

1.0 Introduction

Alliance Source Testing, LLC (AST) was retained by Real Alloy Specification, LLC (RAS) to conduct compliance testing at the Coldwater (N), Michigan facility. The facility operates under Michigan Department of Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit No. 63.19A. Testing was conducted to determine the emission rates of the particulate matter (PM), particulate matter less than 10 microns (PM10), particulate matter less than 2.5 microns (PM2.5) and nitrogen oxides (NOx) at the exhaust of the Furnace No. 1N Flue (SVALFURN1) which was recently relocated to a new position west of the prior location above the 1N Furnace.

1.1 Facility Description

RAS is a secondary aluminum production facility (SIC 3341) which produces molten aluminum and specification ingot from the melting and recovery of aluminum from aluminum scrap, sow and pig. The recovery of aluminum from aluminum scrap and the subsequent production of molten aluminum have been defined by the U.S. EPA as secondary aluminum production processes.

1.2 Source and Control System Descriptions

The three (3) reverberatory furnaces – #1, #7, and #8 – are designed as sidewall melter/holder units. The reverberatory furnaces are used to melt aluminum scrap that has been processed by the aluminum shredder, thermal chip dryer or directly charged. The main scrap types consumed include turnings, cast, extrusions, twitch, clips and alloying materials. The scrap is charged to the sidewall of the furnace along with solid flux material, alloying agents and gaseous Cl_2 that are required for the production order. Clean charge consumed includes sow, ingot and molten metal. Once the materials are molten, the metal flows through a submerged opening to the hearth. Once properly alloyed, the furnace is tapped and the molten aluminum is either transferred to a holding furnace, refractory lined crucibles or cast into ingot. To capture process emissions, the reverberatory furnaces were built with hooding systems over the side wells. To control process emissions, the exhausts from the capture hoods are ducted to lime-injected baghouse systems. In addition, the reverberatory furnaces are equipped with a flue stack to discharge the products of natural gas combustion to the atmosphere.

The facility operates one (1) group 2 furnace – #2. Furnace 2 processes only clean charge and does not use reactive flux.

The thermal chip dryer is used to remove lubricants from turnings and chips. The scrap is charged into the thermal chip dryer via a conveyor belt where hot combustion gases volatilize and burn-off the lubricant. The turnings and chips can then be charged directly into the sidewall of the reverberatory furnaces. The thermal chip dryer uses a series of ducts to capture the emissions. To control process emissions, off gas first flows through an afterburner, then exhausts to a baghouse system. In addition, multiple hoods are used to capture fugitive dryer emissions, and these emissions are routed to a baghouse system for control.

The shredding mill is used to properly size and remove non-aluminum materials from the scrap. These emissions are routed to a baghouse system for control.

The dross handling and loadout equipment are equipped with a baghouse system for control.

1.3 Project Team

Personnel involved in this project are identified in the following table.

**Table 1-1
Project Team**

RAS Personnel	David Likens Jeff Ferg
Regulatory Personnel	Cody Tazzie Lindsey Wells
AST Personnel	Tyler Branca Anthony Delfratte

1.4 Site Specific Test Plan & Notification

Testing was conducted in accordance with the Site-Specific Test Plan (SSTP) submitted to EGLE on August 19, 2021.

1.5 Test Program Notes

During testing on September 21, 2021, the CEMS trailer computer stopped logging data from 8:02 to 8:16, an additional fourteen (14) minutes of data was collected to account for this missing time.

Summary of Results

2.0 Summary of Results

AST conducted compliance testing at the RAS facility in Coldwater (N), Michigan on September 21–22, 2021. Testing consisted of determining the emission rates of PM, PM10, PM2.5 and NOx at the exhaust of the Furnace No. 1N Flue (SVALFURN1).

Table 2-1 provides a summary of the emission testing results with comparisons to the applicable permit limits. This table also provides a summary of the process operating and control system data collected during testing. Any difference between the summary results listed in the following table and the detailed results contained in appendices is due to rounding for presentation.

