

Report of a...

Relative Accuracy Test Audit

performed for...

National Energy
McBain, Michigan

on the

Wood Fired Boiler

September 24, 2024

126.48

Network Environmental, Inc.
Grand Rapids, MI

Performed for:

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I. INTRODUCTION

Network Environmental, Inc. was retained by National Energy of McBain, Michigan (SRN: N1160 - Missaukee County) to perform a Relative Accuracy Test Audit (RATA) on the Continuous Emissions Monitoring System (CEMS) that services their wood fired boiler (EUBOILER). The CEMS is for oxides of nitrogen (NO_x), carbon monoxide (CO), sulfur dioxide (SO₂) and oxygen (O₂).

The RATA was performed on September 24, 2024. Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc. conducted the RATA in accordance with 40 CFR Part 60 Appendix B Performance Specifications 2 for NO_x and SO₂, 3 for O₂ and 4 for CO. Assisting with the RATA were Mr. Matt Doolittle, Mr. Kyle Foster and the operating staff of National Energy McBain. Ms. Tammie Puite of the Michigan Department of Environment, Great Lakes & Energy (EGLE) - Air Quality Division was present to observe the testing and source operation.

II. PRESENTATION OF RESULTS

II.1 TABLE 1
NO_x (LBS/MMBTU) RELATIVE ACCURACY TEST AUDIT RESULTS
WOOD FIRED BOILER
NATIONAL ENERGY
McBAIN, MICHIGAN
SEPTEMBER 24, 2024

Run #	Time	REFERENCE METHOD			CEM	DIFF
		NO _x ⁽¹⁾	O ₂ ⁽²⁾	Lbs/MMBTU	Lbs/MMBTU	
1	09:52-10:17	130.6	9.1	0.261	0.216	0.045
2	10:38-11:03	126.0	8.7	0.243	0.210	0.033
3	11:25-11:50	125.6	8.6	0.241	0.209	0.032
4	12:10-12:35	126.8	8.9	0.249	0.213	0.036
5	12:56-13:21	127.8	9.0	0.253	0.217	0.036
6	13:41-14:06	134.5	8.8	0.262	0.225	0.037
7	14:25-14:50	134.4	8.9	0.264	0.227	0.037
8	15:11-15:36	129.8	8.8	0.253	0.219	0.034
9	15:55-16:20	129.2	8.6	0.248	0.217	0.031

Mean Reference Value 0.25267

Absolute Value of the Mean of the Difference 0.03567

Standard Deviation 0.00412

Confidence Co-efficient 0.00317

Relative Accuracy = 15.37% of the mean of the reference method

(1) = Concentration in terms of PPM by volume on a dry basis

(2) = Concentration in terms of % by volume on a dry basis

II.2 TABLE 2
CO (LBS/MMBTU) RELATIVE ACCURACY TEST AUDIT RESULTS
WOOD FIRED BOILER
NATIONAL ENERGY
McBAIN, MICHIGAN
SEPTEMBER 24, 2024

Run #	Time	REFERENCE METHOD			CEM	DIFF
		CO ⁽¹⁾	O ₂ ⁽²⁾	Lbs/MMBTU	Lbs/MMBTU	
1	09:52-10:17	106.7	9.1	0.130	0.118	0.012
2	10:38-11:03	89.6	8.7	0.105	0.098	0.007
3	11:25-11:50	94.3	8.6	0.110	0.103	0.007
4	12:10-12:35	101.7	8.9	0.122	0.114	0.008
5	12:56-13:21	90.7	9.0	0.109	0.102	0.007
6	13:41-14:06	87.0	8.8	0.103	0.096	0.007
7	14:25-14:50	88.4	8.9	0.106	0.098	0.008
8	15:11-15:36	97.0	8.8	0.115	0.108	0.007
9	15:55-16:20	81.0	8.6	0.095	0.088	0.007

Mean Reference Value 0.11056

Absolute Value of the Mean of the Difference 0.00778

Standard Deviation 0.00164

Confidence Co-efficient 0.00126

Relative Accuracy = 3.62% of the emission limit (0.25 Lbs/MMBTU)
 (8.18% of the mean of the reference method)

