

## **I. INTRODUCTION**

Network Environmental, Inc. was retained by Michigan Sugar Company of Bay City, Michigan to perform a Cylinder Gas Audit (CGA), for the first quarter of 2021, 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 an Oxygen (O<sub>2</sub>) Monitor.

The CGAs were performed on February 9, 2021. Stephan K. Byrd of Network Environmental, Inc. performed the testing.

**II. PRESENTATION OF RESULTS**

**II.1. TABLE 1**  
**CGA RESULTS**  
**MICHIGAN SUGAR COMPANY**  
**BAY CITY, MICHIGAN**  
**OXIDES OF NITROGEN MONITOR BOILER #6**  
**FEBRUARY 9, 2021**

| CEM             | Run Number      | CEM (HI)       | CEM (LOW)      |
|-----------------|-----------------|----------------|----------------|
| NO <sub>x</sub> | 1               | 124.7 PPM      | 52.8 PPM       |
|                 | 2               | 124.7 PPM      | 52.6 PPM       |
|                 | 3               | 124.8 PPM      | 52.7 PPM       |
|                 | Average         | 124.7 PPM      | 52.7 PPM       |
|                 | <b>Accuracy</b> | <b>-1.81 %</b> | <b>-3.48 %</b> |

**Average accuracy = -2.64 %**

Calibration Gas Concentrations:  
 HI - NO<sub>x</sub> = 127 ppm      LOW - NO<sub>x</sub> = 54.6 ppm

**II.2. TABLE 2**  
**CGA RESULTS**  
**MICHIGAN SUGAR COMPANY**  
**BAY CITY, MICHIGAN**  
**OXYGEN MONITOR BOILER #6**  
**FEBRUARY 9, 2021**

| CEM            | Run Number      | CEM (HI)       | CEM (LOW)      |
|----------------|-----------------|----------------|----------------|
| O <sub>2</sub> | 1               | 11.8 %         | 5.7 %          |
|                | 2               | 11.8 %         | 5.7 %          |
|                | 3               | 11.8 %         | 5.7 %          |
|                | Average         | 11.8 %         | 5.7 %          |
|                | <b>Accuracy</b> | <b>-1.67 %</b> | <b>-4.52 %</b> |

**Average accuracy = -3.10 %**

Calibration Gas Concentrations:  
 HI - O<sub>2</sub> = 12.0 %      LOW - O<sub>2</sub> = 5.97%

**II.3 TABLE 3  
CGA RESULTS  
MICHIGAN SUGAR COMPANY  
BAY CITY, MICHIGAN  
OXIDES OF NITROGEN MONITOR BOILER #7  
FEBRUARY 9, 2021**

| CEM   | Run Number      | CEM (HI)       | CEM (LOW)      |
|---|-----------------|----------------|----------------|
| NO <sub>x</sub>   | 1               | 126.0 PPM      | 53.1 PPM       |
|   | 2               | 126.0 PPM      | 53.0 PPM       |
|   | 3               | 126.1 PPM      | 53.0 PPM       |
|   | Average         | 126.0 PPM      | 53.0 PPM       |
|   | <b>Accuracy</b> | <b>-0.79 %</b> | <b>-2.93 %</b> |
| <b>Average accuracy = -1.86 %</b>   |                 |                |                |
| Calibration Gas Concentrations:<br>HI - NO <sub>x</sub> = 127 ppm                      LOW - NO <sub>x</sub> = 54.6 ppm |                 |                |                |

**II.4. TABLE 4  
CGA RESULTS  
MICHIGAN SUGAR COMPANY  
BAY CITY, MICHIGAN  
OXYGEN MONITOR BOILER #7  
FEBRUARY 9, 2021**

| CEM   | Run Number      | CEM (HI)       | CEM (LOW)      |
|---|-----------------|----------------|----------------|
| O <sub>2</sub>  | 1               | 11.8%          | 5.8 %          |
|   | 2               | 11.8 %         | 5.8 %          |
|   | 3               | 11.8 %         | 5.8 %          |
|   | Average         | 11.8 %         | 5.8 %          |
|   | <b>Accuracy</b> | <b>-1.67 %</b> | <b>-2.85 %</b> |
| <b>Average accuracy = -2.26%</b>  |                 |                |                |
| Calibration Gas Concentrations:<br>HI - O <sub>2</sub> = 12.0 %                      LOW - O <sub>2</sub> = 5.97% |                 |                |                |

