

DTE Energy®



EMISSIONS TEST REPORT

for

CARBON MONOXIDE (CO) EMISSIONS

ENGINES 4-6

**DTE-Gas Washington 10 Compressor Station (N3391)
Washington Township, Michigan**

August 21-25, 2014

Prepared By
Environmental Management & Resources
Environmental Field Services Group
DTE Corporate Services, LLC
7940 Livernois H-136
Detroit, MI 48210

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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

**RENEWABLE OPERATING PERMIT
REPORT CERTIFICATION**

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name DTE Gas Company - Washington 10 Compressor Station County Macomb

Source Address 12700 30 Mile Road City Washington

AQD Source ID (SRN) N3391 ROP No. MI-ROP-N3391-2012b ROP Section No. _____

Please check the appropriate box(es):

Annual Compliance Certification (Pursuant to Rule 213(4)(c))

Reporting period (provide inclusive dates): From _____ To _____

- 1. During the entire reporting period, this source was in compliance with ALL terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.
- 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, EXCEPT for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))

Reporting period (provide inclusive dates): From _____ To _____

- 1. During the entire reporting period, ALL monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.
- 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, EXCEPT for the deviations identified on the enclosed deviation report(s).

Other Report Certification

Reporting period (provide inclusive dates): From 8/21/2014 To 8/25/2014

Additional monitoring reports or other applicable documents required by the ROP are attached as described:

Emissions Testing Report

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

<u>Jeffrey M. Holland</u>	<u>Manager - T/S&O</u>	<u>586-412-3088</u>
Name of Responsible Official (print or type)	Title	Phone Number

Signature of Responsible Official

10/15/2014
Date

* Photocopy this form as needed.

**EXECUTIVE SUMMARY**

DTE Energy's Environmental Management and Resources (EM&R), Field Services Group, performed emissions testing at the DTE-Gas Washington 10 Compressor Station, located in Washington Township, Michigan. The fieldwork, performed on August 21-25, 2014 was conducted to satisfy requirements of the Michigan Renewable Operating Permit No. N3391-2012a. Emission testing was performed on Engines 4-6 for carbon monoxide (CO) emission rate and destruction efficiency at the inlet and outlet.

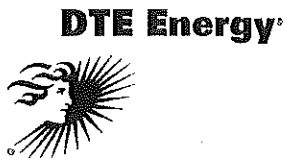
The results of the emissions testing are highlighted below:

**Emissions Testing Summary
Washington 10 Compressor Station
Engines 4-6
August 21-25, 2014**

Parameter	Engine 4	Engine 5	Engine 6	Permit Limit
Average Inlet Carbon Monoxide Concentration (CO grams/BHp-hr) ⁽¹⁾	2.06	1.66	1.80	2.50
Average Carbon Monoxide Destruction Efficiency (%)	98.8	98.5	99.4	93.0

⁽¹⁾ BHp-hr – Brake horsepower per hour

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1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EM&R), Field Services Group, performed emissions testing at the DTE-Gas Washington 10 Compressor Station, located in Washington Township, Michigan. The fieldwork, performed on August 21-25, 2014, was conducted to satisfy requirements of the Michigan Air Renewable Operating Permit No. N3391-2012a. Emission testing was performed on Engines 4-6 for carbon monoxide (CO) emission rate and destruction efficiency at the inlet and outlet.

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

The fieldwork was performed in accordance with EPA Reference Methods and EM&R's Intent to Test¹, Test Plan Submittal. The following EM&R personnel participated in the testing program: Mark Grigereit, Senior Specialist-Environmental and Mr. Thomas Snyder, Environmental Technician, and Mr. Fred Meinecke, Environmental Technician. Mr. Grigereit was the project leader. Mr. Tom Maza with the Air Quality Division of the Michigan Department of Environmental Quality (MDEQ) approved the Test Plan² and witnessed portions of the testing.

