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# EMISSION TEST REPORT

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| Report Title | RESULTS OF THE RELATIVE ACCURACY TEST AUDIT OF CO AND $SO_2$ CONTINUOUS EMISSION RATE MONITORING SYSTEMS |
| Report Date | November 16, 2017 |
| Test Dates | November 15, 2017 |

| **Facility Information** | |
|---|---|
| Name | Gerdau Specialty Steel North America |
| Street Address | 3100 Brooklyn Rd |
| City, County | Jackson, Jackson County |

| **Facility Permit Information** | | | |
|---|---|---|---|
| State Registration No. | B4306 | ROP No. | MI-ROP-B4306-2015 |

| **Testing Contractor** | |
|---|---|
| Company | Derenzo Environmental Services |
| Mailing Address | 4180 Keller Rd., Ste. B<br>Holt, MI 48842 |
| Phone | (517) 268-0043 |
| Project No. | 1709001 |

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# RESULTS OF THE RELATIVE ACCURACY TEST AUDIT OF CO AND $SO_2$ CONTINUOUS EMISSION RATE MONITORING SYSTEMS

GERDAU SPECIALTY STEEL NORTH AMERICA
JACKSON, MICHIGAN

## 1.0 INTRODUCTION

Gerdau Specialty Steel North America (Gerdau) operates electric arc furnaces (EAF), a ladle metallurgy furnace (LMF), and a vacuum arc degasser (VAD) at its Jackson, Michigan facility that is identified as flexible group FG-EAF/LMF/VAD in the State of Michigan Renewable Operating Permit MI-ROP-B4306-2015 issued to the facility.

Conditions of the operating permit require Gerdau to operate a carbon monoxide (CO) and sulfur dioxide ($SO_2$) continuous emission rate monitoring system (CERMS) for FG-EAF/LMF/VAD. This test report presents the results of the relative accuracy test audit (RATA) for the existing CO and $SO_2$ CERMS.

The CO and $SO_2$ CERMS RATA determination testing was performed November 15, 2017 by Derenzo Environmental Services representatives Robert Harvey, Clay Gaffey and Andrew Rusnak. The project was coordinated by Gerdau representative Mr. Craig Metzger.

Mr. David Patterson and Ms. Gina Hines of the Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD) were on-site to observe portions of the compliance demonstration. The exhaust gas sampling and analysis was performed using procedures specified in the Test Plan submitted to MDEQ-AQD dated September 1, 2017 and approved by the regulatory agency.

Appendix 1 provides a copy of the test plan approval letter issued by the MDEQ-AQD.

Questions regarding this emission test report should be directed to:

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## Report Certification

This test report was prepared by Derenzo Environmental Services based on field sampling data collected by Derenzo Environmental Services. Facility process data were collected and provided by Gerdau employees or representatives. This test report has been reviewed by Gerdau representatives and approved for submittal to the Michigan Department of Environmental Quality (MDEQ).

I certify that the testing was conducted in accordance with the approved test plan unless otherwise specified in this report. I believe the information provided in this report and its attachments are true, accurate, and complete.

Report Prepared By:

Andy Rusnak, QSTI
Technical Manager
Derenzo Environmental Services

Based on information and belief formed after reasonable inquiry, I believe the statements and information in this report are true, accurate and complete. The testing was performed in accordance with the approved test plan and the facility was operated in compliance with the permit conditions, at or near maximum routine operating conditions, during the test periods.

Facility Certification By:

Darrel Moore
VP Plant Manager
Gerdau Specialty Steel North America

## 2.0 SUMMARY OF RESULTS

The CERMS RATA conducted on the FG-EAF/LMF/VAD exhaust and associated CEM systems, verified that the unit operated in compliance with the emission limits specified in ROP No. MI-ROP-B4306-2015.

The following table presents a summary of the CERMS RATA. Detailed results are presented in Tables 6.1 – 6.3 of this report.

