1.0 Introduction

Alliance Technical Group, LLC (Alliance) was retained by Real Alloy Recycling, Inc (RAR) to conduct compliance testing at the Coldwater, Michigan (MI) South Plant. The facility operates under Michigan Department of Environment, Great Lakes and Energy (EGLE) Title V Permit No MI-ROP-N5957-2022. Testing including determining the emission rates of particulate matter (PM), particulate matter less than 10 microns (PM10) and particulate matter less than 2.5 microns (PM2.5) at the exhaust of the salt cake/hot dross baghouse.

1.1 Facility Description

RAR 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 and/or specification ingot have been defined by the United States Environmental Protection Agency (EPA) as secondary aluminum production processes.

1.2 Source and Control System Descriptions

The rotary furnaces are used to process aluminum dross and scrap aluminum. Each furnace is designed to rotate on its axis, mixing and tumbling the charge while heating. The furnace then tilts forward to pour out the molten aluminum (tapping) and dump out the remaining slag or Salt Cake.

Included with the metal charge is the feed of a salt flux material. The scrap or dross charge and salt mixture is rotated in the furnace while a natural gas burner directed into the open end of the furnace heats the mixture. When all of the aluminum in the batch has melted, the furnace is tilted forward and the molten aluminum is poured into crucibles for transport, transferred to the reverberatory furnace or poured into sow molds to solidify. The remaining slag or salt cake is dumped out of the furnace by tilting and rotating into pans for cooling and ultimately disposal.

Emissions from these process units are captured by a hood and directed to a lime reagent injected baghouse system for control of the regulated pollutants. The emission control system injects the lime into the air stream prior to the inlet of the baghouse to reduce the concentration of specific pollutants present in the exhaust gases. The baghouse then captures the reacted material and other particulate matter from the melting process.

1.3 Project Team

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

Table 1-1: Project Team

Facility Personnel	David Likens
Alliance Personnel	Kenji Kinoshita James Boone Matthew Fulton Taylor Gentry Dennis Haynes Lucas Kovach Austin Mayfield Moritz Stuehn

1.4 Site Specific Test Plan & Notification

Testing was conducted in accordance with the site specific test protocol submitted to EGLE on May 19, 2023.

1.5 Test Program Notes

No technical difficulties or protocol deviations were encountered during this test program.

2.0 Summary of Results

Alliance conducted compliance testing at the RAR facility in Coldwater, MI on July 20, 2023. Testing consisted of determining the emission rates of PM, PM10, and PM2.5 at the exhaust of Salt Cake/Hot Dross Handling Baghouse.

Table 2-1 provides a summary of the emission testing results with comparisons to the applicable EGLE Title V Permit No. MI-ROP-N5957-2022 limits. 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 – Salt Cake/Hot Dross (EUIMHOTDROSS)

Emissions Data				
Run Number	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	**7/20/23**	**7/20/23**	**7/20/23**	**--**
Particulate Matter Data				
Emission Rate, lb/hr	0.95	0.57	0.080	0.53
EGLE Limit, lb/hr	--	--	--	0.90
Percent of Limit, %	--	--	--	**59**
PM10/PM2.5 Data *				
Emission Rate, lb/hr	1.2	0.89	0.46	0.87
EGLE Limit, lb/hr	--	--	--	0.90
Percent of Limit, %	--	--	--	**96**

*PM10/PM2.5 data is the summation of the filterable and condensable PM fractions. All filterable PM is assumed to be equal to filterable PM2.5 and filterable PM10.

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	3	Assumed Ambient
Moisture Content	4	Gravimetric Analysis
Total Particulate Matter	5/202	Isokinetic Sampling

3.1 U.S. EPA Reference Test Methods 1 and 2 – 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 3 – Oxygen/Carbon Dioxide

The oxygen (O_2) and carbon dioxide (CO_2) concentration were assumed to be at ambient conditions. The remaining stack gas constituent was assumed to be nitrogen for the stack gas molecular weight determination.

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 will consist 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 analytical balance to determine the amount of moisture condensed.

3.4 U.S. EPA Reference Test Method 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 glass 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.