2.0 SOURCE DESCRIPTION

The Washington 10 Compressor Station located at 12700 E. 30 Mile Road, Washington Township, Michigan, employs the use of three natural gas-fired 4,000 Horse Power reciprocating engines (Engines 1, 2, & 3) and three natural gas-fired 4,735 Horse Power reciprocating engines (Engines 4, 5, & 6). The engines generate line pressure assisting the transmission of natural gas into and out of the gas storage field as well as to and from the pipeline transmission system in SE Michigan.

The emissions from engines 1, 2, & 3 are exhausted directly to the atmosphere through individual exhaust stacks. Engines 4, 5, & 6 are exhausted through a catalyst bed and to the atmosphere through individual exhaust stacks. The composition of the emissions from the engines 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 on a daily basis.

¹ MDEQ, Test Plan, Submitted July 14, 2014. (Attached-Appendix A)

² MDEQ, Approval Letter, Received August 8, 2014. (Attached-Appendix A)



During the emissions testing each engine was operated within 10% of its highest achievable load.

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

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 (O₂) emissions were evaluated using USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The O₂ analyzer utilizes a paramagnetic sensor.

Carbon monoxide (CO) emissions were evaluated using USEPA Method 10, "Determination of Carbon Monoxide Emissions from Stationary Sources". The CO analyzer utilizes a NDIR detector.

3.1.2 O₂ and CO Sampling Train

The EPA Methods 3A and 10 sampling system (Figure 2) consisted of the following components:

- (1) Stainless steel sampling probe.
- (2) Heated Teflon™ sampling line.
- (3) Sampling gas conditioner with particulate filter.



- (4) Flexible unheated Teflon™ sampling line.
- (5) Servomax 1400 O₂/CO₂ 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 triplicate 60-minute samples at the inlet and exhaust of the catalyst. Testing was conducted at three points across the diameter of the duct during each run. Sampling was performed simultaneously for O₂ and CO. Data was recorded at 10-second intervals.

3.1.4 Quality Control and Assurance (O₂ and CO)

All sampling and analytical equipment was calibrated according to 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 located 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 E. The CO emissions data collected during the testing was calculated as grams per brake horsepower-hour (g/BHp-Hr).

4.0 OPERATING PARAMETERS

The test program included the collection of engine torque (Hp), engine speed (RPM), inlet and exhaust manifold air temperature (°F) and pressure (psi), fuel upper heating value (BTU), and fuel flow (100 scfh).

Operational data is located in Appendix D.



5.0 DISCUSSION OF RESULTS

The results of the CO emission testing on Engines 4-6 are presented in Tables No 1-3. The CO emissions are presented in grams per brake horsepower hour (g/Bhp-Hr), prior to and after the catalyst, and the destruction efficiency in percent (%). Process data presented includes the Unit load in percent (%), Engine Speed in revolutions per minute (RPM), Engine Torque in brake horsepower (Brake-hp), and Heat Input in million British Thermal Unit per hour (MMBtu/hr) for each test. The results of the testing indicate that Engines 4-6 are in compliance with permit requirements for CO of 2.5 g/BHp-Hr and 93% destruction efficiency.

The results of the testing indicate that Engines 4-6 are in compliance with Michigan Air Renewable Operating Permit No. N3391-2012a.



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."

Mark Grigereit, QSTI

This report prepared by: _____

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Senior Environmental Specialist, Field Services Group
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This report reviewed by: _____

Mr. Thomas Snyder, QSTI
Senior Environmental Technician, Field Services Group
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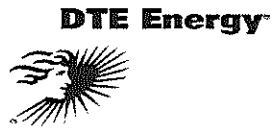


TABLE NO. 1
CARBON MONOXIDE (CO) EMISSION TESTING RESULTS
 Engine 4 - Washington 10 Compressor Station
 August 21, 2014

