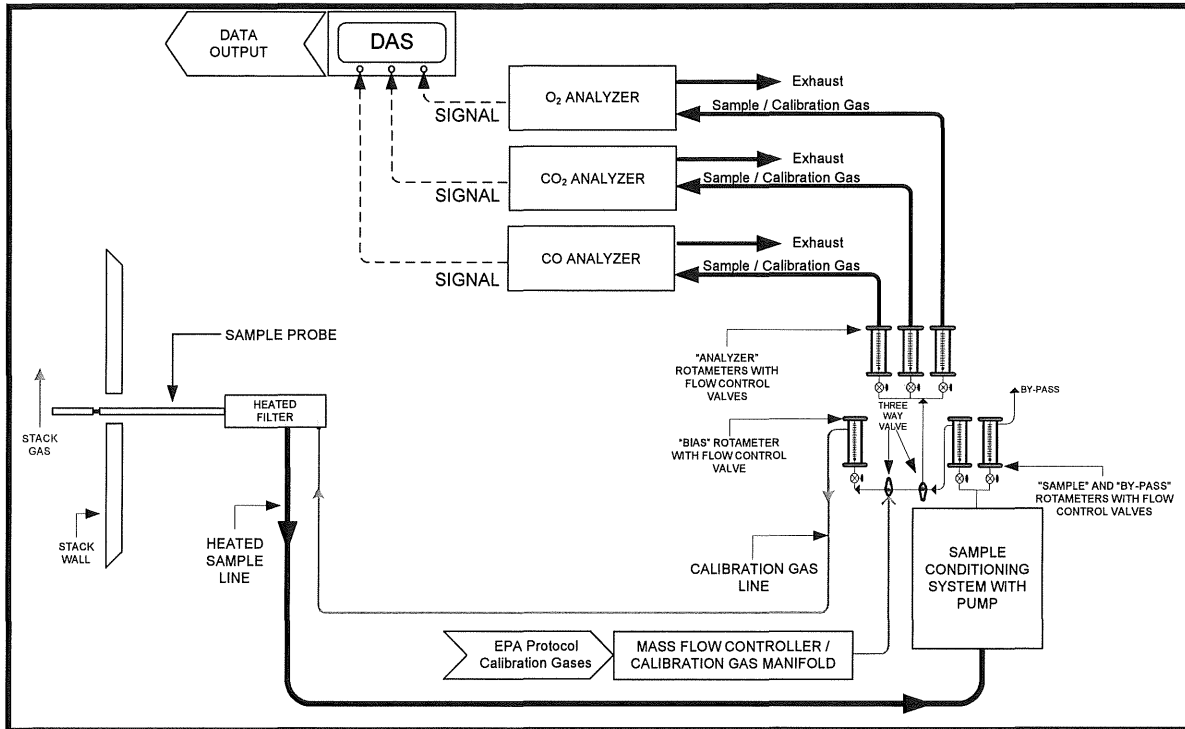
Concentrations of O₂ and CO are measured simultaneously using EPA Methods 3A and 10, which are instrumental test methods. Conditioned gas is sent to a series of analyzers to measure the gaseous emission concentrations. The performance requirements of the method must be met to validate the data.

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 gas filter correlation nondispersive infrared analyzer is used to measure CO
- Target and/or Minimum Required Sample Duration: 15 minutes

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

FIGURE 3-1
EPA METHODS 3A (O₂), 10 (CO) 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 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.

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**TABLE 4-1
 CO EMISSIONS RESULTS -
 EU-COMP**

Run Number	1	2	3	Average
Date	12/8/20	12/8/20	12/8/20	--
Time	12:52-13:06	13:14-13:29	13:44-13:58	--
Flue Gas Parameters				
O ₂ , % volume dry	0.81	0.74	0.93	0.83
Carbon Monoxide (CO)				
ppmvd	27.9	30.0	24.1	27.3
ppmvd @ 15% O ₂	8.2	8.8	7.1	8.0

5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA/QC AUDITS

EPA Method 3A 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.

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).