



**Consumers Energy**

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# **40 CFR Part 63, Subpart ZZZZ Continuous Compliance Test Report**

**EUENGINE1, EUENGINE3,  
EUENGINE2, and EUENGINE4**

Consumers Energy Company  
White Pigeon Compressor Station  
68536 A Road  
White Pigeon, Michigan 49099  
SRN: N5573

May 24, 2023

**Test Dates: April 4 - 6, 2023**

Test Performed by the Consumers Energy Company  
Regulatory Compliance Testing Section  
Air Emissions Testing Body  
Laboratory Services Section  
Work Order No. 41038603  
Version No.: 0

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## EXECUTIVE SUMMARY

Consumers Energy Regulatory Compliance Testing Section (RCTS) conducted carbon monoxide (CO) reduction efficiency testing on four (4), 4-stroke, lean burn (4SLB) natural gas-fired, spark-ignition, reciprocating internal combustion engines (RICE) identified as EUENGINE1, EUENGINE2, EUENGINE3, and EUENGINE4 at the Consumers Energy White Pigeon Compressor Station in White Pigeon, Michigan.

The test program was conducted April 4 through 6, 2023 to satisfy performance testing requirements and evaluate compliance with 40 CFR Part 63, Subpart ZZZZ, "National Emission Standards for Hazardous Air Pollutants (NESHAP) for Reciprocating Internal Combustion Engines," as incorporated within the facility's Renewable Operating Permit (ROP) MI-ROP-N5573-2018 issued by Michigan Department of Environment, Great Lakes, and Energy (EGLE). A test protocol was submitted to EGLE on January 31, 2023, and subsequently approved by Mr. Daniel Droste, Environmental Quality Analyst, in his letter dated March 15, 2023.

Three, 60-minute test runs were conducted upstream and downstream of each engine's oxidation catalyst following the applicable procedures in United States Environmental Protection Agency (USEPA) Reference Methods (RM) 1, 3A, and 10 in 40 CFR Part 60, Appendix A. There were no deviations from the approved stack test protocol or associated USEPA RM.

During testing, the engines were operated at horsepower and/or torque conditions within plus or minus ( $\pm$ ) 10 percent of 100 percent peak (or the highest achievable) load, as specified in 40 CFR 63.6620(b).

The Subpart ZZZZ test results summarized in Table E-1 indicate EUENGINE1, EUENGINE2, EUENGINE3, and EUENGINE4 are operating in continuous compliance with the 40 CFR Part 63, Subpart ZZZZ RICE NESHAP and as specified in the facility ROP.

**Table E-1  
Summary of Test Results**

Source	CO Reduction Efficiency (%) [Limit: $\geq 93\%$ ]	Oxidation Catalyst Inlet Temperature (°F) [Limit: $\geq 450^\circ\text{F}$ & $\leq 1350^\circ\text{F}$ ] <sup>1</sup>	Oxidation Catalyst Pressure Drop Comparison (Inches Water Gauge)	
			Initial Test	2023 Results
			[Limit: $\pm 2''$ from Initial Test]	
EUENGINE1	99.3	761	3.5	4.1
EUENGINE2	98.5	743	3.5	2.9
EUENGINE3	98.4	739	2.9	2.9
EUENGINE4	99.5	768	3.0	3.2

<sup>1</sup>Compliance with the catalyst inlet temperature operating range is based on a 4-hour rolling average

Detailed results are presented in Appendix Tables 1, 2, 3, and 4. Sample calculations and field data sheets are presented in Appendices A and B. Engine operating data and supporting documentation are provided in Appendices C and D.

## 1.0 INTRODUCTION

This report summarizes the results of compliance air emissions testing conducted April 4 through 6, 2023 at the Consumers Energy White Pigeon Compressor Station (WPCS) in White Pigeon, Michigan. This document follows the Michigan Department of Environment, Great Lakes, and Energy (EGLE) format described in the November 2019, *Format for Submittal of Source Emission Test Plans and Reports*. Reproducing only a portion of this report may omit critical substantiating documentation or cause information to be taken out of context. If any portion of this report is reproduced, please exercise due care in this regard.

