

CO COMPLIANCE
TEST REPORT
FOR
CITY OF STURGIS
SV-ENG-6
INLET & OUTLET
May 30, 2019

City of Sturgis
130 N. Nottawa
Sturgis, MI 29180

Job # 19-091

Test Report Date: 06-28-19

INTRODUCTION

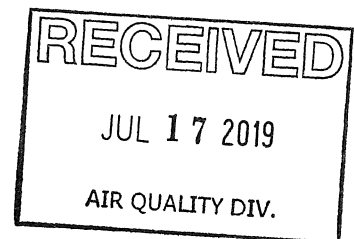
This report presents the results of the emissions tests performed for the City of Sturgis, in Sturgis, MI on SV-ENG-6 Inlet and Outlet.

The purpose of the tests was to determine the CO emissions of the unit while burning gas and oil for compliance. The results can be found in the Summary of Test Results section of this report.

The testing was performed by Grace Consulting, Inc., located at 510 Dickson Street, Wellington, OH 44090. Present during the testing were Tim Moody, Caleb Moody, and Nick Vineyard from Grace Consulting, Inc. Keith Scaggs with the City of Sturgis and Chance Collins with the State of Michigan Department of Environmental Quality were present to observe the testing.

The tests were performed on May 30, 2019. The testing was completed in accordance with USEPA test methods as published in the Federal Register.

The sampling and analytical procedures can be found in the Methods and Discussion section of this report. The raw field data and the equations used to determine the final results are presented in the Appendix section.



SUMMARY OF TEST RESULTS

SUMMARY OF TEST RESULTS

The following presents the results of the emissions tests performed for the City of Sturgis, in Sturgis, MI on SV-ENG-6 Inlet and Outlet.

CO EMISSIONS

<u>Run</u>	<u>Unit</u>	<u>Date</u>	<u>Fuel</u>	<u>CO ppm</u>	<u>CO lb/mmBtu</u>	<u>CO @ 15% O2</u>	<u>O2 Percent</u>	<u>Removal Efficiency</u>
1	Outlet	05-30-19	Oil	22.50	0.034	14.30	11.60	
2	Outlet	05-30-19	Oil	23.70	0.036	15.00	11.60	
3	Outlet	05-30-19	Oil	23.60	0.034	14.50	11.30	
AVG.				23.30	0.035	14.60	11.50	
1	Inlet	05-30-19	Gas	385.90	0.510	227.70	10.90	
2	Inlet	05-30-19	Gas	378.10	0.505	225.30	11.00	
3	Inlet	05-30-19	Gas	380.00	0.523	233.50	11.30	
AVG.				381.30	0.513	228.80	11.10	
1	Outlet	06-21-16	Gas	73.70	0.099	44.40	11.10	80.5
2	Outlet	06-21-16	Gas	73.10	0.105	46.90	11.70	79.2
3	Outlet	06-21-16	Gas	74.10	0.102	45.50	11.30	80.5
AVG.				73.60	0.102	45.60	11.40	80.1

*Percent Reduction based on CO ppm @ 15% O₂

The complete results can be found in the computer printouts following.

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

City of Sturgis
Unit SV-ENG-6 Outlet

Date: 5/30/2019
Pollutant: CO
Monitor Span: 100.50

Fuel: Oil

Run Number	Average Measured Value	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Value, Dry Basis
1	22.90	0.13	0.29	0.16	49.55	50.16	0.61	49.16	22.50
2	24.30	0.29	0.08	-0.21	50.16	50.33	0.17	49.16	23.70
3	24.20	0.08	0.13	0.05	50.33	50.43	0.10	49.16	23.60

$$C_{gas} = (C_{avg} - C_o) * C_{ma} / (C_m - C_o) \quad \text{Eq. 6C-1}$$

where:

- C_{gas} = Effluent gas concentration, dry basis, ppm
- C_{avg} = Average gas concentration indicated by gas analyzer, dry basis, ppm
- C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm
- C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm
- C_{ma} = Actual concentration of the upscale calibration gas, ppm

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

City of Sturgis
Unit SV-ENG-6 Outlet

Date: 5/30/2019
Pollutant: O2
Monitor Span: 22.03

Fuel: Oil

Run Number	Average Measured Value	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Value, Dry Basis
1	11.70	0.15	-0.03	-0.82	11.14	11.13	-0.05	11.02	11.60
2	11.70	-0.03	-0.15	-0.54	11.13	11.11	-0.09	11.02	11.60
3	11.40	-0.15	-0.13	0.09	11.11	11.08	-0.14	11.02	11.30

$$C_{gas} = (C_{avg} - C_o) * C_{ma} / (C_m - C_o)$$

Eq. 6C-1

where:

C_{gas} = Effluent gas concentration, dry basis, percent

C_{avg} = Average gas concentration indicated by gas analyzer, dry basis, percent