(1) = Concentration in terms of PPM by volume on a dry basis

(2) = Concentration in terms of % by volume on a dry basis

II.3 TABLE 3
SO₂ (LBS/MMBTU) RELATIVE ACCURACY TEST AUDIT RESULTS
WOOD FIRED BOILER
NATIONAL ENERGY
McBAIN, MICHIGAN
SEPTEMBER 24, 2024

Run #	Time	REFERENCE METHOD			CEM	DIFF
		SO ₂ ⁽¹⁾	O ₂ ⁽²⁾	Lbs/MMBTU	Lbs/MMBTU	
1	09:52-10:17	16.3	9.1	0.045	0.050	-0.005
2	10:38-11:03	19.5	8.7	0.052	0.058	-0.006
3	11:25-11:50	18.9	8.6	0.050	0.057	-0.007
4	12:10-12:35	19.7	8.9	0.054	0.061	-0.007
5	12:56-13:21	24.9	9.0	0.069	0.073	-0.004
6	13:41-14:06	23.2	8.8	0.063	0.071	-0.008
7	14:25-14:50	23.3	8.9	0.064	0.072	-0.008
8	15:11-15:36	17.0	8.8	0.046	0.055	-0.009
9	15:55-16:20	18.6	8.6	0.050	0.059	-0.009

Mean Reference Value 0.05478

Absolute Value of the Mean of the Difference 0.00700

Standard Deviation 0.00173

Confidence Co-efficient 0.00133

Relative Accuracy = 3.33% of the emission limit (0.25 Lbs/MMBTU)
 (15.21% of the mean of the reference method)

(1) = Concentration in terms of PPM by volume on a dry basis

(2) = Concentration in terms of % by volume on a dry basis

II.4 TABLE 4
O₂(%) RELATIVE ACCURACY TEST AUDIT RESULTS
WOOD FIRED BOILER
NATIONAL ENERGY
McBAIN, MICHIGAN
SEPTEMBER 24, 2024

Run #	Time	REFERENCE METHOD	CEM	DIFF
		O ₂ ⁽¹⁾	O ₂ ⁽¹⁾	
1	09:52-10:17	9.1	8.7	0.4
2	10:38-11:03	8.7	8.5	0.2
3	11:25-11:50	8.6	8.6	0.0
4	12:10-12:35	8.9	8.9	0.0
5	12:56-13:21	9.0	8.9	0.1
6	13:41-14:06	8.8	8.7	0.1
7	14:25-14:50	8.9	8.9	0.0
8	15:11-15:36	8.8	8.8	0.0
9	15:55-16:20	8.6	8.5	0.1

Mean Reference Value = 8.82222

Absolute Value of the Mean of the Difference = 0.10000

Standard Deviation = 0.13229

Confidence Co-efficient = 0.10169

Relative Accuracy = 2.29% of the mean of the reference method

(1) = Concentration in terms of % by volume on a dry basis

III. DISCUSSION OF RESULTS

III.1 NO_x (LBS/MMBTU) RATA - The results of the NO_x RATA in terms of Lbs/MMBTU can be found in Table 1 (Section II.1). The relative accuracy calculations were performed in terms of Lbs/MMBTU in accordance with U.S. EPA Reference Method 19. The Lbs/MMBTU results were calculated using the formula found in Section 12.2.1 (Equation 19-1) of Method 19 for O₂ on a dry basis. The F factor used was 9,475. Nine (9), twenty-five (25) minute samples were collected from the boiler exhaust.

The relative accuracy for the NO_x CEMS in terms of Lbs/MMBTU was 15.37% of the mean of the reference method samples.

According to Performance Specification 2 in 40 CFR Part 60 Appendix B, "The relative accuracy (RA) of the CEMS shall be no greater than 20 percent of the mean value of the reference method test data in terms of the units of the emission standard or 10 percent of the applicable standard, whichever is greater."

III.2 CO (LBS/MMBTU) RATA - The results of the CO RATA can be found in Table 2 (Section II.2). The relative accuracy calculations were performed in terms of Lbs/MMBTU in accordance with U.S. EPA Reference Method 19. The Lbs/MMBTU results were calculated using the formula found in Section 12.2.1 (Equation 19-1) of Method 19 for O₂ on a dry basis. The F factor used was 9,475. Nine (9), twenty-five (25) minute samples were collected from the boiler exhaust.

The relative accuracy for the CO CEMS was 3.62% of the emission limit (0.25 Lbs/MMBTU).