Test	Time	Load (%)	Speed (RPM)	Brake-HP	Heat Input (MMBtu/Hr)	Oxygen ⁽¹⁾		CO Emissions ⁽¹⁾		Destruction Efficiency (%)
						Inlet (%)	Outlet (%)	Inlet (g/BHp-Hr)	Outlet (g/BHp-Hr)	
Run - 1	8:15-9:15	93.6	974.5	4,319	31.78	11.1	11.0	2.04	0.02	98.8
Run - 2	11:50-12:50	93.3	974.5	4,305	31.73	11.1	11.1	2.07	0.03	98.8
Run - 3	13:10-14:10	<u>93.0</u>	<u>974.4</u>	<u>4,291</u>	<u>31.62</u>	<u>11.1</u>	<u>11.1</u>	<u>2.06</u>	<u>0.03</u>	<u>98.7</u>
	<i>Avg:</i>	93.3	974.5	4,305	31.71	11.1	11.1	2.06	0.03	98.8

(1) Corrected for analyzer drift per USEPA method 7E

CO Permit Limits:

2.5 g/BHp-Hr (uncontrolled)

93% DE



TABLE NO. 2
CARBON MONOXIDE (CO) EMISSION TESTING RESULTS
 Engine 5 - Washington 10 Compressor Station
 August 25, 2014

Test	Time	Load (%)	Speed (RPM)	Brake-HP	Heat Input (MMBtu/Hr)	Oxygen ⁽¹⁾		CO Emissions ⁽¹⁾		Destruction Efficiency (%)
						Inlet (%)	Outlet (%)	Inlet (g/BHp-Hr)	Outlet (g/BHp-Hr)	
Run - 1	8:15-9:15	92.9	985.4	4,335	31.27	11.0	10.9	1.71	0.02	98.9
Run - 2	9:26-10:26	92.8	985.5	4,330	31.26	11.0	10.9	1.58	0.03	97.9
Run - 3	10:40-11:40	<u>92.7</u>	<u>985.7</u>	<u>4,327</u>	<u>31.14</u>	<u>11.0</u>	<u>10.9</u>	<u>1.68</u>	<u>0.02</u>	<u>98.8</u>
	<i>Avg:</i>	92.8	985.5	4,331	31.22	11.0	10.9	1.66	0.02	98.5

(1) Corrected for analyzer drift per USEPA method 7E

CO Permit Limits:

2.5 g/BHp-Hr (uncontrolled)
 93% DE

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TABLE NO. 3
CARBON MONOXIDE (CO) EMISSION TESTING RESULTS
 Engine 6 - Washington 10 Compressor Station
 August 22, 2014

Test	Time	Load (%)	Speed (RPM)	Brake-HP	Heat Input (MMBtu/Hr)	Oxygen ⁽¹⁾		CO Emissions ⁽¹⁾		Destruction Efficiency (%)
						Inlet (%)	Outlet (%)	Inlet (g/BHp-Hr)	Outlet (g/BHp-Hr)	
Run - 1	8:10-9:10	95.4	981.6	4,434	32.46	11.2	11.3	1.82	0.09	95.2
Run - 2	9:26-10:26	95.1	981.6	4,420	32.38	11.2	11.3	1.80	0.10	94.7
Run - 3	10:45-11:45	<u>94.7</u>	<u>982.0</u>	<u>4,403</u>	<u>32.23</u>	<u>11.2</u>	<u>11.3</u>	<u>1.79</u>	<u>0.09</u>	<u>94.8</u>
	<i>Avg:</i>	<i>95.1</i>	<i>981.7</i>	<i>4,419</i>	<i>32.36</i>	<i>11.2</i>	<i>11.3</i>	<i>1.80</i>	<i>0.09</i>	<i>94.9</i>

(1) Corrected for analyzer drift per USEPA method 7E

CO Permit Limits:

2.5 g/BHp-Hr (uncontrolled)
 93% DE



Figure 1 – Sampling Locations
Engines 4-6
Washington 10 Compressor Station
August 21-25, 2014