Table 2.1 Summary of CERMS RATA results

| RATA Parameter | Relative Accuracy Result | Allowable Limit |
|---|---|---|
| $SO_2$ (ppm)[1] | 1.4 ppmv | 5.0 ppmv |
| $SO_2$ (lb/hr)[1,2] | 12% | 10% |
| CO (lb/hr)[3] | 18% | 20% |
| Total Flow (scfm)[3] | 15% | 20% |

1. Absolute average difference of $SO_2$ CEMS RA and CEMS plus the 2.5% confidence coefficient result was 1.4 ppmv. Reference Performance Specification 4A, Section 13.2 allows RA to be within 5 ppmv.
2. CERMS RA result was calculated using the emission standard because actual emissions were less than 50% of the emission standard. MI-ROP-B4306-2015 specifies an allowable emission limit of 1.0 lb $SO_2$/ton and a material use limit for the EAF of 1,920 ton/day, which is equivalent to 80 lb $SO_2$/hr.
3. CERMS RA result was calculated using the mean of the reference method results.

## 3.0 SOURCE DESCRIPTION

### 3.1 Metal Furnaces

Gerdau produces steel bar using two electric arc furnaces (EAF), a ladle metallurgy furnace (LMF), and a vacuum arc degasser (VAD) at the Jackson, Michigan facility. Exhaust gases from the processes (Identified as flexible group FG-EAF/LMF/VAD) are controlled by a positive pressure, fabric filter baghouse. Typical production at the facility is 50 tons per hour. The fume collection system has a maximum rated capacity of 618,000 actual cubic feet per minute (ACFM) @ 275°F (not including reverse air). The rated efficiency of the fabric filter baghouse is 99.9%.

### 3.2 Type of Raw Materials Used

The primary raw material is steel scrap. When in a molten state, approximately one percent by weight of carbon, manganese, silicon, and a fraction of a percent of aluminum are added as alloys. Nominal quantity of steel produced is 54 tons per hour through the caster. The furnace vessel itself is lined with a consumable material, earthen in nature.

### 3.3 Emission Control System Description

The EAFs are directly connected to side draft hoods, then to a spark-arrestor. Canopy hoods above each EAF are also directly connected to a spark arrestor. The outlet of the spark arrestor connects to fans (three separate fans) that exhaust to a positive pressure, reverse air-cleaned baghouse with polyester filter tubes.

The LMF is equipped with a hood that is fitted over a hot metal ladle. The hood is connected through ductwork to the same baghouse as the EAF. The VAD has a hood outside the vacuum chamber which collects fugitive emissions emitted when the vacuum chamber is opened after a ladle is degassed. This hood is also connected by ductwork to the baghouse. The baghouse was designed and supplied by Brandt Filtration Group of Norcross, Georgia.

Three separate process air ducts combine prior to being introduced to the baghouse. FLOWSIC100 PR volume flow measuring devices are installed in the ducts to continuously monitor airflow.

### 3.4 Process Operating Conditions During the Compliance Testing

During the compliance test program, Gerdau was running at normal, full load conditions, approximately 448.4 tons of scrap were charged during the test periods, approximately 54.4 tons per hour. Gerdau representatives provided 1-minute averaged CERM data (combined flowrate, $SO_2$ and CO mass emission rates) for each test period.

Appendix 2 provides CERM system response data and operating data.

## 4.0 SAMPLING AND ANALYTICAL PROCEDURES

A test plan for the compliance testing prepared by Gerdau and Derenzo Environmental Services and was reviewed by the MDEQ-AQD. This section provides a summary of the sampling and analytical procedures that were used during the test and presented in the test plan.

### 4.1 Summary of USEPA Test Methods

Derenzo Environmental Services performed the exhaust gas and pollutant measurements in accordance with the following USEPA reference test methods:

| Parameter / Analyte | Sampling Methodology | Analytical Methodology |
|---|---|---|
| Velocity traverses | USEPA Method 1 | Selection of sample and velocity traverse locations by physical stack measurements |
| Volumetric flow rate | USEPA Method 2 | Measurement of velocity head using a Type-S Pitot tube and inclined manometer |
| Oxygen and Carbon dioxide | USEPA Method 3A | IR & Paramagnetic instrumental analyzers |
| Moisture | USEPA Method 4 | Wet bulb / dry bulb temperature measurements |
| Sulfur dioxide | USEPA Method 6C | Ultraviolet (UV) fluorescence instrumental analyzer |
| Carbon monoxide | USEPA Method 10 | Non-dispersive infrared (NDIR) instrumental analyzer |

In addition to the measurement methods specified in the previous table:

- USEPA Method 205; *Verification of Dilution Systems for Field Instrument Calibrations,* was used to verify linearity of the calibration gas dilution system.

