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EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Resources (EMS) Field Services Group performed emissions testing at Alpena Compressor Station, located in Harrison, Michigan. The fieldwork, performed on October 8, 2020 was conducted to satisfy requirements of the Michigan Renewable Operating Permit No. MI-ROP-N5935-2019 and 40 CFR Part 63 Subpart ZZZZ. Emissions tests were performed on the White-Superior Compressor Engine for carbon monoxide (CO).

The results of the emissions testing are summarized below:

Emissions Testing Summary – Compressor Engine (EUWHITESUPERIOR)
Alpena Compressor Station
Harrison, MI

October 8, 2020	Carbon Monoxide[1] (ppm_{dry})
White-Superior Compressor Engine	14.0
Subpart ZZZZ Permit Limit	<47

[1] ppm, corrected to 15% $O_{2,dry}$

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1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EMS) Field Services Group performed emissions testing at Alpena Compressor Station, located in Harrison, Michigan. The fieldwork, performed on October 8, 2020 was conducted to satisfy requirements of the Michigan Renewable Operating Permit No. MI-ROP-N5935-2019 and 40 CFR Part 63 Subpart ZZZZ. Emissions tests were performed on the White-Superior Compressor Engine for carbon monoxide (CO).

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 1-3A, and 10.

The fieldwork was performed in accordance with EPA Reference Methods and EMS's Intent to Test[1] which was approved by the Michigan Department of Environment, Great Lakes, and Energy (EGLE)[2]. The following DTE personnel participated in the testing program: Mr. Thomas Snyder, Environmental Specialist, and Mr. Fred Meinecke, Sr. Engineering Technician. Mr. Snyder was the project leader.

Mr. Darin Cummings, DTE Gas, provided on-site support of the testing. Ms. Lindsey Wells, EGLE, reviewed the test plan and observed the testing. Mr. Nathanael Gentle, EGLE, also observed the testing.

2.0 SOURCE DESCRIPTION

The Alpena Compressor Station, located at 8512 East Arnold Lake Road, Harrison, MI is a natural gas compressor station. The facility operates one White-Superior, 4-cycle, lean burn, natural gas-fired 2,000 Horse Power reciprocating engine. The engine generates line pressure assisting in the transmission of natural gas throughout the pipeline transmission system in Michigan.

The emissions from the engine are exhausted through a catalyst bed and to the atmosphere through an individual exhaust stack. The composition of the emissions from the engine depend both upon the speed of the engine and the torque delivered to the compressor. Ambient atmospheric conditions, as it affects the density of air, may limit the speed and torque at which the engines can effectively operate each day.

Schematic representations of the engine's exhaust and sampling locations are presented in Figure 1.

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[1] EGLE, Test Plan, Submitted August 10, 2020. (Attached-Appendix A)

[2] EGLE, Acceptance Letter, September 21, 2020. (Attached-Appendix A)

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3.0 SAMPLING AND ANALYTICAL PROCEDURES

DTE Energy obtained emissions measurements in accordance with procedures specified in the USEPA *Standards of Performance for New Stationary Sources*. The sampling and analytical methods used in the testing program are indicated in the table below

Sampling Method	Parameter	Analysis
USEPA Method 3A	Oxygen	Instrumental Analyzer Method
USEPA Method 10	Carbon Monoxide	NDIR

3.1 OXYGEN AND CARBON MONOXIDE (USEPA METHODS 3A AND 10)

3.1.1 Sampling Method

Oxygen (O_2) emissions were evaluated using USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The O_2 analyzer utilizes a paramagnetic sensor.

3.1.2 O_2 and CO Sampling Train

The EPA Methods 3A and 10 sampling system (Figure 1) consisted of the following components:

(1) Stainless steel sampling probe.
(2) Heated PTFE sampling line.
(3) Sampling gas conditioner with particulate filter.
(4) Flexible unheated PTFE sampling line.
(5) Servomex 1400 O_2/CO_2 gas analyzer and TECO 48i NDIR CO gas analyzer.
(6) USEPA Protocol 1 calibration gases.
(7) Data Acquisition System.

