MONTROSE AIR QUALITY SERVICES

SOURCE TEST REPORT
2023 ANNUAL COMPLIANCE DEMONSTRATION
BLUEWATER GAS STORAGE, LLC.
KIMBALL PLANT
ST. CLAIR COUNTY, MICHIGAN

Prepared For:

Bluewater Gas Storage
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STAC
A2LA ACCREDITED TO ASTM D7036 ONLY CERT #3925.01

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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: *Brandon Check* Date: 7/31/2023

Name: Brandon Check 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: *Brian Romani* Date: 7/31/2023

Name: Brian Romani Title: Logistics Manager

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1.0 PROJECT OVERVIEW

1.1 GENERAL

Montrose Air Quality Services, LLC (Montrose) located at 1371 Brummel Avenue, Elk Grove Village, Illinois was contracted by Bluewater Gas Storage, LLC to perform an air emission test program at the Bluewater Gas Storage Kimball Station located in Kimball, Michigan. Testing was performed to satisfy the requirements of the United States Environmental Protection Agency (U.S. EPA), 40 CFR 63.6640 (c), Subpart ZZZZ, as applicable.

The specific objective of the test program is as follows:

- Determine the carbon monoxide (CO) emissions from one natural gas fired, compressor engine at the Bluewater Gas Storage Kimball Station

Testing was performed on June 20, 2023. Coordinating the field aspects of the test program were:

James Jensen - WEC Energy Group - (414) 221-2530

Frank Rasmussen – Bluewater Gas Storage - (810) 305-3912

Brandon Check – Montrose Air Quality Services, LLC – (630) 860-4740

1.2 EXECUTIVE SUMMARY

The results of the carbon monoxide testing are summarized in the following table.

TABLE 1-1
EXECUTIVE SUMMARY

Location	Limit	Result
EU-COMP	**47 ppm@15% O2**	**0.668**

1.3 ASTM D7036-04(2011)

All applicable Montrose field personnel used on-site for this test program were compliant with ASTM D7036-04(2011) "Standard Practice for Competence of Air Emissions Testing Bodies" for all tests performed. This includes having the appropriate QSTI directly supervise the testing.

The following table summarizes the key personnel that were involved with this project:

TABLE 1-2
PROJECT PERSONNEL

Personnel	Position on Project	Date of QSTI Exam
Brandon Check, Q.S.T.I.	Client Project Manager	04/28/2021

1.4 METHODOLOGY

The concentrations of oxygen (O_2), and CO at the exhaust of the engine were determined using EPA Methods 3A, and 10. The sample gas was withdrawn from the outlet at a constant rate through a stainless steel probe, a glass fiber filter and a Teflon sample line. The probe, filter and sample line were operated at a minimum temperature of 250 °F to prevent the condensation of moisture. The sample gas passed through a gas cooler system. The gas cooler consists of two separate stages designed to lower the dew point of the sample gas to 35 °F, thus removing the moisture. Each stage of the gas cooler is designed to minimize contact of condensed moisture with the dry sample gas. The dry gas is then delivered to the O_2 and CO analyzer.

Three 15 minute test runs were performed at the outlet of the engine. Results from the analyzers will be determined on a "dry" basis. Results are in parts per million dry volume (ppmdv) and ppmdv at 15 percent (%) O_2 (ppmdv@15%).

1.5 PARAMETERS

The following specific parameters were determined at each engine at the Bluewater Gas Storage Kimball Station test locations during each test run:

- oxygen concentration
- carbon monoxide

1.6 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 presented in the report appendices.

1.7 RESULTS

A complete summary of test results is presented in Table 2-1.

Testing was performed according to Test Plan No. MW023AS-024983-PP-593. The procedures outlined in that document were followed.

Sample measurements where conducted at three points on the line passing through the centroidal area at 16.7, 50.0, and 83.3 percent (%) of the measurement line. Each point was sampled for five minutes for each fifteen minute test run.