Table 2-1
Summary of Results

AIR QUALITY DIVISION

Emissions Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	9/21/21	9/21/21	9/22/21	--
Filterable Particulate Matter Data				
Emission Rate, lb/hr	1.5	1.7	1.5	1.6
Emission Factor, lb/ton	0.18	0.18	0.18	0.18
Emission Limit, lb/ton	--	--	--	0.53
Percent of Limit, %	--	--	--	34
Condensable Particulate Matter Data				
Emission Rate, lb/hr	0.23	0.26	0.29	0.26
Emission Factor, lb/ton	0.027	0.027	0.035	0.030
Total Particulate Matter/PM10/PM2.5 Data ¹				
Emission Rate, lb/hr	1.8	2.0	1.8	1.8
Emission Factor, lb/ton	0.20	0.21	0.21	0.21
Emission Limit, lb/ton	--	--	--	0.327
Percent of Limit, %	--	--	--	64
Nitrogen Oxides Data				
Emission Rate, lb/hr	1.5	1.6	1.6	1.5
Emission Factor, lb/ton	0.17	0.16	0.19	0.18
Emission Limit, lb/ton	--	--	--	0.4
Percent of Limit, %	--	--	--	44
Process Operating / Control System Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	9/21/21	9/21/21	9/22/21	--
Feed Rate, lb/hr	17,229	18,854	16,734	17,606
Flux, lb	1,760	2,540	2,320	2,207
Chlorine, lb/ton	26.6	33.9	34.7	31.7
Lime Injection Set Point	--	--	--	3.0
Bag Break Detection Setpoint	--	--	--	14%
Bag Break Setpoint Delay	--	--	--	120 sec

¹ Total PM is the summation of filterable and condensable PM and is consider PM10/PM2.5 for compliance demonstration.

Testing Methodology

3.0 Testing Methodology

The emission testing program was conducted in accordance with the test methods listed in Table 3-1. Method descriptions are provided below while quality assurance/quality control data is provided in Appendix D.

**Table 3-1
Source Testing Methodology**

Parameter	U.S. EPA Reference Test Methods	Notes/Remarks
Volumetric Flow Rate	1 & 2	Full Velocity Traverses
Oxygen / Carbon Dioxide	3A	Instrumental Analysis
Moisture Content	4	Gravimetric Analysis
Total Particulate Matter	5 / 202	Isokinetic Sampling
Nitrogen Oxides	7E	Instrumental Analysis

3.1 U.S. EPA Reference Test Methods 1 and 2 – Sampling/Traverse Points and Volumetric Flow Rate

The sampling location and number of traverse (sampling) points were selected in accordance with U.S. EPA Reference Test Method 1. To determine the minimum number of traverse points, the upstream and downstream distances were equated into equivalent diameters and compared to Figure 1-1 in U.S. EPA Reference Test Method 1.

Full velocity traverses were conducted in accordance with U.S. EPA Reference Test Method 2 to determine the average stack gas velocity pressure, static pressure and temperature. The velocity and static pressure measurement system consisted of a pitot tube and inclined manometer. The stack gas temperature was measured with a K-type thermocouple and pyrometer.

3.2 U.S. EPA Reference Test Method 3A – Oxygen/Carbon Dioxide

The oxygen (O₂) and carbon dioxide (CO₂) testing was conducted in accordance with U.S. EPA Reference Test Method 3A. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, Teflon sample line(s), gas conditioning system and the identified gas analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the stack gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 3.6.

3.3 U.S. EPA Reference Test Method 4 – Moisture Content

The stack gas moisture content was determined in accordance with U.S. EPA Reference Test Method 4. The gas conditioning train consisted of a series of chilled impingers. Prior to testing, each impinger was filled with a known quantity of water or silica gel. Each impinger was analyzed gravimetrically before and after each test run on the same balance to determine the amount of moisture condensed.

3.4 U.S. EPA Reference Test Methods 5 and 202 – Total Particulate Matter

The total particulate matter (filterable and condensable PM) testing was conducted in accordance with U.S. EPA Reference Test Methods 5 and 202. The complete sampling system consisted of a Teflon nozzle, glass-lined probe, pre-weighed quartz filter, coil condenser, un-weighed Teflon filter, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning train consisted of a coiled condenser and four (4) chilled impingers. The first, and second impingers were initially empty, the third contained 100 mL of de-ionized water and the last impinger contained 200-300 grams of silica gel. The un-weighed 90 mm Teflon filter was placed between the second and third impingers. The probe liner heating system was maintained at a temperature of 248 ±25°F, and the impinger temperature was maintained at 68°F or less throughout testing. The temperature of the Teflon filter was maintained greater than 65°F but less than or equal to 85°F.

Following the completion of each test run, the sampling train was leak checked at a vacuum pressure greater than or equal to the highest vacuum pressure observed during the run. Condensate was collected in the first dry impinger, therefore the front-half of the sample train (the nozzle, probe, and heated pre-weighed filter) was removed in order to purge the back-half of the sample train (coil condenser, first and second impingers and CPM filter). A glass bubbler was inserted into the first impinger. If needed, de-ionized ultra-filtered (DIUF) water was added to the first impinger to raise the water level above the bubbler, then the coil condenser was replaced. Zero nitrogen was connected to the condenser, and a 60-minute purge at 14 liters per minute was conducted. After the completion of the nitrogen purge the impinger contents were measured for moisture gain.

