



**Alliance**  
SOURCE TESTING

Continental Aluminum  
29201 Milford Road  
New Hudson, MI 48165

Test Dates: September 24-26, 2013

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AST Project No. 2013-0215-002  
Submittal Date: October 24, 2013

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**Regulatory Information**

*Permit No.* MDEQ Permit No. PTI 504-096F  
*Regulatory Citation* 40 CFR 63, RRR – Secondary Aluminum

**Source Information**

<i>Source Name</i>	<i>Source ID</i>	<i>Target Parameter(s)</i>
Reverberatory Furnace No. 1	RV-1	PM, TPM, HCl, HF, D/F
Rotary Furnace No. 1	RO-1	PM, TPM, HCl, HF, D/F

**Contact Information**

<i>Test Location</i>	<i>Test Company</i>	<i>Analytical Laboratories</i>
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Alliance Source Testing, LLC (AST) has completed the source testing as described in this report. Results apply only to the source(s) tested and operating condition(s) for the specific test date(s) and time(s) identified within this report. All results are intended to be considered in their entirety, and AST is not responsible for use of less than the complete test report without written consent. This report shall not be reproduced in full or in part without written approval from the customer.

To the best of my knowledge and abilities, all information, facts and test data are correct. Data presented in this report has been checked for completeness and is accurate, error-free and legible. Onsite testing was conducted in accordance with approved internal Standard Operating Procedures. Any deviations or problems are detailed in the relevant sections on the test report.

This document was prepared in portable document format (.pdf) and contains pages as identified in the bottom footer of this document.



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Chris LeMay, QSTI  
Alliance Source Testing, LLC

10/24/13

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Date

## **Introduction**

**1.0 Introduction**

Alliance Source Testing, LLC (AST) was retained by Continental Aluminum (Continental) to conduct compliance demonstration testing at New Hudson, Michigan facility. This facility is subject to provisions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Secondary Aluminum Production as detailed in 40 CFR 63, Subpart RRR and Michigan Department of Environmental Quality (MDEQ) Permit No. PTI 504-096F.

Testing was conducted to determine the emission rates of filterable particulate matter (PM), total particulate matter (TPM), hydrogen chloride (HCl), hydrogen fluoride (HF) and dioxins/furans (D/F) as indicated below. Please note that TPM data represents particulate matter less than 10 microns (PM10) data for these sources.

Source-ID:	Reverberatory Furnace – RV-1	Rotary Furnace – RO-1	
Condition No:	N/A	#1	#2
Condition Description:	worst case scrap maximum feed rate maximum flux addition	100% dross maximum flux addition	worst case scrap maximum feed rate highest baghouse temperature
Pollutants:	PM, TPM, HCl, HF, D/F	PM, TPM, HCl, HF, D/F	PM, TPM, HCl, HF, D/F

**1.1 Facility and Source Description**

The facility consists of secondary aluminum melting operations. The secondary melting operation contains two (2) reverberatory furnace processing units and a rotary furnace. The secondary aluminum melting process is initiated by placing scrap into the sidewell of the furnace. The scrap is melted in the sidewell using natural gas-fired burners to heat the aluminum to its melting point (approximately 1,250 °F). The exhaust from the sidewell is vented through a hood into the lime-injected baghouse. The hearth (heating input only) is separated from the sidewell physically with underflow weirs and vented through a separate stack to the atmosphere. The molten metal is continuously transferred from the sidewell (via a pump) to the hearth of the furnace and then is cast into shaped products for sale.

The reverberatory furnace (RV-1 De-Ox) is a continuous melting operation which consists of melting scrap and removing dross from the sidewell every 1-2 hrs. The exhaust from the sidewell hood is routed to a lime-injected baghouse, which is used to control particulate matter (PM) and hydrogen chloride (HCl) emissions from RV-1 for state permitting requirements. However, as an area source, the Continental facility is only subject to the dioxin/furan (D/F) emission requirements of the Secondary Aluminum MACT. The new MDEQ PTI revision includes several additional emission limits, including proof that HAPs emissions remain below the limit for an Area source at the higher production rates. Ambient air is introduced into the exhaust gas to reduce the temperature of the gas prior to entering the baghouse. The furnace meets the regulatory standard through furnace design and operating parameters defined during the initial performance test (IPT). Lime is injected into the exhaust gas before the air stream enters the baghouse. Used lime and dust is collected for off-site disposal.