- USEPA Performance Specification (PS) 2, *Specifications for $SO_2$ and $NO_X$ Continuous Emission Monitoring Systems in Stationary Sources;* was used to evaluate the acceptability the analyzer used to monitor the $SO_2$ content of the gases exhausted from FG-EAF/LMF/VAD.

- USEPA PS 4, *Specifications and Test Procedures for Carbon Monoxide Continuous Emission Monitoring Systems in Stationary Sources;* was used to evaluate the acceptability the analyzer used to monitor the CO content of the gases exhausted from FG-EAF/LMF/VAD.

- USEPA PS 6, *Specifications and Test Procedures for Continuous Emission Rate Monitoring Systems in Stationary Sources;* was used to evaluate the acceptability the flowrate monitors and the CO and $SO_2$ analyzers used to monitor the gases exhausted from FG-EAF/LMF/VAD.

### 4.2 Sampling Locations and Velocity Measurements (USEPA Method 1 and 2)

The locations of the velocity measurement ports meet the USEPA Method 1 criteria for a representative measurement location. The inner diameter of the ducts is 108.625 inches. Each duct is equipped with two (2) 4.0-inch sample ports, opposed 90°, that provided a sampling location 5 duct diameter downstream and 1 duct diameters upstream from any flow disturbance.

Velocity pressure traverse locations for the sampling points were determined in accordance with USEPA Method 1.

Exhaust gas velocity pressure and temperature were measured at each sampling location in accordance with USEPA Method 2 using an S-type Pitot tube connected to a red-oil manometer. A K-type thermocouple mounted to the Pitot tube was used for temperature measurements. The pitot tube and connective tubing were leak-checked prior to each set of velocity measurements to verify the integrity of the measurement system. Upon conclusion of each velocity traverse, the pitot was cleared of any particulate deposits by using a small acetone rinse and blown out with compressed air.

Appendix 3 provides diagrams of the test sampling locations.

Appendix 4 provides flowrate calculations and data sheets.

### 4.3 Exhaust Gas Molecular Weight Determination (USEPA Method 3A)

$CO_2$ and $O_2$ content in the exhaust gas stream were measured continuously throughout each test period in accordance with USEPA Method 3A. The $CO_2$ content of the gas stream was monitored using a Servomex Model 1440D infrared (IR) gas analyzer. The $O_2$ content of the gas stream was monitored using a Servomex Model 1440D paramagnetic gas analyzer.

Prior to, and at the conclusion of each test, the instruments were calibrated using upscale calibration and zero gas to determine analyzer calibration error and system bias (described in Section 5.0 of this document). Sampling times were recorded on field data sheets.

Appendix 5 provides $O_2$ and $CO_2$ calculation sheets. Raw instrument response data are provided in Appendix 6.

## 4.4 Determination of moisture content in stack gases (USEPA Method 4)

Moisture determinations for the gas stream was determined using the USEPA Method 4 approximation technique consisting of wet bulb-dry bulb temperature measurements using a type-K thermocouple and calibrated digital pyrometer in conjunction with a psychometric chart.

## 4.5 $SO_2$ and CO Concentration Measurements (USEPA Method 6C and 10)

$SO_2$ and CO pollutant concentrations in the exhaust gas stream were determined using a Thermo Environmental Instruments, Inc. (TEI) Model 43i ultraviolet pulsed fluorescence $SO_2$ analyzer and a TEI Model 48i NDIR CO analyzer.

Prior to, and at the conclusion of each test, the instruments were calibrated using upscale calibration and zero gas to determine analyzer calibration error and system bias (described in Section 5.0 of this document). Sampling times were recorded on field data sheets.

Appendix 5 provides CO and $SO_2$ calculation sheets. Raw instrument response data are provided in Appendix 6.