### 1.1 IDENTIFICATION, LOCATION, AND DATES OF TESTS

Consumers Energy Regulatory Compliance Testing Section (RCTS) conducted carbon monoxide (CO) reduction efficiency testing at four (4), 4-stroke, lean burn (4SLB), natural gas-fired, spark-ignition (SI), reciprocating internal combustion engines (RICE), identified as EUENGINE1, EUENGINE2, EUENGINE3, and EUENGINE4 installed and operating at WPCS in White Pigeon, Michigan. The test program was conducted on April 4 through 6, 2023.

### 1.2 PURPOSE OF TESTING

The test program was conducted to satisfy performance testing requirements and evaluate compliance with 40 CFR Part 63, Subpart ZZZZ, "National Emission Standards for Hazardous Air Pollutants (NESHAP) for Reciprocating Internal Combustion Engines," as incorporated in the facility's Renewable Operating Permit MI-ROP-N5573-2018 issued by EGLE. The applicable operating requirements and emission limits evaluated during this test program are presented in Table 1-1.

**Table 1-1**  
**Summary of Engine Operating Requirements and Emission Limits**

<b>CO Reduction Efficiency (%)</b>	<b>Oxidation Catalyst Inlet Temperature (°F)</b>	<b>Oxidation Catalyst Pressure Drop Change (Inches Water Gauge)</b>
≥93	≥450°F and ≤1350°F (based on a 4-hour rolling average)	±2" from Initial Performance Test

### 1.3 BRIEF DESCRIPTION OF SOURCE

WPCS operates one Caterpillar Model 3608 4SLB engine (EUENGINE1) and three Caterpillar Model 3616 4SLB engines (EUENGINE2 – 4) installed at Plant 3 to maintain pressure in the pipeline transporting natural gas from a main line to storage facilities located in Michigan or local distribution companies. The engines are collectively grouped as FGENGINES within MI-ROP-N5573-2018.

### 1.4 CONTACT INFORMATION

Table 1-2 presents the names, addresses, and telephone numbers of the contacts for information regarding the test and the test report, and names and affiliation of personnel involved in conducting the testing.

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**AIR QUALITY DIVISION**

**Table 1-2  
Contact Information**

<b>Program Role</b>	<b>Contact</b>	<b>Address</b>
State Regulatory Administrator	Regina Angellotti Technical Programs Unit Manager 313-418-0895 <a href="mailto:angellottir@michigan.gov">angellottir@michigan.gov</a>	EGLÉ – Air Quality Division Warren District Office 27000 Donald Ct. Warren, Michigan 48902
District Regulatory Oversight	Rex Lane District Supervisor 269-312-1540 <a href="mailto:laner@michigan.gov">laner@michigan.gov</a>	EGLÉ – Air Quality Division Kalamazoo / Southwest Michigan District 7953 Adobe Road Kalamazoo, Michigan 49009-5026
State Regulatory Inspector	Daniel Droste Environmental Quality Analyst 989-225-6052 <a href="mailto:drostt@michigan.gov">drostt@michigan.gov</a>	EGLÉ-AQD Bay City District Office 401 Ketchum Street, Suite B Bay City, Michigan 48708-5430
Responsible Official	Avelock Robinson Director of Gas Compression Operations 586-716-3326 <a href="mailto:avelock.robinson@cmsenergy.com">avelock.robinson@cmsenergy.com</a>	Consumers Energy Company St. Clair Compressor Station 10021 Marine City Highway Ira, Michigan 48023
Corporate Air Quality Contact	Amy Kapuga Senior Engineer 517-788-2201 <a href="mailto:amy.kapuga@cmsenergy.com">amy.kapuga@cmsenergy.com</a>	Consumers Energy Company Environmental Services Department 1945 West Parnall Road Jackson, Michigan 49201
Field Environmental Coordinator	Frank Rand Senior Environmental Analyst 734-807-0935 <a href="mailto:frank.randjr@cmsenergy.com">frank.randjr@cmsenergy.com</a>	Consumers Energy Company South Monroe Customer Service Center 7116 Crabb Road Temperance, MI 48182
Facility Leader	Tim Wolf Supervisor Compression Operations 269-483-2902 <a href="mailto:Timothy.Wolf@cmsenergy.com">Timothy.Wolf@cmsenergy.com</a>	Consumers Energy Company White Pigeon Compressor Station 68536 A Road, Route 1 White Pigeon, Michigan 49099
Test Team Representative	Thomas Schmelter Engineering Technical Analyst 248-388-1525 <a href="mailto:thomas.schmelter@cmsenergy.com">thomas.schmelter@cmsenergy.com</a>	Consumers Energy Company L & D Training Center 17010 Croswell Street West Olive, Michigan 49460