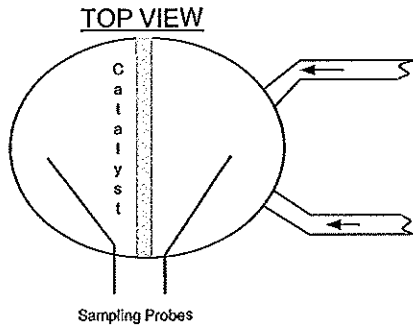
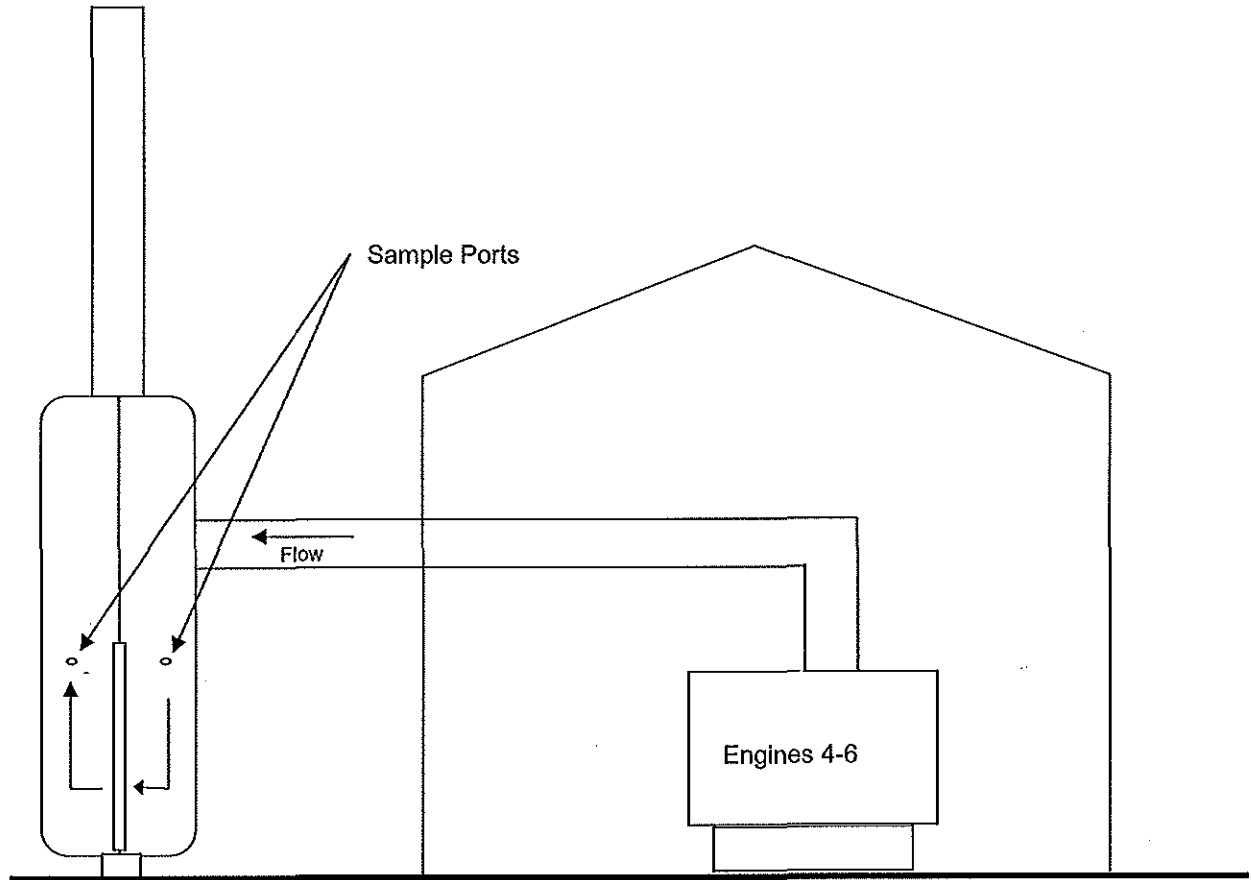




Figure 2 – EPA Method 3A and 10
Engines 4-6
Washington 10 Compressor Station
August 21-25, 2014

