

Report of a...

# Cylinder Gas Audit

performed for...

**Michigan Sugar Company**  
Bay City, Michigan

on

**Gas Fired Boilers #6, #7 & #8**

June 5 and July 12, 2018

022.44

Network Environmental, Inc.  
Grand Rapids, MI

**RECEIVED**

**AUG 01 2018**

**AIR QUALITY DIVISION**

## **I. INTRODUCTION**

Network Environmental, Inc. was retained by Michigan Sugar Company of Bay City, Michigan to perform a Cylinder Gas Audit (CGA), for the second quarter of 2018, on the CEMS servicing gas fired Boilers #6, #7 and #8. The CEMS are comprised of an Oxides of Nitrogen (NO<sub>x</sub>) Monitor and a Oxygen (O<sub>2</sub>) Monitor.

The CGAs were performed on June 5, and July 12, 2018. CGAs for Units 6 and 8 were performed on June 5<sup>th</sup> and the CGA for Unit 7 was performed on July 12<sup>th</sup>. The NO<sub>x</sub> analyzer, for Unit 7, was out for repair on June 5<sup>th</sup>. Stephan K. Byrd of Network Environmental, Inc. performed the testing.

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**II. PRESENTATION OF RESULTS**

**II.1. TABLE 1  
CGA RESULTS  
MICHIGAN SUGAR COMPANY  
BAY CITY, MICHIGAN  
OXIDES OF NITROGEN MONITOR BOILER #6  
JUNE 5, 2018**

CEM	Run Number	CEM (HI)	CEM (LOW)
NO <sub>x</sub>	1	121.4 PPM	51.7 PPM
	2	121.5 PPM	51.6 PPM
	3	121.4 PPM	51.5 PPM
	Average	121.4 PPM	51.6 PPM
	<b>Accuracy</b>	<b>-2.10 %</b>	<b>-4.44 %</b>
<b>Average accuracy = -3.27 %</b>			
Calibration Gas Concentrations: HI - NO <sub>x</sub> = 124 ppm      LOW - NO <sub>x</sub> = 54.0 ppm			

**II.2. TABLE 2  
CGA RESULTS  
MICHIGAN SUGAR COMPANY  
BAY CITY, MICHIGAN  
OXYGEN MONITOR BOILER #6  
JUNE 5, 2018**

CEM	Run Number	CEM (HI)	CEM (LOW)
O <sub>2</sub>	1	11.8 %	5.8%
	2	11.8 %	5.7%
	3	11.8 %	5.8%
	Average	11.8 %	5.8%
	<b>Accuracy</b>	<b>-2.48 %</b>	<b>-2.36 %</b>
<b>Average accuracy = -2.42 %</b>			
Calibration Gas Concentrations: HI - O <sub>2</sub> = 12.1 %      LOW - O <sub>2</sub> = 5.94%			

**II.3 TABLE 3  
CGA RESULTS  
MICHIGAN SUGAR COMPANY  
BAY CITY, MICHIGAN  
OXIDES OF NITROGEN MONITOR BOILER #7  
JULY 12, 2018**

CEM	Run Number	CEM (HI)	CEM (LOW)
NO <sub>x</sub>	1	121.7 PPM	51.5 PPM
	2	121.6 PPM	51.3 PPM
	3	121.5 PPM	51.4 PPM
	Average	121.6 PPM	51.4 PPM
	<b>Accuracy</b>	<b>-1.94 %</b>	<b>-4.81 %</b>
<b>Average accuracy = -3.37 %</b>			
Calibration Gas Concentrations: HI - NO <sub>x</sub> = 124 ppm                      LOW - NO <sub>x</sub> = 54 ppm			

**II.4. TABLE 4  
CGA RESULTS  
MICHIGAN SUGAR COMPANY  
BAY CITY, MICHIGAN  
OXYGEN MONITOR BOILER #7  
JULY 12, 2018**

CEM	Run Number	CEM (HI)	CEM (LOW)
O <sub>2</sub>	1	12.4 %	6.1 %
	2	12.4 %	6.1 %
	3	12.4 %	6.1 %
	Average	12.4 %	6.1 %
	<b>Accuracy</b>	<b>2.48 %</b>	<b>2.69 %</b>
<b>Average accuracy = 2.59%</b>			
Calibration Gas Concentrations: HI - O <sub>2</sub> = 12.1 %                      LOW - O <sub>2</sub> = 5.94%			

**II.5. TABLE 5  
CGA RESULTS  
MICHIGAN SUGAR COMPANY  
BAY CITY, MICHIGAN  
OXIDES OF NITROGEN MONITOR BOILER #8  
JUNE 5, 2018**