## 2.0 SUMMARY OF RESULTS

### 2.1 OPERATING DATA

During the performance test, the engines fired natural gas and pursuant to §63.6620(b), were operated within ( $\pm$ ) 10% of 100 percent load. The performance tests were conducted with the engines operating at a 3-run average load  $\geq$ 95% compressor torque or greater, based on the maximum manufacturer's design capacity at engine and compressor site conditions. Refer to Appendix C for detailed operating data.

### 2.2 APPLICABLE PERMIT INFORMATION

The White Pigeon Compressor Station operates in accordance with MI-ROP-N5573-2018. EUENGINE1, EUENGINE2, EUENGINE3, and EUENGINE4 are the emission unit sources identified in the permit. Collectively they are included within the FGENGINEs flexible group. Incorporated within the permit are the applicable federal requirements of 40 CFR Part 63, Subpart ZZZZ.

## 2.3 RESULTS

The CO reduction efficiency results indicate compliance with 40 CFR Part 63, Subpart ZZZZ as incorporated within MI-ROP-N5573-2018. Refer to Table 2-1 for the summary of test results.

**Table 2-1  
Summary of Test Results**

Source	CO Reduction Efficiency (%) [Limit: ≥93%]	Oxidation Catalyst Inlet Temperature (°F) [Limit: ≥450°F & ≤1350°F] <sup>1</sup>	Oxidation Catalyst Pressure Drop Comparison (Inches Water Gauge)	
			Initial Test	2023 Results
			[Limit: ±2" from Initial Test]	
EUENGINE1	99.3	761	3.5	4.1
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EUENGINE4	99.5	768	3.0	3.2

<sup>1</sup>Compliance with the catalyst inlet temperature operating range is based on a 4-hour rolling average

Detailed results are presented in Appendix Tables 1 - 4. A discussion of the results is presented in Section 5.0. Sample calculations and field data sheets are presented in Appendices A and B. Engine operating data and supporting documentation are provided in Appendices C and D.

## 3.0 SOURCE DESCRIPTION

EUENGINE1, EUENGINE2, EUENGINE3, and EUENGINE4 are operated as needed to maintain natural gas pressure along the natural gas pipeline system. A summary of the engine specifications is presented in Table 3-1.

**Table 3-1  
Engine Specifications**

Parameter <sup>1</sup>	EUENGINE1	EUENGINE2, EUENGINE3, and EUENGINE4
Purchase Year	2008	2008
Installation Date	June 15, 2010	June 15, 2010
Make	Caterpillar	Caterpillar
Model	G3608	G3616
Cylinders	8	16
Output (brake-horsepower)	2,370	4,735
Heat Input (mmBtu/hr)	16.1	32.0
Exhaust Flow Rate (acfm, wet)	16,144	32,100

**Table 3-1  
Engine Specifications**

Parameter <sup>1</sup>	EUENGINE1	EUENGINE2, EUENGINE3, and EUENGINE4
Exhaust Gas Temp. (°F)	857	856
Engine Outlet O <sub>2</sub> (Vol-%, dry)	12.00	12.00
Engine Outlet CO <sub>2</sub> (Vol-%, dry)	5.81	5.81
CO, uncontrolled (ppmvd)	570.0	572.0
CO, controlled <sup>2</sup> (ppmvd)	39.9	40.0