According to Performance Specification 4 in 40 CFR Part 60 Appendix B, "The relative accuracy (RA) of the CEMS shall be no greater than 10 percent of the mean value of the reference method test data in terms of the units of the emission standard or 5 percent of the applicable standard, whichever is greater."

III.3 SO₂ (LBS/MMBTU) RATA - The results of the SO₂ RATA can be found in Table 3 (Section II.3). The relative accuracy calculations were performed in terms of Lbs/MMBTU in accordance with U.S. EPA Reference Method 19. The Lbs/MMBTU results were calculated using the formula found in Section 12.2.1 (Equation 19-1) of Method 19 for O₂ on a dry basis. The F factor used was

9,475. Nine (9), twenty-five (25) minute samples were collected from the boiler exhaust.

The relative accuracy for the SO₂ CEMS was 3.33% of the emission limit (0.25 Lbs/MMBTU).

According to Performance Specification 2 in 40 CFR Part 60 Appendix B, "The relative accuracy (RA) of the CEMS shall be no greater than 20 percent of the mean value of the reference method test data in terms of the units of the emission standard or 10 percent of the applicable standard, whichever is greater."

III.4 O₂ (%) RATA - The results of the O₂ RATA in terms of % on a dry basis can be found in Table 4 (Section II.4). The relative accuracy calculations were performed in terms of % Dry. Nine (9), twenty-five (25) minute samples were collected from the boiler exhaust. All reference method data was corrected using Equation 7E-5 (U.S. EPA Method 7E) prior to performing the RATA calculations..

The relative accuracy for the O₂ CEMS in terms of % was 2.29% of the mean of the reference method samples.

According to Performance Specification 2 in 40 CFR Part 60 Appendix B, "The relative accuracy (RA) of the CEMS shall be no greater than 20 percent of the mean value of the reference method test data in terms of the units of the emission standard or 10 percent of the applicable standard, whichever is greater."

IV. SOURCE DESCRIPTION

The CEMS services a wood fired boiler with a capacity of 600 tons per day of fuel. The exhaust is controlled by an electrostatic precipitator. The boiler was operated at approximately 100% of load during the testing period. The waste wood was supplemented by tire derived fuel (TDF) during the RATA.

V. CEMS DESCRIPTION

The NO_x monitor is a Thermo-Fisher/Teco Model 42iQHL NO_x analyzer, Serial # 12327630468. The monitor

records data on a dry basis. The span range is 0-400 PPM.

The CO monitor is a Thermo Scientific Model 48I-ANSCA, Serial # JC1606001770. The monitor records data on a dry basis. The span range is 0-1000 PPM.

The SO₂ monitor is a Bovar Western Research Model # 721-M SO₂ analyzer, Serial # VE-721-721M-8653-3. The monitor records on a dry basis. The span range is 0-250 PPM.

The O₂ monitor is a Ametek Model RM CEM O₂-IQ, Serial # 10210202. The monitor records data on a dry basis. The span range is 0-21 %.

VI. SAMPLING AND ANALYTICAL PROTOCOL

The RATA was performed in accordance with 40 CFR Part 60 Appendix B Performance Specifications 2 for NO_x and SO₂, 3 for O₂ and 4 for CO.

The sampling was conducted on the 71 inch I.D. exhaust stack at a location that exceeds 8 duct diameters downstream and 2 duct diameters upstream from the nearest disturbances (U.S. EPA Reference Method 1 requirement).

The RATA was performed in accordance with the protocol approved by EGLE-Air Quality Division. The pre-RATA stratification test showed no stratification in the exhaust stack. One (1) point (50% of diameter) sampling was used to collect the exhaust gas from the stack.

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

VI.1 Oxides of Nitrogen

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 boiler exhaust. Sample gas was extracted through a heated probe. 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 191.0 PPM was used to establish the initial instrument calibration. Calibration gases of 98.3 PPM and 55.6 PPM 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 98.3 PPM gas to determine the system bias. After each sample, a system zero and system injection of 98.3 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 boiler.

VI.2 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 boiler exhaust. Sample gas was extracted through a heated probe. 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 concentrations (PPM).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 168.0 PPM was used to establish the initial instrument calibration. Calibration gases of 92.9 PPM and 51.1 PPM 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 51.1 PPM gas to determine the system bias. After each sample, a system zero and system injection of 51.1 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 boiler.