3.1.3 Sampling Duration & Frequency

The emissions testing of the engine consisted of one 15-minute sample at the exhaust of the catalyst. Testing was conducted at three points across the diameter of the duct. Sampling was performed simultaneously for O_2 and CO. Data was recorded at 10-second intervals.

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3.1.4 Quality Control and Assurance (O_2 and CO)

All sampling and analytical equipment was calibrated per the guidelines referenced in Methods 3A and 7E. Calibration gases were EPA Protocol 1 gases and the concentrations were within the acceptable ranges (40-60% mid-range and span) specified in Method 7E.

Calibration gas certification sheets are in Appendix C.

3.1.5 Data Reduction

Data collected during the emissions testing was recorded at 10-second intervals and averaged in 1-minute increments. The CO emissions were recorded in parts per million (ppm). The 1-minute readings collected can be found in Appendix B.

Emissions calculations are based on calculations located in USEPA Methods 7E, 10, and 19 and can be found in Appendix D. The CO emissions data collected during the testing was calculated as parts per million, corrected to 15% oxygen (ppm @ 15% O_2).

4.0 OPERATING PARAMETERS

The test program included the collection of compressor data collected included engine speed (RPM) and torque (Hp), fuel flow, inlet & exhaust manifold air pressure (psi) and temperature (F), and differential pressure across the catalyst (in. H_2O).

Operational data is in Appendix E.

5.0 DISCUSSION OF RESULTS

The Results Table presents the emission testing results from Compressor Engine while operating at greater than 90% of full load conditions. The CO emissions are presented in parts per million, corrected to 15% oxygen (ppm @ 15% O_2). Additional test data presented for each test includes the collected operating data.

Testing was initiated but invalidated shortly after. After further review of the operating parameters, and a discussion with EGLE representatives on site, it was determined that the engine did not have enough warm up time, and the catalyst did not have sufficient heat soak, prior to starting testing. A valid test run was conducted after sufficient engine and catalyst warm up time and heat soak.

The results from the testing demonstrate that the Compressor Engine is in compliance with Michigan Renewable Operating Permit No. MI-ROP-N5935-2019 and 40 CFR Part 63 Subpart ZZZZ.

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6.0 CERTIFICATION STATEMENT

"I certify that I believe the information provided in this document is true, accurate, and complete. Results of testing are based on the good faith application of sound professional judgment, using techniques, factors, or standards approved by the Local, State, or Federal Governing body, or generally accepted in the trade."

Thomas Snyder, QSTI

This report prepared by: _____

Mr. Thomas Snyder, QSTI
Environmental Specialist, Environmental Field Services
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DTE Energy Corporate Services, LLC

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Principal Engineer, Environmental Field Services
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RESULTS TABLE

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White-Superior Compressor Engine
DTE Energy Gas, Alpena Compressor Station
Harrison, MI

Parameter	Run 1
Sampling Date	10/08/20
Sampling Start Time	11:09-11:24
Load (%)	94.0
Speed (RPM)	902
Brake-HP	1891
Catalyst Diff Pressure ("H2O)	-0.6
Catalyst Pre Temp (F)	903
Catalyst Post Temp (F)	916
Average Outlet O_2 Concentration (%, dry)	8.0
Average Outlet O_2 Concentration (%, dry, corrected)[1]	8.2
Average Outlet CO Concentration (ppmv, dry)	29.3
Average Outlet CO Concentration (ppmv, dry, corrected)[1]	30.3
Average Outlet CO Concentration (ppmv, dry, @15% O_2)[1]	**14.0**

[1]corrected for analyzer drift as per USEPA Method 7E

O_2 : oxygen

CO : carbon monoxide

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FIGURES

Figure 1 – Sampling Location
Compressor Engine
Alpena Compressor Station
October 8, 2020