## 4.6 Extractive gas sampling system

A "rake-type" sampling probe is installed in the baghouse exhaust for sampling gaseous pollutants. The test team used this sampling probe to obtain a sample of the baghouse exhaust gas for the reference analyzers. Samples of the baghouse exhaust gas were continuously delivered to the instrument analyzers using a heated Teflon® line and filtered using a heated 10-micron stainless steel filter. The heated Teflon® line and heated filter were equipped with a temperature controller which maintained the temperature of the sample line at approximately 300 °F in order to prevent moisture condensation.

The exhaust gas samples for the Method 3A ($CO_2$, $O_2$), Method 6C ($SO_2$) and Method 10 (CO) instruments were conditioned (i.e., dried using a sample gas condenser) prior to being introduced to the instrument analyzer. Therefore, these measurements correspond to standard conditions with moisture correction (dry basis).

## 4.7 Relative Accuracy Performance Specification (USEPA PS2, PS4 and PS6)

Performance of the relative accuracy testing included performing eleven (11) separate tests where concentrations of $SO_2$ and CO were measured for at least 21 minutes. Nine (9) tests were used to determine the relative accuracy (i.e., the two (2) tests with the greatest difference between the CEM and reference monitors were not included in the RA calculation).

The RA was calculated for each measurement system using the equations in Performance Specifications 2, 4 and 6. Performance of the CERMS was considered acceptable when compared against the following performance specifications:

- Calculated $SO_2$ RA is no greater than 20% or 10% if using the emission standard in the denominator of the RA calculation (i.e., when measured emissions are less than 50% of the standard) or if the calculated RA of the CEMS is within 5.0 ppmv when the RA is calculated as the absolute average difference between the RM and CEMS, plus the 2.5 percent confidence coefficient (Performance Specification 4A, Section 13.2).

- Calculated CO RA is no greater than 20% or 10% if using the emission standard in the denominator of the RA calculation (i.e., when measured emissions are less than 50% of the standard).

- Calculated total flowrate RA is no greater than 20% or 10% if using the emission standard in the denominator of the RA calculation.

The CO CERMS RA results were calculated using the average reference method value because actual emissions were greater than 50% of the emission standard. The $SO_2$ CERMS RA was verified using the Performance Specification 4A, Section 13.2 criteria because the measured emissions were so low (i.e., measured $SO_2$ concentrations were 1.35 ppmv for RA and 0.24 ppmv for the CEMS).

## 5.0 INTERNAL QA/QC ACTIVITIES

### 5.1 Sampling System Response Time Determination

The response time of the sampling system was determined prior to the compliance test program by introducing upscale gas and zero gas, in series, into the sampling system using a tee connection at the base of the sample probe. The elapsed time for the analyzer to display a reading of 95% of the expected concentration was determined using a stopwatch.

The TEI Model 43i $SO_2$ analyzer exhibited the longest system response time at 120 seconds. Results of the response time determinations were recorded on field data sheets. For each test period, test data were collected once the sample probe was in position for at least twice the maximum system response time.

### 5.2 Gas Divider Certification (USEPA Method 205)

A STEC Model SGD-710C 10-step gas divider was used to obtain appropriate calibration span gases. The ten-step STEC gas divider was NIST certified (within the previous 12 months) with a primary flow standard in accordance with Method 205. When cut with an appropriate zero gas, the ten-step STEC gas divider delivered calibration gas values ranging from 0% to 100% (in 10% step increments) of the USEPA Protocol 1 calibration gas that was introduced into the system. The field evaluation procedures presented in Section 3.2 of Method 205 were followed prior to use of gas divider. The field evaluation yielded no errors greater than 2% of the triplicate measured average and no errors greater than 2% from the expected values.

### 5.3 Instrumental Analyzer Interference Check

The instrumental analyzers used to measure $SO_2$, CO, $O_2$ and $CO_2$ have had an interference response test preformed prior to their use in the field (July 26, 2006, July 3, 2007 and November 11, 2015), pursuant to the interference response test procedures specified in USEPA Method 7E. The appropriate interference test gases (i.e., gases that would be encountered in the exhaust gas stream) were introduced into each analyzer, separately and as a mixture with the analyte that each analyzer is designed to measure. All of analyzers exhibited a composite deviation of less than 2.5% of the span for all measured interferent gases. No major analytical components of the analyzers have been replaced since performing the original interference tests.