2.0 SUMMARY OF RESULTS

TABLE 2-1
BLUEWATER GAS STORAGE KIMBALL STATION

Test Parameters	Run 1	Run 2	Run 3	Average
Date	6/20/2023	6/20/2023	6/20/2023	
Start Time	8:28	8:51	9:13	
Stop Time	8:43	9:06	9:28	
Fuel Factor, Fd	8611	8614	8611	**8612**
Fuel Flow (MSCH)	5.9	5.9	6.0	**5.9**
Heating Value (BTU)	1065	1065	1065	**1065**
Heat Input (MMBTU/hr)	6.28	6.28	6.39	**6.32**
Gas Conditions				
Oxygen (% dry)	7.1	7.2	7.2	**7.2**
Pollutant Results				
Carbon Monoxide Concentration (ppmdv)	1.68	1.57	1.42	**1.55**
Carbon Monoxide Concentration, C (ppmdv@15% O2)	0.719	0.676	0.609	**0.668**
Carbon Monoxide Emission rate, E (lb/mmBTU)	0.00159	0.00150	0.00148	**0.00142**
Carbon Monoxide Emission Rate (lb/hr)	0.0100	0.00941	0.00862	**0.00935**

TABLE 2-2
PROCESS DATA

Run	RMP/BHP	% Load	Catalyst Pressure drop (in)	Catalyst inlet temperature (F)	Fuel Flow (MSCFH)	Fuel Consumed (MSCF)
1	1047/673	72	2.7	631	5.9	1.46
2	1050/671	72	3.0	632	5.9	1.45
3	1047/674	72	2.9	633	6.0	1.46

3.0 TEST PROCEDURES

3.1 METHOD LISTING

The following EPA test methods were referenced for the test program. These methods can be found in 40 CFR Part 60 Appendix A and 40 CFR Part 63, Appendix A.

Method 3A Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

Method 10 Determination of carbon monoxide emissions from stationary sources (Instrumental Analyzer Procedure)

3.2 METHOD DESCRIPTIONS

3.2.1. Methods 3A, and 10

The oxygen and carbon monoxide concentrations at the test location were determined using EPA Methods 3A, and 10. A schematic of the sample system is shown in Figure 1 in the Appendix.

The sample gas was withdrawn from the test location at a constant rate through an in-situ 0.3 micron stainless steel cintered frit, a stainless steel probe and Teflon sample line. The sample line was operated at a temperature of 250 °F to prevent the condensation of moisture. The sample gas passed through an M & C Type EC gas cooler system. The gas cooler is designed to unobtrusively lower the dewpoint of the sample gas to 35 °F, thus removing the moisture. The dry gas was then vented to the oxygen and carbon monoxide analyzers. Results from these analyzers were determined on a dry basis.

The analyzers that were used for this project are listed in the table below.

TABLE 3-1
ANALYZERS

Parameter	Manufacturer	Model Number	Operating Principle	Units Reported	Range to be used
Oxygen	Servo	1440	Paramagnetic	(%)	0-20.12
Carbon Monoxide	Thermo Environmental	48i	Infrared, Gas Filter Correlation	(ppm)	0-45.30

Prior to sampling, a calibration error test was performed on each analyzer using EPA Protocol 1 gases. The zero and high-range calibration gases for each constituent was introduced directly into each analyzer. Each analyzer was then adjusted to the appropriate values. The mid-range and low-range gases were introduced to each analyzer and the measured values were then recorded. The measured values for each calibration gas were compared to the calibration gas values and the differences were less than the method requirement of two percent of the span value.

A sample system bias check was performed, by introducing the zero and mid-range calibration gases into the sampling system at the base of the probe. The gas was drawn through the entire sampling system. The measured responses were compared to the calibration error test values to determine the bias in response due to the sampling system. In all cases, the sampling system bias was less than the method requirement of five percent of the span value. In addition, the system response time was determined by measuring the time required for each analyzer to reach 95 percent of its' high-range calibration gas value.