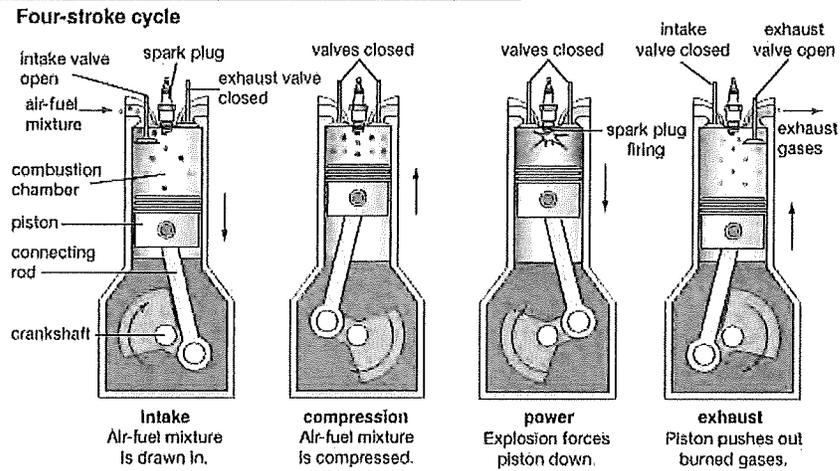
<sup>1</sup> All engine specifications are based upon vendor data for operation at 100% of rated engine capacity.

<sup>2</sup> The controlled CO concentrations are based upon the vendor not to exceed CO concentrations at 100% load, and a reduction of 93% by volume for the associated oxidation catalysts.

### 3.1 PROCESS

The engines utilize the four-stroke engine cycle which starts with the downward air intake piston stroke which aspirates air through intake valves into the combustion chamber (cylinder). When the piston nears the bottom of the cylinder, fuel is injected and the intake valves close. As the piston travels upward, the air/fuel mixture is compressed and ignited, thus forcing the piston downward into the power stroke. At the bottom of the power stroke, exhaust valves open and the piston traveling upward expels the combustion by-products. Refer to Figure 3-1 for a four-stroke engine process diagram.

**Figure 3-1. Four-Stroke Engine Process Diagram**



The flue gas generated by natural gas combustion is controlled through parametric controls (i.e., timing and air-to-fuel ratio), lean burn combustion technology, and oxidation catalysts. The Caterpillar engines include an Advanced Digital Engine Management (ADEM) III electronic control system. The ADEM III electronic controls integrate governing (engine sensing and monitoring, air/fuel ratio control, ignition timing, and detonation control) into one comprehensive engine control system for optimum performance and reliability.

The engines are equipped with oxidation catalysts. Pollution Control Associates, Inc. (PCA) manufactures the model ADCAT CO catalysts (part number 28283.5-300CO) that are installed on each engine exhaust stack. The catalysts are designed in a modular manner



### 3.4 RATED CAPACITY

EUENGINE1 has a maximum power output of approximately 2,370 horsepower while EUENGINE2-4 are rated at 4,735 horsepower. The engines have a rated heat input of 16.1 and 32.0 million British thermal units per hour (mmBtu/hour), respectively. The normal rated capacities of the engines are a function of facility and gas transmission demand. The engine operating parameters were recorded and averaged for each test run. Refer to Appendix C for operating data recorded during testing.

### 3.5 PROCESS INSTRUMENTATION

The engine operating parameters were continuously monitored by a distributed control system for the Caterpillar engines, data acquisition systems, and by Consumers Energy operations personnel during testing. Data were collected at 1-minute intervals during each test for the following parameters:

- Discharge pressure (psi)
- Suction pressure (psi)
- Catalyst differential pressure (In. H<sub>2</sub>O)
- Pre-Catalyst inlet temperature (°F)
- Post Catalyst exhaust temperature (°F)
- Power (BHP)
- Engine speed (rpm)
- Compressor Torque (% max)
- Compressor Load Step (unit less)
- Fuel use (1,000 scf/hr)

Refer to Appendix C for operating data.

## 4.0 SAMPLING AND ANALYTICAL PROCEDURES

Consumers Energy RCTS tested for CO and O<sub>2</sub> concentrations using the United States Environmental Protection Agency (USEPA) test methods presented in Table 4-1. The sampling and analytical procedures associated with each parameter are described in the following sections.