## 5.4 Instrument Calibration and System Bias Checks

At the beginning of each day of the testing program, initial three-point instrument calibrations were performed for the $SO_2$, CO, $CO_2$ and $O_2$ analyzers by injecting calibration gas directly into the inlet sample port for each instrument. System bias checks were performed prior to and at the conclusion of each sampling period by introducing the upscale calibration gas and zero gas into the sampling system (at the base of the stainless steel sampling probe prior to the particulate filter and Teflon® heated sample line) and determining the instrument response against the initial instrument calibration readings.

The instruments were calibrated with USEPA Protocol 1 certified concentrations of $CO_2$, $O_2$, $SO_2$, and CO in nitrogen or air and zeroed using hydrocarbon free nitrogen or air. A STEC Model SGD-710C ten-step gas divider was used to obtain intermediate calibration gas concentrations as needed.

Appendix 7 provides information and quality assurance data for the equipment and instrumental analyzers used for the RA test periods (calibration data, copies of calibration gas certificates, gas divider certification, Pitot tube integrity inspection sheets, and interference study records).

## 6.0 TEST RESULTS AND DISCUSSION

### 6.1 Test Results and Allowable Emission Limits

Air pollutant emission measurement results for each CERMS RATA are presented in Tables 6.1 through 6.4.

ROP No. MI-ROP-B4306-2015 requires Gerdau to install and operate each CERMS in accordance with the requirements detailed in Appendix 3 and to use the CERMS data for determining compliance with Special Condition Nos. I.5, I.6, I.9 and I.10 of the ROP. S.C. I.5, I.6, I.9 and I.10 of the ROP present emission rate limits for the FG-EAF/LMF/VAD. The compliance demonstration performed on November 15, 2017 demonstrated:

- The relative accuracy for the total exhaust flowrate monitor was 15% (allowable relative accuracy limit is 20%);
- The absolute average difference of the $SO_2$ CEMS and RA plus the 2.5% confidence coefficient was 1.4 ppmv (Reference Performance Specification 4A, Section 13.2 allows RA to be within 5 ppmv); and
- The relative accuracy for the CO emission rate monitor was 18% (allowable relative accuracy limit is 20%).

The test results confirmed that the CO, $SO_2$ and exhaust flowrate monitors are operated in compliance with the allowable relative accuracy limits specified in the respective performance specifications.

### 6.2 Variations from Normal Sampling Procedures or Operating Conditions

The testing was performed in accordance with the Test Plan dated September 1, 2017 and specified USEPA test methods. All instrument calibrations and sampling period results satisfied the quality assurance verifications required by USEPA.

A sampling run (performed 8:30 – 8:50) was discarded because the Gerdau datalogger experienced a malfunction and no CEM data was able to be retrieved for that time period. No other variations from the normal operating conditions occurred during the testing program.

**Table 6.1 - $SO_2$ Concentration RATA for Gerdeau - Jackson Baghouse Exhaust**

| Run Number | Test Date | Begin | End | Ref. Method Result (ppmvd $SO_2$) | CEMS Data (ppmvd $SO_2$) | Difference [d] |
|---|---|---|---|---|---|---|
| 1 | 11/15/17 | 9:45 | 10:05 | 0.86 | 0.48 | 0.4 |
| 2 | 11/15/17 | 10:30 | 10:50 | 1.29 | 0.42 | 0.9 |
| 3 | 11/15/17 | 11:20 | 11:40 | 1.84 | 0.40 | 1.4 |
| 4 | 11/15/17 | 12:10 | 12:30 | 1.55 | 0.43 | 1.1 |
| 5 | 11/15/17 | 13:00 | 13:20 | 1.95 | 0.29 | 1.7 |
| 6 | 11/15/17 | 13:50 | 14:10 | 1.28 | 0.11 | 1.2 |
| 7 | 11/15/17 | 14:40 | 15:00 | 0.79 | 0.07 | 0.7 |
| 8 | 11/15/17 | 15:25 | 15:45 | 1.36 | 0.00 | 1.4 |
| 9 | 11/15/17 | 16:10 | 16:30 | 2.28 | 0.00 | 2.3 |
| 10 | 11/15/17 | 16:55 | 17:15 | 1.24 | 0.00 | 1.2 |
| 11 | 11/15/17 | 17:40 | 18:00 | 1.76 | 0.00 | 1.8 |