The pre-weighed quartz filter was carefully removed and placed in container 1. The probe, nozzle and front half of the filter holder were rinsed three (3) times with acetone to remove any adhering particulate matter and these rinses were recovered in container 2. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for filterable particulate matter analysis.

The contents of impingers 1 and 2 were recovered in container CPM Cont. #1. The back half of the filterable PM filter holder, the coil condenser, impingers 1 and 2 and all connecting glassware were rinsed with DIUF water and then rinsed with acetone, followed by hexane. The water rinses were added to container CPM Cont. #1 while the solvent rinses were recovered in container CPM Cont. #2. The Teflon filter was removed from the filter holder and placed in container CPM Cont. #3. The front half of the condensable PM filter holder was rinsed with DIUF water and then with acetone, followed by hexane. The water rinse was added to container CPM Cont. #1 while the solvent rinses were added to container CPM Cont. #2. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for condensable particulate matter analysis.

3.5 U.S. EPA Reference Test Method 7E – Nitrogen Oxides

The nitrogen oxides (NO_x) testing was conducted in accordance with U.S. EPA Reference Test Method 7E. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, Teflon sample line(s), gas conditioning system and the identified gas analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the stack gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 3.6.

3.6 Quality Assurance/Quality Control – U.S. EPA Reference Test Methods 3A and 7E

Cylinder calibration gases used met EPA Protocol 1 (+/- 2%) standards. Copies of all calibration gas certificates can be found in the Quality Assurance/Quality Control Appendix.

Low Level gas was introduced directly to the analyzer. After adjusting the analyzer to the Low-Level gas concentration and once the analyzer reading was stable, the analyzer value was recorded. This process was repeated for the High-Level gas. For the Calibration Error Test, Low, Mid, and High Level calibration gases were sequentially introduced directly to the analyzer. All values were within 2.0 percent of the Calibration Span or 0.5 ppmv/% absolute difference.

High or Mid Level gas (whichever was closer to the stack gas concentration) was introduced at the probe and the time required for the analyzer reading to reach 95 percent or 0.5 ppmv/% (whichever was less restrictive) of the gas concentration was recorded. The analyzer reading was observed until it reached a stable value, and this value was recorded. Next, Low Level gas was introduced at the probe and the time required for the analyzer reading to decrease to a value within 5.0 percent or 0.5 ppmv/% (whichever was less restrictive) was recorded. If the Low-Level gas was zero gas, the response was 0.5 ppmv/% or 5.0 percent of the upscale gas concentration (whichever was less restrictive). The analyzer reading was observed until it reached a stable value and this value was recorded. The measurement system response time and initial system bias were determined from these data. The System Bias was within 5.0 percent of the Calibration Span or 0.5 ppmv/% absolute difference.

High or Mid Level gas (whichever was closer to the stack gas concentration) was introduced at the probe. After the analyzer response was stable, the value was recorded. Next, Low Level gas was introduced at the probe, and the analyzer value recorded once it reached a stable response. The System Bias was within 5.0 percent of the Calibration Span or 0.5 ppmv/% absolute difference or the data was invalidated and the Calibration Error Test and System Bias were repeated.

Drift between pre- and post-run System Bias was within 3 percent of the Calibration Span or 0.5 ppmv/% absolute difference. If the drift exceeded 3 percent or 0.5 ppmv/%, the Calibration Error Test and System Bias were repeated.

To determine the number of sampling points, a gas stratification check was conducted prior to initiating testing. The pollutant concentrations were measured at three points (16.7, 50.0 and 83.3 percent of the measurement line). Each traverse point was sampled for a minimum of twice the system response time. The pollutant concentration at each traverse point did not differ more than 5 percent or 0.5 ppmv/0.3% (whichever was less restrictive) of the average pollutant concentration. Therefore, single point sampling was conducted during the test runs. Copies of stratification check data can be found in the Quality Assurance/Quality Control Appendix.

An NO₂ – NO converter check was performed on the analyzer prior to initiating testing and at the completion of testing. An approximately 50 ppm nitrogen dioxide cylinder gas was introduced directly to the NO_x analyzer and the instrument response was recorded in an electronic data sheet. The instrument response was within +/- 10 percent of the cylinder concentration.

A Data Acquisition System with battery backup was used to record the instrument response in one (1) minute averages. The data was continuously stored as a *.CSV file in Excel format on the hard drive of a computer. At the completion of testing, the data was also saved to the AST server. All data was reviewed by the Field Team Leader before leaving the facility. Once arriving at AST's office, all written and electronic data was relinquished to the report coordinator and then a final review was performed by the Project Manager.

Appendix A