**Table 4-1  
Test Methods**

Parameter	USEPA	
	Method	Title
Sample traverses	1	Sample and Velocity Traverses for Stationary Sources
Oxygen	3A	Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)
Carbon monoxide (CO)	10	Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)

#### 4.1 DESCRIPTION OF SAMPLING TRAIN AND FIELD PROCEDURES

The test matrix presented in Table 4-2 summarizes the sampling and analytical methods

**Table 4-2  
Test Matrix**

Date (2023)	Run	Sample Type	Start Time (EDT)	Stop Time (EDT)	Test Duration (min)	EPA Test Method	Comment
<b>EUENGINE4</b>							
April 4	1	O <sub>2</sub> CO	8:45	9:44	60	1 3A 10	Three-point traverse during Run 1; Single-point sample during Runs 2 and 3.
	2		10:00	10:59	60		
	3		11:15	12:14	60		
<b>EUENGINE3</b>							
April 4	1	O <sub>2</sub> CO	12:40	13:39	60	1 3A 10	Three-point traverse during Run 1; Single-point sample during Runs 2 and 3.
	2		13:55	14:54	60		
	3		15:10	16:09	60		
<b>EUENGINE2</b>							
April 5	1	O <sub>2</sub> CO	09:50	10:49	60	1 3A 10	Three-point traverse during Run 1; Single-point sample during Runs 2 and 3.
	2		11:10	12:09	60		
	3		12:25	13:24	60		
<b>EUENGINE1</b>							
April 6	1	O <sub>2</sub> CO	08:20	09:19	60	1 3A 10	Three-point traverse during Run 1; Single-point sample during Runs 2 and 3. Fuel flow issue encountered during Run 2.
	2		9:35 10:40	10:20 10:54	60		
	3		11:05	12:04	60		

#### 4.2 SAMPLE LOCATION AND TRAVERSE POINTS (USEPA METHOD 1)

The number and location of traverse points was evaluated according to the requirements in Table 4 of 40 CFR Part 63, Subpart ZZZZ and USEPA Method 1, *Sample and Velocity Traverses for Stationary Sources*. The engine sampling locations are presented in the following section. Pre-catalyst and post-catalyst sampling port location drawings are presented as Figures 4-1 (EUENGINE1) and 4-2 (EUENGINE2, 3, and 4).

## **EUENGINE1**

### **Sample Port Location Upstream of Oxidation Catalyst in 26-inch diameter duct:**

- Approximately 60-inches or 2.3 duct diameters downstream of a flow disturbance where the engine exhaust enters the exhaust stack, and
- Approximately 85-inches or 3.3 duct diameters upstream of the catalysts.

### **Sample Port Location Downstream of Oxidation Catalyst in 26-inch diameter duct:**

- Approximately 52-inches or 2 duct diameters downstream of a flow disturbance, and
- Approximately 573-inches or 22 duct diameters upstream of the stack exit.

## **EUENGINE2, EUENGINE3, and EUENGINE4**

### **Sample Port Location Upstream of Oxidation Catalyst in 34.5-inch equivalent diameter duct (note sample port is within the duct annulus):**

- Approximately 127-inches or 3.7 duct diameters downstream of a flow disturbance where the engine exhaust enters the exhaust stack, and
- Approximately 41-inches or 1.2 duct diameters upstream of the catalysts.

### **Sample Port Location Downstream of Oxidation Catalyst in 36-inch diameter duct:**

- Approximately 72-inches or 2 duct diameters downstream of a flow disturbance, and
- Approximately 679-inches or 18.9 duct diameters upstream of the stack exit.

The sample ports are 0.5 to 1-inch in diameter and extend 3 inches beyond the stack wall. Because the ducts are >12 inches in diameter and the port locations meet the two and one-half diameter criterion of Section 11.1.1 of Method 1 of 40 CFR Part 60, Appendix A-1, the exhaust ducts were sampled at approximately equal intervals at 3 traverse points located at 16.7, 50.0, and 83.3% of the measurement line.