| | | | |
|---|---|---|---|
| Number of tests periods: | [$n$] | 9 | |
| Arithmetic Mean Difference: | [$d'$] | 1.11 | |
| Standard Deviation: | [$S_d$] | 0.394 | |
| 97.5% Confidence T-Value: | [$t_{0.975}$] | 2.306 | |
| Confidence Coefficient: | [$CC$] | 0.30 | |
| Arithmetic Mean RM Values*: | [$RM'$] | 1.35 | |
| Relative Accuracy**: | [$RA$] | **104%** | |
| Mean Difference + CC | ppmv | **1.4** | |
| Allowable Limit***: | ppmv | **5.0** | Ref: PS-4A 13.2 |

* If actual measured emissions are less than 50% of applicable standard, use the emission standard for RM'

** Relative accuracy for the CEMS must be no greater than 20% (10% if the emission standard is used for RM').

*** Performance Specification 4A, Section 13.2 states (in part):
*The RA of the CEMS must be no greater than, . . . or within 5 ppmv when the RA is calculated as the absolute average difference between the RM and CEMS, plus the 2.5 percent confidence coefficient.*

**** Highlighted runs were excluded from RA determination.

**Table 6.2 - $SO_2$ Emission Rate RATA for Gerdeau - Jackson Baghouse Exhaust**

| Run Number | Test Date | Begin | End | Ref. Method Result (lb $SO_2$/hr) | CERMS Data (lb $SO_2$/hr) | Difference [d] |
|---|---|---|---|---|---|---|
| 1 | 11/15/17 | 9:45 | 10:05 | 6.02 | 3.06 | 3.0 |
| 2 | 11/15/17 | 10:30 | 10:50 | 9.07 | 2.54 | 6.5 |
| 3 | 11/15/17 | 11:20 | 11:40 | 12.25 | 2.32 | 9.9 |
| 4 | 11/15/17 | 12:10 | 12:30 | 10.47 | 2.5 | 8.0 |
| 5 | 11/15/17 | 13:00 | 13:20 | 13.57 | 1.69 | 11.9 |
| 6 | 11/15/17 | 13:50 | 14:10 | 9.74 | 0.66 | 9.1 |
| 7 | 11/15/17 | 14:40 | 15:00 | 5.66 | 0.42 | 5.2 |
| 8 | 11/15/17 | 15:25 | 15:45 | 8.71 | 0.02 | 8.7 |
| 9 | 11/15/17 | 16:10 | 16:30 | 15.23 | 0.02 | 15.2 |
| 10 | 11/15/17 | 16:55 | 17:15 | 8.00 | 0.02 | 8.0 |
| 11 | 11/15/17 | 17:40 | 18:00 | 12.11 | 0.01 | 12.1 |

| | | |
|---|---|---|
| Number of tests periods: | [$n$] | 9 |
| Arithmetic Mean Difference: | [$d'$] | 7.81 |
| Standard Deviation: | [$S_d$] | 2.629 |
| 97.5% Confidence T-Value: | [$t_{0.975}$] | 2.306 |
| Confidence Coefficient: | [$CC$] | 2.02 |
| Arithmetic Mean RM Values*: | [$RM'$] | 80.0 |
| Relative Accuracy**: | [$RA$] | **12.3%** |
| Allowable Limit: | | **10%** |

* If actual measured emissions are less than 50% of applicable standard, use the emission standard for RM'