C_o = Average of initial and final system calibration bias check responses for the zero gas, percent

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent

C_{ma} = Actual concentration of the upscale calibration gas, percent

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Sampling System Bias Check and Measured Value Correction

City of Sturgis
Unit SV-ENG-6 Inlet

Date: 5/30/2019
Pollutant: CO
Monitor Span: 980.20

Fuel: Gas

Run Number	Average Measured Value	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Value, Dry Basis
1	385.90	0.61	3.17	0.26	490.58	495.61	0.51	493.60	385.90
2	380.40	3.17	2.19	-0.10	495.61	495.87	0.03	493.60	378.10
3	380.20	2.19	2.44	0.03	495.87	490.54	-0.54	493.60	380.00

$$C_{gas} = (C_{avg} - C_o) * C_{ma} / (C_m - C_o) \quad \text{Eq. 6C-1}$$

where:

C_{gas} = Effluent gas concentration, dry basis, ppm

C_{avg} = Average gas concentration indicated by gas analyzer, dry basis, ppm

C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm

C_{ma} = Actual concentration of the upscale calibration gas, ppm

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

City of Sturgis
Unit SV-ENG-6 Inlet

Date: 5/30/2019
Pollutant: O2
Monitor Span: 22.03

Fuel: Gas

Run Number	Average Measured Value	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Value, Dry Basis
1	11.00	0.14	0.14	0.00	10.95	11.23	1.27	11.02	10.90
2	11.00	0.14	0.15	0.05	11.23	10.89	-1.54	11.02	11.00
3	11.30	0.15	0.09	-0.27	10.89	11.13	1.09	11.02	11.30

$$C_{gas} = (C_{avg} - C_o) * C_{ma} / (C_m - C_o) \quad \text{Eq. 6C-1}$$

- where:
- C_{gas} = Effluent gas concentration, dry basis, percent
 - C_{avg} = Average gas concentration indicated by gas analyzer, dry basis, percent
 - C_o = Average of initial and final system calibration bias check responses for the zero gas, percent
 - C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent
 - C_{ma} = Actual concentration of the upscale calibration gas, percent

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Sampling System Bias Check and Measured Value Correction

City of Sturgis
Unit SV-ENG-6 Outlet

Date: 5/30/2019
Pollutant: CO
Monitor Span: 100.50

Fuel: Gas

Run Number	Average Measured Value	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Value, Dry Basis
1	74.80	0.16	-0.35	-0.51	49.78	49.93	0.15	49.16	73.70
2	73.90	-0.35	-0.07	0.28	49.93	49.35	-0.58	49.16	73.10
3	74.30	-0.07	-0.16	-0.09	49.35	49.15	-0.20	49.16	74.10

$$C_{gas} = (C_{avg} - C_o) * C_{ma} / (C_m - C_o) \quad \text{Eq. 6C-1}$$

- where:
- C_{gas} = Effluent gas concentration, dry basis, ppm
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 - C_{ma} = Actual concentration of the upscale calibration gas, ppm

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

City of Sturgis
Unit SV-ENG-6 Outlet

Date: 5/30/2019
Pollutant: O2
Monitor Span: 22.03

Fuel: Gas

Run Number	Average Measured Value	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Value, Dry Basis
1	11.20	0.06	0.06	0.00	11.17	11.05	-0.54	11.02	11.10
2	11.70	0.06	-0.01	-0.32	11.05	10.99	-0.27	11.02	11.70
3	11.30	-0.01	-0.04	-0.14	10.99	11.04	0.23	11.02	11.30

$$C_{gas} = (C_{avg} - C_o) * C_{ma} / (C_m - C_o) \quad \text{Eq. 6C-1}$$

where:

C_{gas} = Effluent gas concentration, dry basis, percent

C_{avg} = Average gas concentration indicated by gas analyzer, dry basis, percent

C_o = Average of initial and final system calibration bias check responses for the zero gas, percent

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C_{ma} = Actual concentration of the upscale calibration gas, percent

METHODS AND DISCUSSION

Test Methods used at City of Sturgis, SV-ENG-6, Inlet & Outlet

Method 3A

O₂ concentrations were determined with 3 Method 3A test runs while burning Oil and while burning Gas. GCI used a monitor range of 0-22.03% for O₂ at each location.

Method 10

CO emissions were determined with 3 Method 10 test runs while burning Oil and while burning Gas. GCI used a monitor span of 100.5 ppm for CO on the Outlet and 980.2 ppm for CO on the Inlet.

Gaseous testing was performed at 16.7, 50.0 and 83.3 percent of the measurement line.

Discussion

Environmental conditions did not adversely affect the test results.

Testing was completed by following GCI's Internal Site Specific Test Plan #19-091 with no deviations.