### 4.3 O<sub>2</sub> AND CO (USEPA METHODS 3A AND 10)

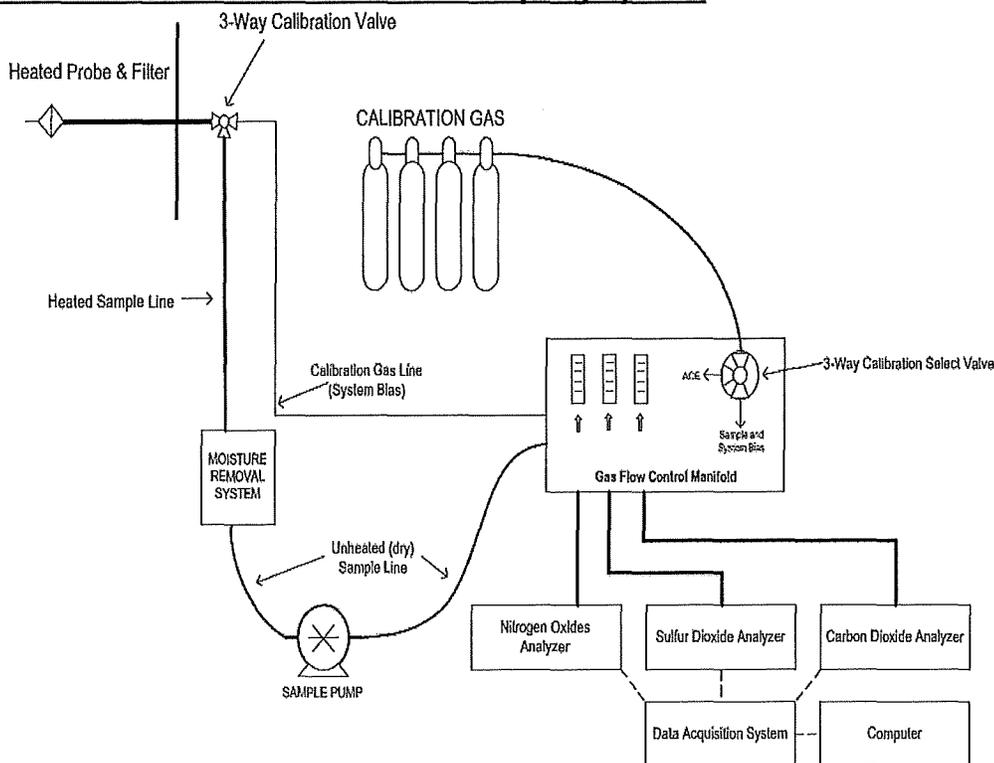
Oxygen and carbon monoxide concentrations were measured using the following sampling and analytical procedures:

- USEPA Method 3A, *Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)*,
- USEPA Method 10, *Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)*.

The sampling procedures of the methods are similar, except the analyzers and analytical technique used to quantify the parameters of interest. The measured oxygen concentrations were used to adjust the pollutant concentrations to 15% O<sub>2</sub> and calculate pollutant emission rates.

Engine exhaust gas was extracted from the stacks or ducts through a stainless-steel probe, heated Teflon® sample line, and through a gas conditioning system to remove water and dry the sample before entering a sample pump, flow control manifold, and gas analyzers. Figure 4-3 depicts a drawing of the Methods 3A and 10 sampling system.

**Figure 4-3. USEPA Methods 3A and 10 Sampling System**



Prior to sampling engine exhaust gas, the analyzers were calibrated by performing a calibration error test where zero-, mid-, and high-level calibration gases were introduced directly to the back of the analyzers. The calibration error check was performed to evaluate if the analyzers response was within  $\pm 2.0\%$  of the calibration gas span or high calibration gas concentration. An initial system-bias test was performed where the zero- and mid- or high- calibration gases were introduced at the sample probe to measure the ability of the system to respond accurately to within  $\pm 5.0\%$  of span.

Upon successful completion of the calibration error and initial system bias tests, sample flow rate and component temperatures were verified, bv0063 and the probes were inserted into

the ducts at the appropriate traverse point. After confirming the engine was operating at established conditions, the test run was initiated. Gas concentrations were recorded at 1-minute intervals throughout each 60-minute test run.