** Relative accuracy for the CEMS must be no greater than 20% (10% if the emission standard is used for RM').

*** Highlighted runs were excluded from RA determination.

**Table 6.3 - CO Emission Rate RATA for Gerdeau - Jackson Baghouse Exhaust**

| Run Number | Test Date | Begin | End | Ref. Method Result (lb CO/hr) | CERMS Data | Difference [d] |
|---|---|---|---|---|---|---|
| 1 | 11/15/17 | 9:45 | 10:05 | 51.1 | 67.6 | -16.6 |
| 2 | 11/15/17 | 10:30 | 10:50 | 263.4 | 234.0 | 29.4 |
| 3 | 11/15/17 | 11:20 | 11:40 | 157.0 | 146.7 | 10.3 |
| 4 | 11/15/17 | 12:10 | 12:30 | 217.7 | 192.0 | 25.7 |
| 5 | 11/15/17 | 13:00 | 13:20 | 437.0 | 330.6 | 106.4 |
| 6 | 11/15/17 | 13:50 | 14:10 | 324.2 | 256.5 | 67.8 |
| 7 | 11/15/17 | 14:40 | 15:00 | 143.8 | 126.1 | 17.8 |
| 8 | 11/15/17 | 15:25 | 15:45 | 220.3 | 211.3 | 9.0 |
| 9 | 11/15/17 | 16:10 | 16:30 | 335.2 | 273.9 | 61.3 |
| 10 | 11/15/17 | 16:55 | 17:15 | 313.4 | 268.1 | 45.3 |
| 11 | 11/15/17 | 17:40 | 18:00 | 228.9 | 211.2 | 17.7 |

| | | |
|---|---|---|
| Number of tests periods: | [$n$] | 9 |
| Arithmetic Mean Difference: | [$d'$] | 22.2 |
| Standard Deviation: | [$S_d$] | 22.3 |
| 97.5% Confidence T-Value: | [$t_{0.975}$] | 2.306 |
| Confidence Coefficient: | [$CC$] | 17.17 |
| Arithmetic Mean RM Values*: | [$RM'$] | 214.5 |
| Relative Accuracy**: | [$RA$] | **18.4%** |
| Allowable Limit: | | **20%** |

* If actual measured emissions are less than 50% of applicable standard, use the emission standard for RM'

** Relative accuracy for the CEMS must be no greater than 20% (10% if the emission standard is used for RM').

*** Highlighted runs were excluded from RA determination.

**Table 6.4 - Combined Flow RATA for Gerdeau - Jackson Baghouse Exhaust**

| Run Number | Test Date | Begin | End | Ref. Method Result (scfm) | CERMS Data (scfm) | Difference [d] |
|---|---|---|---|---|---|---|
| 1 | 11/15/17 | 9:45 | 10:05 | 706,626 | 630,148 | 76,478 |
| 2 | 11/15/17 | 10:30 | 10:50 | 705,086 | 605,516 | 99,570 |
| 3 | 11/15/17 | 11:20 | 11:40 | 667,127 | 568,965 | 98,163 |
| 4 | 11/15/17 | 12:10 | 12:30 | 677,047 | 581,749 | 95,298 |
| 5 | 11/15/17 | 13:00 | 13:20 | 700,478 | 571,550 | 128,928 |
| 6 | 11/15/17 | 13:50 | 14:10 | 761,593 | 601,006 | 160,587 |
| 7 | 11/15/17 | 14:40 | 15:00 | 720,436 | 607,365 | 113,071 |
| 8 | 11/15/17 | 15:25 | 15:45 | 643,347 | 574,209 | 69,138 |
| 9 | 11/15/17 | 16:10 | 16:30 | 668,952 | 577,790 | 91,162 |
| 10 | 11/15/17 | 16:55 | 17:15 | 650,022 | 578,047 | 71,974 |
| 11 | 11/15/17 | 17:40 | 18:00 | 691,181 | 609,097 | 82,084 |

| | | |
|---|---|---|
| Number of tests periods: | [$n$] | 9 |
| Arithmetic Mean Difference: | [$d'$] | 88549 |
| Standard Deviation: | [$S_d$] | 14606 |
| 97.5% Confidence T-Value: | [$t_{0.975}$] | 2.306 |
| Confidence Coefficient: | [$CC$] | 11227 |
| Arithmetic Mean RM Values*: | [$RM'$] | 681091 |
| Relative Accuracy**: | [$RA$] | **14.6%** |
| Allowable Limit: | | **20%** |

* If actual measured emissions are less than 50% of applicable standard, use the emission standard for RM'

** Relative accuracy for the CEMS must be no greater than 20% (10% if the emission standard is used for RM').

*** Highlighted runs were excluded from RA determination.