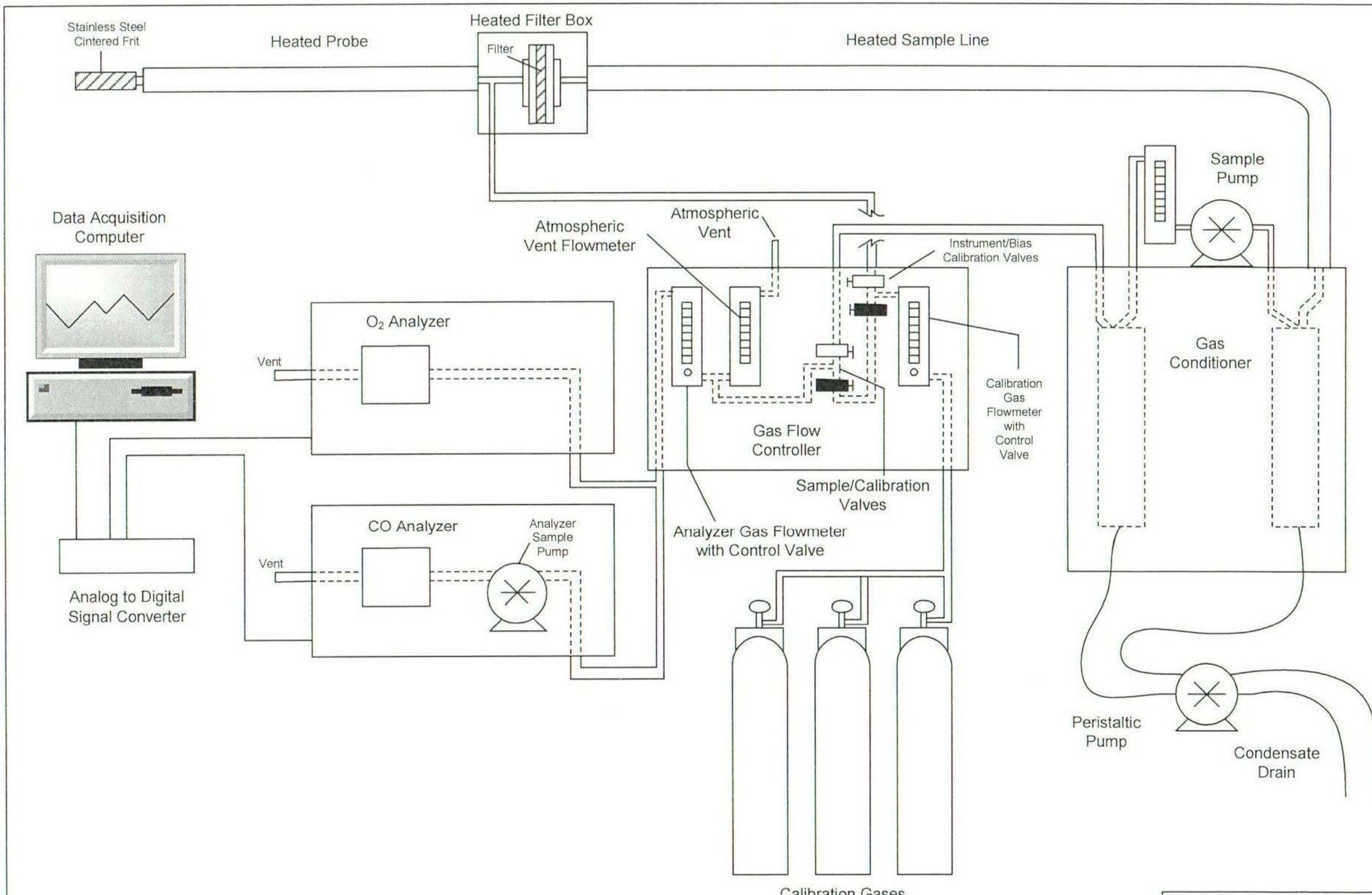
After each test run the instrument drift for each analyzer was determined by introducing the zero and mid-range calibration gases into the sampling system at the base of the probe. The gas was drawn through the entire sampling system. The measured responses were compared to the values from the previous test run to determine the analyzer drift. For all test runs, the analyzer drift was less than the method requirement of three percent of the span value.

4.0 DESCRIPTION OF INSTALLATION

EU-COMP is a 9.9 MMBTU Caterpillar G3516 natural gas fired 4-stroke lean burn reciprocating internal combustion engine driving a compressor. It is controlled with a catalytic oxidation system.

The CAT control system calculates load% by using fuel flow, manifold pressure, combustion air flow and rmps.

APPENDIX A
FIGURES



EPA Methods 3A and 10:
O_2 and CO Gas Sampling System

Figure 1

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