EMISSION TEST REPORT
For
CO Reduction Efficiency
Catalyst on Generators 3, 4, and 5
City of Portland Light and Power
Portland, Michigan
June 12-13, 2018

Comprehensive Emission Services, Inc
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Project No. 7918

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PREFACE

This report was prepared by Comprehensive Emission Services, Inc. in response to a test that was conducted at the City of Portland Light and Power, on Generators 3, 4, and 5. The test was conducted at 723 E. Grand River Ave, Portland, Michigan on June 12 - 13, 2018. Any questions concerning this report should be directed to Mr. Matt Milligan or Mr. Tim Titus.

Comprehensive Emission Services, Inc.

Matt Milligan
Test Leader

Timothy C Titus, QSTI
Approved By

Date: June 22, 2018

SECTION 1

INTRODUCTION

An emission test was conducted by Comprehensive Emission Services, Inc. on Generators 3, 4, and 5 at the City of Portland Light and Power located in Portland, Michigan.

Coordinating the field test:

Tim Titus - Comprehensive Emission Services Inc.
Kevin DeValkenaere - Farabee Mechanical Inc.

Conducting the field test:

Matt Milligan - Comprehensive Emission Services, Inc.
Joe Bourek - Comprehensive Emission Services, Inc.

Observing the field test:

David Patterson - Michigan Dept. of Environmental Quality
Chris Robinson - Michigan Dept. of Environmental Quality

The results were used to evaluate the Generator with regards to the following:

CO Emission reduction efficiency

The appendices contain the following:

Appendix A: Analyzer Data
Appendix B: Plant Process Data
Appendix C: Monitor Calibration Data
Appendix D: Protocol 1 Certification Sheets
Appendix E: Certificates of Accreditation

SECTION 3

SAMPLING AND ANALYTICAL PROCEDURES

Carbon Monoxide

Carbon Monoxide (CO), Oxygen (O_2) and Nitric Oxides were measured by Method 10, 3A, and 7E. The Generators were sampled with each test run lasting approximately one hour. A Teflon heated line was used to transfer the sample from the probe to the sampling trailer. At the sampling trailer, the sample was conditioned by a series of refrigeration dryers to remove the moisture from the gas stream. After the refrigeration dryers, the sample was transported through a Teflon line to the analyzers. The flow of the stack gas sample was regulated at a constant rate to minimize drift.

3.3 Calibration Procedure

At the start of the day, the each monitor was checked for calibration error by introducing zero, low, mid, and high-range EPA Protocol 1 gases to the measurement system at a point upstream of the analyzers. Comprehensive Emission Services, Inc. refers to the calibration error test as the instrument calibration. The gas was injected into the sampling valve located at the inlet of the sampling probe. The bias test was conducted before and after each consecutive test condition by introducing zero and upscale calibration gases for each monitor. The upscale calibration gases used for the each monitors bias tests were the calibration gases which most closely approximates the effluent concentration monitored during the test runs.

SECTION 2

SUMMARY OF RESULTS

Table 1 summarizes the test results for testing at the City of Portland Light and Power located in Portland, Michigan. The CO results are presented in ppm corrected to 15 percent O_2. The catalyst on Generators 3, 4, and 5 were tested to demonstrate compliance with the outlet concentration limit of < 23 ppm @ 15% O2, or a 70% or greater reduction of CO emissions as required in NESHAP ZZZZ, 40 CFR, Part 63.

SUMMARY OF TEST RESULTS
Table 1

Parameters	CO(ppm @ 15% O_2)	CO(ppm @ 15% O_2)	**%**
	Inlet	Outlet	CO Reduction (%)
Generator Unit 3	380.39	17.00	95.52
Generator Unit 4	209.79	9.63	95.41
Generator Unit 5	293.50	49.91	82.97

Table 2

Parameters	NOx (lb/hr)	NOx (tons/yr)
Nordberg	3 run avg	3 run avg
Generator Unit 3	1.69	7.33

SECTION 4

TEST RESULTS

Tables 3 thru 5 summarize the CO emissions and other parameters for Generator Units: 3, 4, and 5. The raw data is presented in appendix B.

Table 3
Test Results
June 12, 2018
Generator Unit 3
Nordberg FSG-136-HSC
1000 kW, 1400 hp

Parameters	Run 1	Run 2	Run 3
Start time	02:30 PM	03:42 PM	04:55 PM
Stop time	03:30 PM	04:42 PM	05:55 PM
O2(%) Inlet	11.6	11.7	11.9
O2(%) Outlet	11.5	11.6	11.6
CO(ppm)Inlet	557.7	605.5	607.8
CO(ppm @ 15% O2)Inlet	354.03	390.07	397.06
CO(ppm)Outlet	27.3	27.0	26.5
CO(ppm @ 15% O2)Outlet	17.13	17.06	16.82
CO Reduction (%)	95.16	95.63	95.76
Electrical Output (KW)	900		
Catalyst Pressure Differential	2.2		
Catalyst Inlet Temp (F)	807.1		
NOx (ppm)	482.3	344.5	352.1
NOx (lb/hr)	2.05	1.48	1.54
NOx (ton/yr)	8.87	6.48	6.65

Table 4
Test Results
June 13, 2018
Generator Unit 4
Cooper Bessemer JS-8
820 kW, 1148 hp

Parameters	Run 1	Run 2	Run 3
Start time	07:57 AM	09:03 AM	10:09 AM
Stop time	08:57 AM	10:03 AM	11:09 AM
O2(%) Inlet	12.4	12.4	12.3
O2(%) Outlet	12.4	12.3	12.3
CO(ppm)Inlet	302.0	302.6	302.5
CO(ppm @ 15% O2)Inlet	210.14	211.13	208.09
CO(ppm)Outlet	14.4	13.7	13.8
CO(ppm @ 15% O2)Outlet	9.99	9.42	9.49
CO Reduction (%)	95.25	95.54	95.44
Electrical Output (KW)	750		
Catalyst Pressure Differential	2.1		
Catalyst Inlet Temp	811.5		

Table 5
Test Results
June 12, 2018
Generator Unit 5
Fairbanks DLA-8
2000 kW, 2800 hp

Parameters	Run 1	Run 2	Run 3
Start time	09:25 AM	10:32 AM	11:37 AM
Stop time	10:25 AM	11:32 AM	12:37 PM
O2(%) Inlet	16.1	16.1	16.1
O2(%) Outlet	16.0	16.0	16.0
CO(ppm)Inlet	236.8	236.5	244.6
CO(ppm @ 15% O2)Inlet	289.49	290.22	300.80
CO(ppm)Outlet	49.7	38.0	37.6
CO(ppm @ 15% O2)Outlet	59.29	45.49	44.96
CO Reduction (%)	79.52	84.33	85.05
Electrical Output (KW)	1900		
Catalyst Pressure Differential	3.2		
Catalyst Inlet Temp	556.6		