CEM	Run Number	CEM (HI)	CEM (LOW)
NO <sub>x</sub>	1	53.2 PPM	21.8 PPM
	2	53.1 PPM	21.9 PPM
	3	53.1 PPM	21.8 PPM
	Average	53.1 PPM	21.8 PPM
	<b>Accuracy</b>	<b>-1.67 %</b>	<b>-9.92 %</b>
<b>Average accuracy = -5.80 %</b>			
Calibration Gas Concentrations: HI - NO <sub>x</sub> = 54 ppm                      LOW - NO <sub>x</sub> = 24.2 ppm			

**II.6. TABLE 6  
CGA RESULTS  
MICHIGAN SUGAR COMPANY  
BAY CITY, MICHIGAN  
OXYGEN MONITOR BOILER #8  
JUNE 5, 2018**

CEM	Run Number	CEM (HI)	CEM (LOW)
O <sub>2</sub>	1	11.9 %	5.8 %
	2	11.9 %	5.8 %
	3	11.9 %	5.9 %
	Average	11.9 %	5.8 %
	<b>Accuracy</b>	<b>-1.65 %</b>	<b>-2.36 %</b>
<b>Average accuracy = -2.01 %</b>			
Calibration Gas Concentrations: HI - O <sub>2</sub> = 12.1 %                      LOW - O <sub>2</sub> = 5.94 %			

### **III. DISCUSSION OF RESULTS**

The results of the CGA performed on the CEMS servicing Boilers #6, #7 and #8 can be found in Section II. Tables 1 through 6. The control limit for CGA accuracy is plus or minus 15% of the average audit value or plus or minus 5 ppm, whichever is greater.

#### **III.1. Boiler #6 -**

**III.1.1. NO<sub>x</sub>** - The CGA results for the NO<sub>x</sub> CEMS were -2.10% accuracy for the high NO<sub>x</sub> gas and -4.44% for the low gas. The average accuracy for the NO<sub>x</sub> monitor was -3.27%.

**III.1.2. O<sub>2</sub>** - The CGA results for the O<sub>2</sub> analyzer were -2.48% accuracy for the high O<sub>2</sub> gas and -2.36% for the low gas. The average accuracy for the O<sub>2</sub> monitor was -2.42%.

#### **III.2. Boiler #7 -**

**III.2.1. NO<sub>x</sub>** - The CGA results for the NO<sub>x</sub> CEMS were -1.94% accuracy for the high NO<sub>x</sub> gas and -4.81% for the low gas. The average accuracy for the NO<sub>x</sub> monitor was -3.37%.

**III.2.2. O<sub>2</sub>** - The CGA results for the O<sub>2</sub> analyzer were 2.48% accuracy for the high O<sub>2</sub> gas and 2.69% for the low gas. The average accuracy for the O<sub>2</sub> monitor was 2.59%.

#### **III.3. Boiler #8 -**

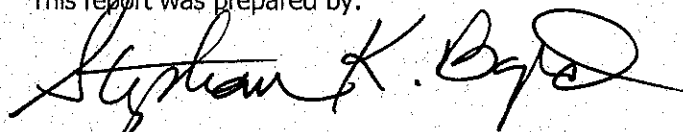
**III.3.1. NO<sub>x</sub>** - The CGA results for the NO<sub>x</sub> CEMS were -1.67% accuracy for the high NO<sub>x</sub> gas and -9.92% for the low gas. The average accuracy for the NO<sub>x</sub> monitor was -5.80%.

**III.3.2. O<sub>2</sub>** - The CGA results, for the O<sub>2</sub> analyzer, were -1.65% accuracy for the high O<sub>2</sub> gas and -2.36% for the low gas. The average accuracy for the O<sub>2</sub> monitor was -2.01%.

#### **IV. AUDIT PROTOCOL**

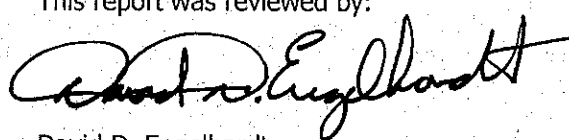
**CGA** - The CGA was performed in accordance with 40 CFR Part 60, Appendix F. Each monitor was challenged three times each with a high and low protocol gas. Once a stable reading was obtained, it was recorded. The three high and the three low readings for each monitor were averaged and compared to the protocol gas concentrations. The calculations were performed using Equation 1-1 from Appendix F. Audit gas certification sheets can be found in Appendix A.

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