After the conclusion of each test run, a post-test system bias check was performed to evaluate analyzer bias and drift from the pre- and post-test system bias checks. The system-bias checks evaluated if the analyzers bias was within  $\pm 5.0\%$  of span and drift was within  $\pm 3.0\%$ . The analyzers responses were used to correct the measured gas concentrations for analyzer drift.

For the analyzer calibration error tests, bias tests and drift checks, these evaluations are also passed if the standard criteria are not achieved, but the absolute difference between the analyzer responses and calibration gas is less than or equal to 0.5 ppmv for CO or 0.5% for O<sub>2</sub>.

## **5.0 TEST RESULTS AND DISCUSSION**

The test program was conducted April 4 and 6, 2023 to satisfy performance testing requirements and evaluate compliance with 40 CFR Part 63, Subpart ZZZZ, "National Emission Standards for Hazardous Air Pollutants (NESHAP) for Reciprocating Internal Combustion Engines," and MI-ROP-N5573-2018.

### **5.1 TABULATION OF RESULTS**

The EUENGINE1, EUENGINE2, EUENGINE3, and EUENGINE4 test results indicate the CO emissions are compliant with applicable emissions limits as summarized in Table 2-1. Appendix Tables 1 - 4 contain detailed tabulation of results, process operating conditions, and exhaust gas conditions for each respective RICE.

### **5.2 SIGNIFICANCE OF RESULTS**

The results of the testing indicate compliance with the applicable emission limits.

### **5.3 VARIATIONS FROM SAMPLING OR OPERATING CONDITIONS**

No operating condition variations were observed during the test program.

### **5.4 PROCESS OR CONTROL EQUIPMENT UPSET CONDITIONS**

The engines and gas compressors were operating under maximum routine conditions and no upsets were encountered during testing.

### **5.5 AIR POLLUTION CONTROL DEVICE MAINTENANCE**

No major air pollution control device maintenance was performed during the three-month period prior to the test event. Engine optimization is continuously performed to ensure lean-burn combustion and ongoing compliance with regulatory emission limits.

### **5.6 RE-TEST DISCUSSION**

Based on the results of this test program, a re-test is not required. Subsequent air emissions testing on the engines will be performed annually to evaluate the reduction of CO emissions across the oxidation catalyst in accordance with 40 CFR Part 63, Subpart ZZZZ and the ROP.

## 5.7 RESULTS OF AUDIT SAMPLES

Audit samples for the reference methods utilized during this test program are not available from USEPA Stationary Source Audit Sample Program providers.

The USEPA reference methods performed state reliable results are obtained by persons equipped with a thorough knowledge of the techniques associated with each method. Factors with the potential to cause measurement errors are minimized by implementing quality control (QC) and assurance (QA) programs into the applicable components of field testing. QA/QC components were included in this test program. Table 5-1 summarizes the primary field quality assurance and quality control activities that were performed. Refer to Appendix E for supporting documentation.

**Table 5-1  
QA/QC Procedures**

QA/QC Activity	Purpose	Procedure	Frequency	Acceptance Criteria
M1: Sampling Location	Evaluates suitability of sample location	Measure distance from ports to downstream and upstream flow disturbances	Pre-test	≥2 diameters downstream; ≥0.5 diameter upstream.
M1: Duct diameter/dimensions	Verifies area of stack is accurately measured	Review as-built drawings and field measurement	Pre-test	Field measurement agreement with as-built drawings
M3A, M10: Calibration gas standards	Ensures accurate calibration standards	Traceability protocol of calibration gases	Pre-test	Calibration gas uncertainty ≤2.0%
M3A, M10: Calibration Error	Evaluates operation of analyzers	Calibration gases introduced directly into analyzers	Pre-test	±2.0% of the calibration span
M3A, M10: System Bias and Analyzer Drift	Evaluates analyzer and sample system integrity and accuracy over test duration	Calibration gases introduced at sample probe tip, heated sample line, and into analyzers	Pre and Post-test	±5.0% of the analyzer calibration span for bias and ±3.0% of analyzer calibration span for drift

## 5.8 CALIBRATION SHEETS

Calibration sheets, including gas protocol sheets and analyzer quality control and assurance checks are presented in Appendix D.