**II.5. TABLE 5  
CGA RESULTS  
MICHIGAN SUGAR COMPANY  
BAY CITY, MICHIGAN  
OXIDES OF NITROGEN MONITOR BOILER #8  
FEBRUARY 9, 2021**

| CEM             | Run Number      | CEM (HI)      | CEM (LOW)     |
|-----------------|-----------------|---------------|---------------|
| NO <sub>x</sub> | 1               | 55.1 PPM      | 25.6 PPM      |
|                 | 2               | 55.1 PPM      | 25.7 PPM      |
|                 | 3               | 55.1 PPM      | 25.7 PPM      |
|                 | Average         | 55.1 PPM      | 25.7 PPM      |
|                 | <b>Accuracy</b> | <b>0.92 %</b> | <b>1.98 %</b> |

**Average accuracy = 1.45 %**

Calibration Gas Concentrations:

HI - NO<sub>x</sub> = 54.6 ppm

LOW - NO<sub>x</sub> = 25.2 ppm

**II.6. TABLE 6  
CGA RESULTS  
MICHIGAN SUGAR COMPANY  
BAY CITY, MICHIGAN  
OXYGEN MONITOR BOILER #8  
FEBRUARY 9, 2021**

| CEM            | Run Number      | CEM (HI)       | CEM (LOW)      |
|----------------|-----------------|----------------|----------------|
| O <sub>2</sub> | 1               | 11.9 %         | 5.8 %          |
|                | 2               | 11.9 %         | 5.8 %          |
|                | 3               | 11.9 %         | 5.8 %          |
|                | Average         | 11.9 %         | 5.8 %          |
|                | <b>Accuracy</b> | <b>-0.83 %</b> | <b>-2.85 %</b> |

**Average accuracy = -1.84 %**

Calibration Gas Concentrations:

HI - O<sub>2</sub> = 12.0 %

LOW - O<sub>2</sub> = 5.97 %

### **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 -1.81% accuracy for the high NO<sub>x</sub> gas and -3.48% for the low gas. The average accuracy for the NO<sub>x</sub> monitor was -2.64%.

**III.1.2. O<sub>2</sub>** - The CGA results for the O<sub>2</sub> analyzer were -1.67% accuracy for the high O<sub>2</sub> gas and -4.52% for the low gas. The average accuracy for the O<sub>2</sub> monitor was -3.10%.

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

**III.2.1. NO<sub>x</sub>** - The CGA results for the NO<sub>x</sub> CEMS were -0.79% accuracy for the high NO<sub>x</sub> gas and -2.93% for the low gas. The average accuracy for the NO<sub>x</sub> monitor was -1.86%.

**III.2.2. O<sub>2</sub>** - The CGA results for the O<sub>2</sub> analyzer were -1.67% accuracy for the high O<sub>2</sub> gas and -2.85% for the low gas. The average accuracy for the O<sub>2</sub> monitor was -2.26%.

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

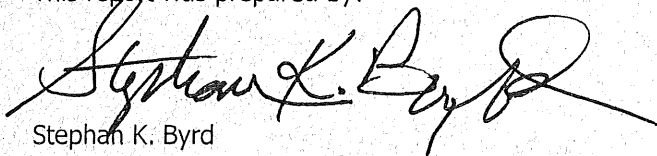
**III.3.1. NO<sub>x</sub>** - The CGA results for the NO<sub>x</sub> CEMS were 0.92% accuracy for the high NO<sub>x</sub> gas and 1.98% for the low gas. The average accuracy for the NO<sub>x</sub> monitor was 1.45%.

**III.3.2. O<sub>2</sub>** - The CGA results, for the O<sub>2</sub> analyzer, were -0.83% accuracy for the high O<sub>2</sub> gas and -2.85% for the low gas. The average accuracy for the O<sub>2</sub> monitor was -1.84%.

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

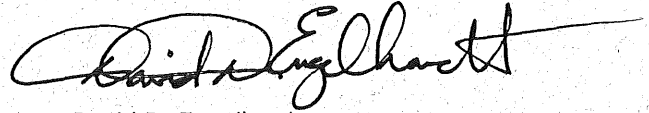
**CGA** - The CGA was performed in accordance with 40 CFR Part 60, Appendix F. Each monitor was challenged three times each with a high and low protocol gas. Once a stable reading was obtained, it was recorded. The three high and the three low readings for each monitor were averaged and compared to the 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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