Report of...

Compliance Emission Sampling

Performed for the...

City of Wyandotte
Municipal Services
Wyandotte, Michigan

On...

Diesel Engines #1, #2 & #3

October 5-6 & November 3, 2016

256.14

By...

Network Environmental, Inc.
Grand Rapids, MI

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

RECEIVED
DEC 0 5 2016
AIR QUALITY DIV.

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: City of Wyandotte Municipal Power Plant   County: Wayne

Source Address: 2555 Van Alstyne   City: Wyandotte

AQD Source ID (SRN): B2132   ROP No.: MI-ROP-B2132-2010   ROP Section No.: NA

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 10/05/2016 To 11/03/2016

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

Compliance Emission Sampling Report on Diesel Engines #1, #2 & #3 dated October 5-6 & November 3, 2016 prepared by Network Environmental, Inc.

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

Name of Responsible Official (print or type)	Title	Phone Number
Charlene Hudson	Power Systems Supervising Engineer	(734)324-7158

Charlene Hudson
Signature of Responsible Official

12-1-16
Date

* Photocopy this form as needed.

EQP 5736 (Rev 11-04)

RECEIVED

DEC 0 5 2016

AIR QUALITY DIV.

I. INTRODUCTION

Network Environmental, Inc. was retained by the City of Wyandotte, Department of Municipal Services, to perform an emission study on their Diesel Engines #1, #2 & #3 (permitted as EU-WMSENGINE1, EU-WMSENGINE2 AND EU-WMSENGINE3). The purpose of the study was to document compliance with MDEQ Air Quality Division ROP No. MI-ROP-B2132-2010. MI-ROP-B2132-2010 has established the following emission limits for these engines under flexible group, FGWMSENGINES:

- Carbon Monoxide (CO) reduction (destruction efficiency) of 70% **Or** a formaldehyde emission limit of 580 parts per billion (v/v), Dry @ 15% O_2
- Oxides of Nitrogen (NO_x) emission limit of 35.9 Tons/Year (per 12 month rolling time period). The tested emission rate is used to develop an emission factor.

The CO reduction was determined by monitoring the CO concentrations at the inlet and outlet of each engine's catalytic oxidation emission control system. The NO_x emissions were only required to be determined on one (1) engine. NO_x was monitored on the Engine #3 exhaust only. In conjunction with the NO_x sampling, the exhaust gas parameters (air flow rate, temperature, moisture & density) were also determined, in order to calculate the NO_x mass emission rate (Lbs/Hr) for Engine #3.

The testing was designed to meet the requirements of MI-ROP-B2132-2010 and 40CFR Part 63 Subparts A & ZZZZ. The following reference test methods were employed to conduct the sampling:

- CO – U.S. EPA Method 10
- NO_x – U.S. EPA Method 7E
- O_2 & CO_2 – U.S. EPA Method 3A
- Exhaust Gas Parameters (air flow rate, temperature, moisture & density) – U.S. EPA Reference Methods 1 through 4.

The sampling was performed over the period of October 5-6 and on November 3, 2016 by Stephan K. Byrd, Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc. Testing on Engine #1 was completed on November 3 since initial testing on October 5 was terminated following an engine trip and shutdown. Assisting with the study were Ms. Kimberly Kemper of Wyandotte Municipal Services, Mr. Nick Hansen of Barr Engineering and the operating staff of the facility. Mr. Mark Dziadosz of the Michigan Department of Environmental Quality (MDEQ) - Air Quality Division was present to observe portions of the sampling and source operation.