## 5.9 SAMPLE CALCULATIONS

Sample calculations and formulas used to compute emissions data are presented in Appendix A.

## 5.10 FIELD DATA SHEETS

Field data sheets are presented in Appendix B.

## 5.11 LABORATORY QUALITY ASSURANCE / QUALITY CONTROL PROCEDURES

Laboratory analysis was not required for this compliance demonstration.

## 5.12 QA/QC BLANKS

Other than Method 3A and 10 QA/QC and calibration gases used for analyzer calibrations, no other reagent or media blanks were used. QA/QC data are presented in Appendix D.

# Appendix Tables

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**Table 1**  
**White Pigeon Compressor Station**  
**EUENGINE1 Catalyst Inlet / Outlet Emission Rates and Process Data**  
**April 6, 2023**

Parameter	Average Result	
	Inlet	Outlet
<b>Diluent Concentrations and Emissions</b>		
O <sub>2</sub> Concentration, %, dry	11.7	11.9
<b>Carbon Monoxide (CO) Concentrations and Emissions</b>		
CO Concentration, ppmvd	347.1	2.4
CO Concentration, ppmvd @15% O <sub>2</sub>	223.2	1.6
CO Percent Reduction Efficiency, Percent:	99.3	
<b>Engine and Process Data</b>		
Engine Speed, RPM:	999.0	
Engine Torque, %:	94.9	
Engine Power, BHP:	2,249.8	

**Table 2**  
**White Pigeon Compressor Station**  
**EUENGINE2 Catalyst Inlet / Outlet Emission Rates and Process Data**  
**April 5, 2023**

Parameter	Average Result	
	Inlet	Outlet
<b>Diluent Concentrations and Emissions</b>		
O <sub>2</sub> Concentration, %, dry	12.4	11.7
<b>Carbon Monoxide (CO) Concentrations and Emissions</b>	<b>Inlet</b>	<b>Outlet</b>
CO Concentration, ppmvd	476.5	7.7
CO Concentration, ppmvd @15% O <sub>2</sub>	329.7	5.0
CO Percent Reduction Efficiency, Percent:	98.5	
<b>Engine and Process Data</b>		
Engine Speed, RPM:	998.6	
Compressor Torque, %:	98.6	
Engine Power, BHP:	4,696.1	

**Table 3**  
**White Pigeon Compressor Station**  
**EUENGINE3 Catalyst Inlet / Outlet Emission Rates and Process Data**  
**April 4, 2023**

Parameter	Average Result	
	Inlet	Outlet
<b>Diluent Concentrations and Emissions</b>		
O <sub>2</sub> Concentration, %, dry	11.9	12.0
<b>Carbon Monoxide (CO) Concentrations and Emissions</b>		
CO Concentration, ppmvd	356.2	5.6
CO Concentration, ppmvd @15% O <sub>2</sub>	232.4	3.7
CO Percent Reduction Efficiency, Percent:	98.4	
<b>Engine and Process Data</b>		
Engine Speed, RPM:	992.2	
Compressor Torque, %:	99.8	
Engine Power, BHP:	4,721.4	

**Table 4**  
**White Pigeon Compressor Station**  
**EUENGINE4 Catalyst Inlet / Outlet Emission Rates and Process Data**  
**April 4, 2023**

Parameter	Average Result	
	Inlet	Outlet
<b>Diluent Concentrations and Emissions</b>		
O <sub>2</sub> Concentration, %, dry	11.7	11.7
<b>Carbon Monoxide (CO) Concentrations and Emissions</b>		
CO Concentration, ppmvd	341.1	1.7
CO Concentration, ppmvd @15% O <sub>2</sub>	218.7	1.1
CO Percent Reduction Efficiency, Percent:	99.5	
<b>Engine and Process Data</b>		
Engine Speed, RPM:	990.7	
Compressor Torque, %:	96.0	
Engine Power, BHP:	4,552.9	