VI.3 Sulfur Dioxide

The SO₂ sampling was conducted in accordance with U.S. EPA Reference Method 6C. A Bivar Model 721M gas analyzer was used to monitor the boiler exhaust. Sample gas was extracted through a heated probe. 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 SO₂ concentrations (PPM).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 269.0 PPM was used to establish the initial instrument calibration. Calibration gases of 95.2 PPM and 148.0 PPM 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 95.2 PPM gas to determine the system bias. After each sample, a system zero and system injection of 95.2 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 boiler.

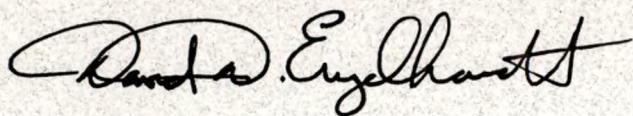
VI.4 Oxygen

The O₂ 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 boiler exhaust. Sample gas was extracted through a heated probe. 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 O₂ concentrations (%).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 21.0% was used to establish the initial instrument calibration. Calibration gases of 6.05% and 11.8% 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 6.05% gas to determine the system bias. After each sample, a system zero and system injection of 6.05% were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

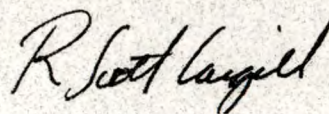
The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the boiler.

This report was prepared by:

A handwritten signature in black ink, appearing to read "David D. Engelhardt". The signature is fluid and cursive, with the first name "David" and last name "Engelhardt" clearly distinguishable.

David D. Engelhardt
Vice President

This report was reviewed by:

A handwritten signature in black ink, appearing to read "R. Scott Cargill". The signature is fluid and cursive, with the first name "R. Scott" and last name "Cargill" clearly distinguishable.

R. Scott Cargill
Project Manager

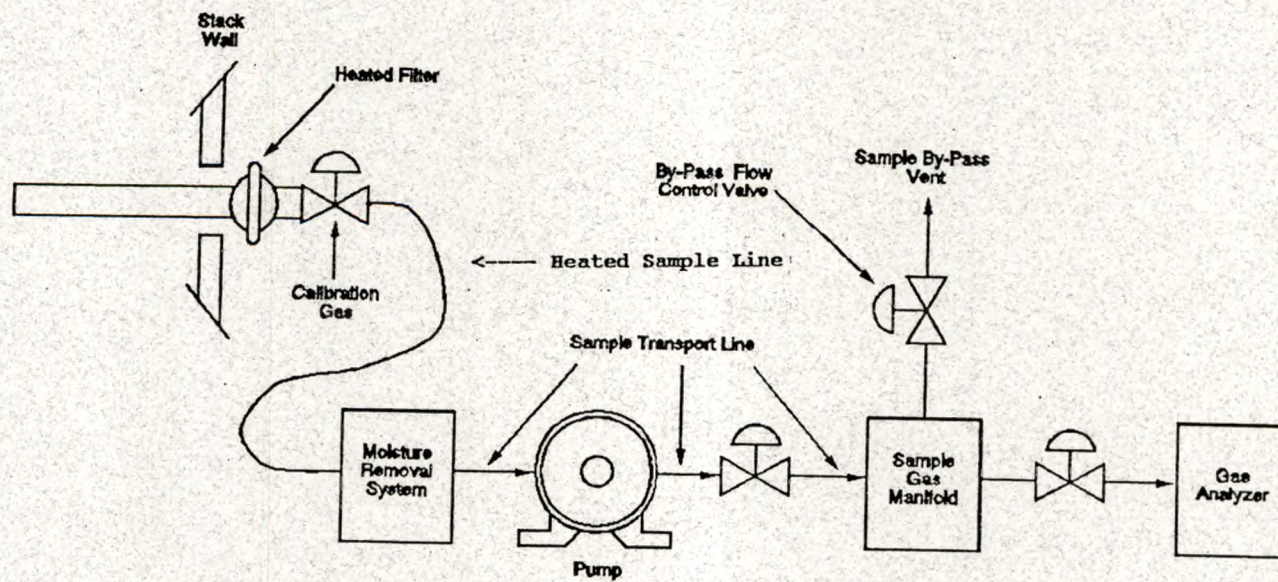


Figure 1
 NO_x , CO, SO_2 & O_2
Sampling Train