II. PRESENTATION OF RESULTS

II.1 TABLE 1
CO DESTRUCTION EFFICIENCY RESULTS
DIESEL ENGINES
CITY OF WYANDOTTE
WYANDOTTE, MICHIGAN

Source	Sample	Date	Time	CO Concentration PPM [1]		CO % Destruction Efficiency
				Inlet	Outlet	
Diesel Engine #1 (EU-WMSENGINE1)	1	11/03/16	09:23-10:23	51.50	2.34	95.46
	2	11/03/16	10:33-11:33	52.00	2.58	95.04
	3	11/03/16	11:42-13:04	53.90	2.70	94.99
	Average			**52.47**	**2.54**	**95.16**
Diesel Engine #2 (EU-WMSENGINE2)	1	10/05/16	12:43-13:43	48.47	2.75	94.33
	2	10/05/16	13:55-14:55	50.68	2.63	94.81
	3	10/05/16	15:08-16:08	51.71	2.65	94.88
	Average			**50.29**	**2.68**	**94.67**
Diesel Engine #3 (EU-WMSENGINE3)	1	10/06/16	09:47-10:47	68.94	3.63	94.73
	2	10/06/16	11:14-12:14	71.08	3.49	95.09
	3	10/06/16	12:30-13:30	76.69	3.54	95.38
	Average			**72.23**	**3.55**	**95.07**

(1) PPM = Parts Per Million (v/v) On A Dry Basis Corrected To 15% O_2
(2) The engines were operated at approximately 1800 kW (99% of capacity) during all of the testing.
(3) MI-ROP-B2132-2010 has established an emission limit of 70% CO reduction (destruction efficiency) for these engines.

II.2 TABLE 2
OXIDES OF NITROGEN (NO_x) EMISSION RESULTS
DIESEL ENGINE #3
CITY OF WYANDOTTE
WYANDOTTE, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate DSCFM (1)	NO_x Concentration PPM (2)	NO_x Emission Rate Lbs/Hr (3)
Diesel Engine#2 (EU-WMSENGINE2)	1	10/06/16	09:47-10:47	3,674	915.3	23.93
	2	10/06/16	11:14-12:14	3,707	910.0	24.01
	3	10/06/16	12:30-13:30	3,684	906.9	23.78
	Average			**3,688**	**910.7**	**23.91**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (Standard Temperature & Pressure = 68 °F & 29.92 In. Hg).
(2) PPM = Parts Per Million (v/v) On A Dry Basis
(3) Lbs/Hr = Pounds of NO_x Per Hour

III. DISCUSSION OF RESULTS

The results of the emission sampling are summarized in Tables 1 & 2 (Sections II.1 & II.2). The results are presented as follows:

III.1 Carbon Monoxide (CO) Destruction Efficiency Results (Table 1)

Table 1 summarizes the CO DE results for the diesel engine catalytic oxidation systems as follows:

- Source
- Sample
- Date
- Time
- Inlet & Outlet CO Concentrations (PPM) – Parts Per Million (v/v) On A Dry Basis Corrected To 15% O_2
- CO Percent Destruction Efficiency (DE)

III.2 NO_x Emissions – The Diesel Engine #3 NO_x emissions are summarized in Table 2 as follows:

- Source
- Sample
- Date
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (Standard Temperature and Pressure = 68 °F and 29.92 Inches Hg)
- NO_x Concentration (PPM) – Parts Per Million (v/v) On A Dry Basis
- NO_x Mass Emission Rates (Lbs/Hr) – Pounds of NO_x Per Hour

IV. SOURCE DESCRIPTION

The engines tested are 1,825 kW standby compression ignition diesel fuel fired engine generators, each equipped with a catalytic oxidation emission control system. Testing was performed at approximately 1800 kW (99% of load capacity) for all the engines. Process operating data collected during the sampling can be found in Appendix F.

V. SAMPLING AND ANALYTICAL PROTOCOL

The sampling methods used for the reference method determinations were as follows:

V.1 Carbon Monoxide – The CO sampling was conducted in accordance with U.S. EPA Reference Method 10. A Thermo Environmental Model 48C gas analyzer was used to monitor the catalyst inlets. A Thermo Environmental Model 48 gas analyzer was used to monitor the catalyst outlets. Heated Teflon sample lines were used to transport the inlet and outlet gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzers. The analyzers produce instantaneous readouts of the CO concentrations (PPM).

The analyzers were calibrated by direct injection prior to the testing. Span gases of 169.2 PPM (inlets) and 19.2 PPM (outlets) were used to establish the initial instrument calibrations. Calibration gases of 49.66 PPM & 92.97 PPM for the inlets and 9.05 PPM for the outlets were used to determine the calibration error of the analyzers. The sampling systems (from the back of the stack probes to the analyzers) were injected using the 9.05 PPM or 92.97 PPM gases to determine the system bias. After each sample, a system zero and system injection of 9.05 PPM or 92.97 PPM were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzers were calibrated to the output of the data acquisition system (DAS) used to collect the data from the engines. A diagram of the CO sampling train is shown in Figure 1.