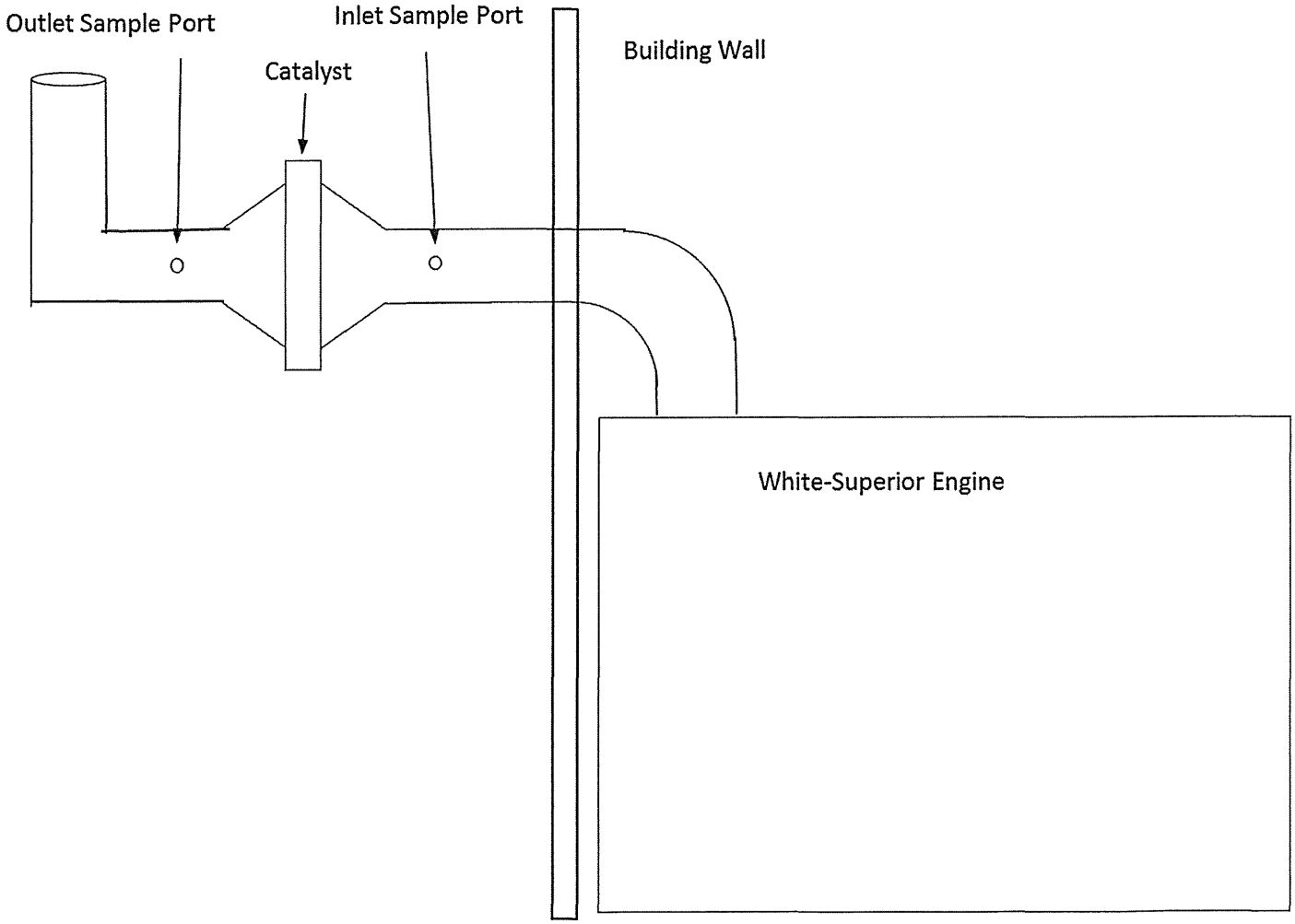

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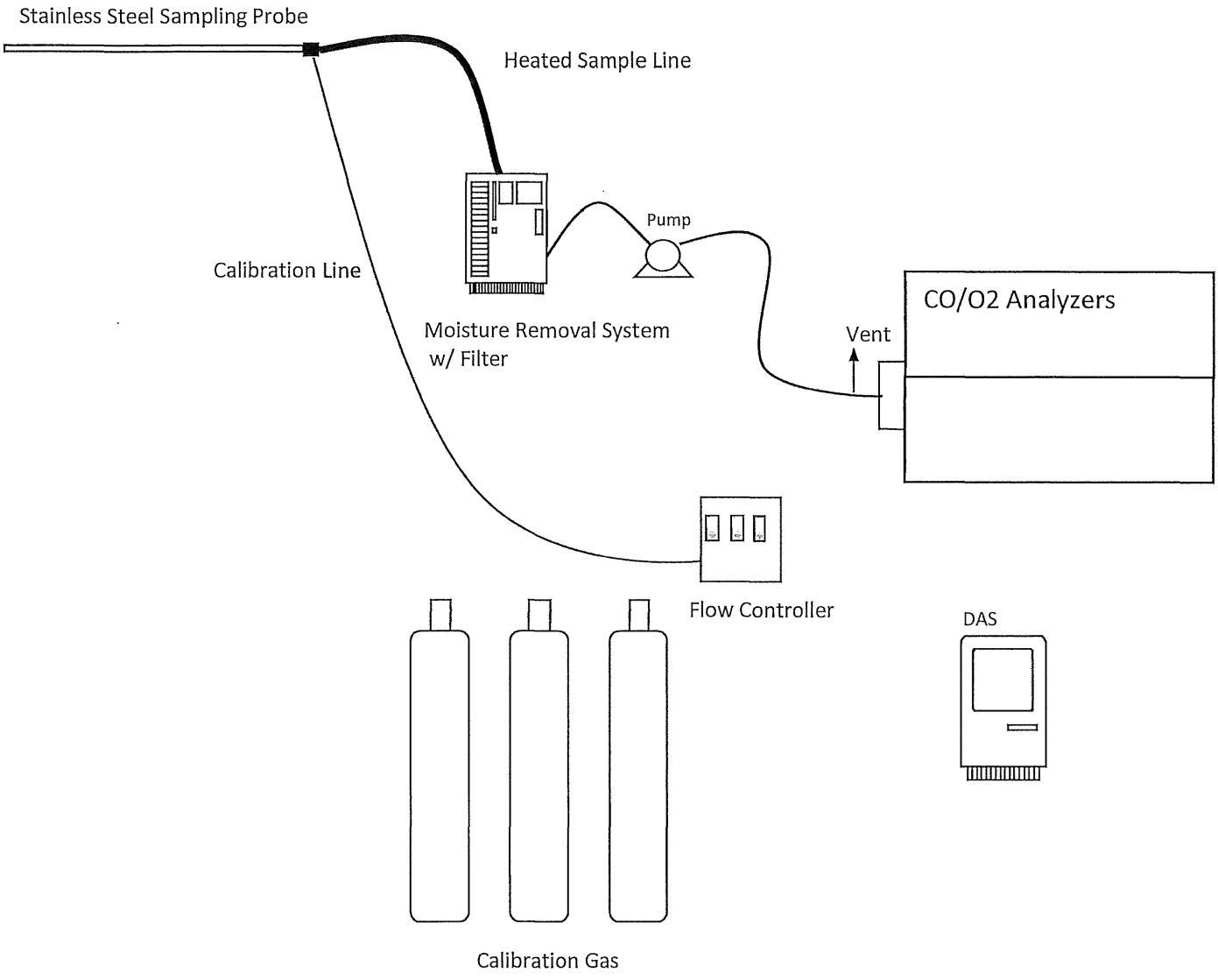
Figure 2 – EPA Methods 3A/10
Alpena Compressor Station
October 10, 2020



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