V.2 Oxides of Nitrogen (Engine #3 Outlet only) – The NO_x sampling was conducted in accordance with U.S. EPA Reference Method 7E. A Thermo Environmental Model 42H gas analyzer was used to monitor the Engine #3 outlet. A heated Teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzer. The analyzer produces instantaneous readouts of the NO_x concentrations (PPM).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 2,503 PPM was used to establish the initial instrument calibration. A calibration gas of 1220 PPM was used to determine the calibration error of the analyzer. A direct injection of 49.6 PPM nitrogen dioxide (NO_2) was performed to show the conversion efficiency of the monitor. The conversion efficiency data can be found in Appendix B. The sampling system (from the back of the stack probe to the analyzer) was injected using the 1220 PPM gas to determine the system bias. After each sample, a system zero and system injection of 1220 PPM were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the outlet. A diagram of the NO_x sampling train is shown in Figure 1.

V.3 Oxygen (Outlets only) – The O_2 sampling was conducted in accordance with U.S. EPA Reference Method 3A. A Servomex Model 1400M portable stack gas analyzer was used to monitor the outlets. A heated Teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzer. The analyzer produces instantaneous readouts of the O_2 concentrations (%).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 20.96% was used to establish the initial instrument calibration. Calibration gases of 12.1% and 5.96% were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 12.1% gas to determine the system bias. After each sample, a system zero and system injection of 12.1% were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the outlets. A diagram of the O_2 sampling train is shown in Figure 1.

V.4 Oxygen (Inlets only) – Integrated bag samples were collected on the inlets of each engine during each of the three test runs. The bag samples were run on the O_2 analyzer to confirm that the inlet concentrations equaled the outlet.

V.5 Carbon Dioxide (Engine #3 Outlet only) – The CO_2 sampling was conducted in accordance with U.S. EPA Reference Method 3A. A Servomex Model 1400M portable stack gas analyzer was used to monitor the Engine #3 outlet. A heated Teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzer. The analyzer produces instantaneous readouts of the CO_2 concentrations (%).

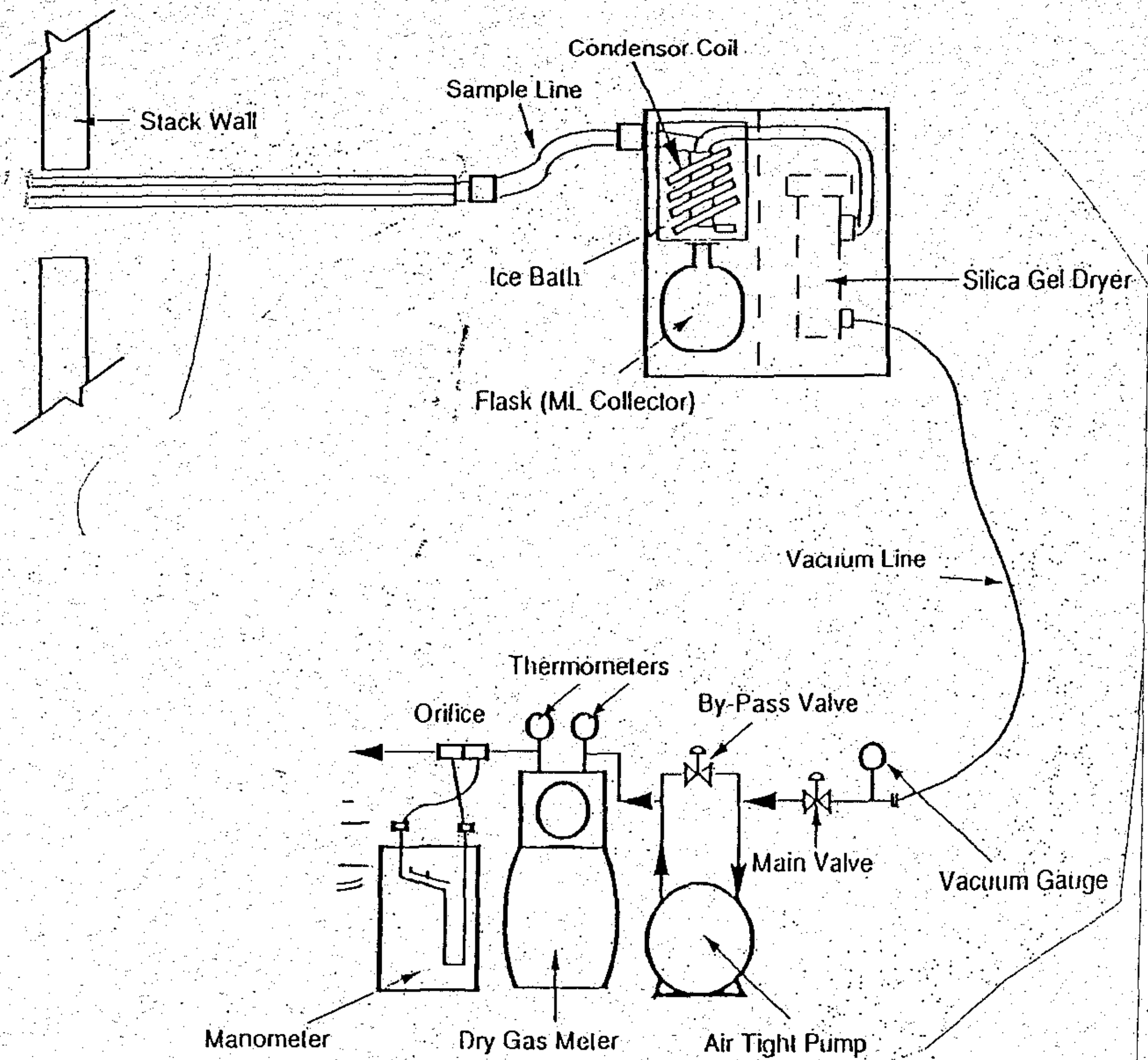

Figure 2

Moisture Sampling Train

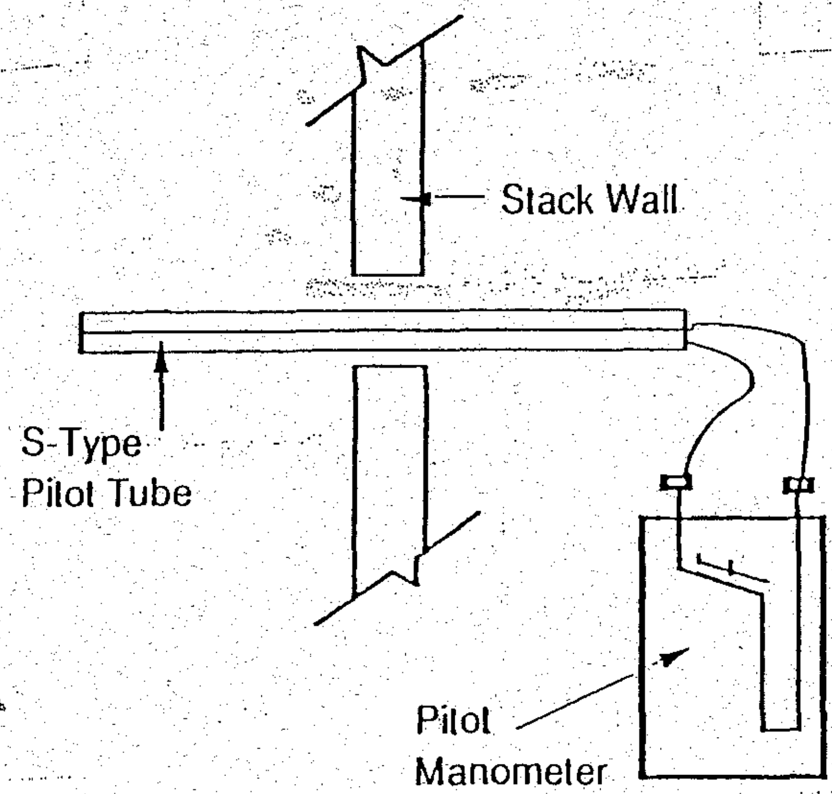

Figure 3

Air Flow Sampling Train