The RV-2 alloy furnace is currently idle and not being tested for new operating parameters. Plan to retest if ever started and run longer than 90 days. The control systems are an exact duplicate of RV-1.

The rotary furnace (RO-1) is a batch melting operation consisting of a barrel furnace with a natural gas combustion system, a casting station, and a lime-injected baghouse. Oxides form during the melting process. These oxides and other impurities (known as dross), rise to the surface of the molten aluminum bath in the furnaces. Dross, though primarily considered waste material, contains a significant percentage of aluminum that may be recovered for

production use. Aluminum metal is recovered from the dross by processing the dross through the rotary furnace. The primary function of the rotary furnace is to recover aluminum metal from the dross. In addition, the rotary furnace may be used to melt other scrap aluminum (such as turnings) when it is not processing dross at full capacity. All the emissions from the process are routed through the hood located over the furnace entrance. After the melting process is complete, the metal is poured into molds for future use in the melting furnaces or transferred molten to RV-1 or a holding vessel for casting. The remaining impurities are removed from the furnace and collected for off-site disposal. All exhaust from the rotary furnace hood is routed directly to a lime-injected baghouse, which is used to control PM and HCl emissions for state permitting requirements. Ambient air is introduced into the exhaust gas to reduce the temperature of the gas prior to entering the baghouse. Lime is injected into the exhaust gas before the air stream enters the baghouse. Used lime and dust is collected for off-site disposal.

### 1.2 Project Team

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

**Table 1-1  
Project Team**

<b>Facility Personnel</b>	March Buchner – Continental Aluminum Bruce Bergeson – Bergeson Technology Services
<b>MDEQ Personnel</b>	Tom Gasloli Iranna Konanahalli
<b>AST Personnel</b>	Chris LeMay – Project Manager Brandy Hughes – Report Coordinator Stacey Cunningham – Team Leader Brently Nelson Drew Sloan Jim Boozer

### 1.3 Site Specific Test Plan & Notification

Testing was conducted in accordance with the Site Specific Test Plan submitted to Ms. Karen Kajiya-Mills of the MDEQ on July 31, 2013 and as revised on August 27 and 28, 2013.

### 1.4 Test Program Deviations

Test Run 1 for the reverberatory furnace was stopped after approximately 50 minutes of sampling due to an incorrect mix of scrap being used. Test Runs 2-4 are valid test runs for this performance test.

**Summary of Results**

## **2.0 Summary of Results**

AST conducted compliance demonstration testing at the Continental facility in New Hudson, MI on September 24-26, 2013. Testing was conducted to determine the emission rates of filterable particulate matter (PM), total particulate matter (TPM), hydrogen chloride (HCl), hydrogen fluoride (HF) and dioxins/furans (D/F) from the Reverberatory Furnace (RV-1) and Rotary Furnace (RO-1).

Tables 2-1 through 2-3 provide summaries of the emission testing results with comparisons to the applicable limits. These tables also contain a summary of the applicable process operating and control system data collected during testing. Any difference between the summary results listed in the following tables and the detailed results contained in Appendix B is due to rounding for presentation.

**Table 2-1**  
**Summary of Results – Reverberatory Furnace**

Emissions Data				
Run Number	Run 2	Run 3	Run 4	Average <sup>1</sup>
Date	9/24/13	9/24/13	9/24/13	--
<b>Particulate Matter Data</b>				
PM Emission Rate, lb/hr	0.18	0.18	0.17	0.18
PM Emission Factor, lb/ton	0.026	0.024	0.022	0.024
Limit, lb/ton	--	--	--	0.40
Percent of Limit, %	--	--	--	6
PM2.5 Emission Rate, lb/hr <sup>2</sup>	0.28	0.34	0.25	0.29
Limit, lb/hr	--	--	--	1.4
Percent of Limit, %	--	--	--	21
PM2.5 Emission Factor, lb/ton <sup>2</sup>	0.040	0.045	0.032	0.039
PM10 Emission Rate, lb/hr <sup>2</sup>	0.28	0.34	0.25	0.29
Limit, lb/hr	--	--	--	2.0
Percent of Limit, %	--	--	--	14
PM10 Emission Factor, lb/ton <sup>2</sup>	0.040	0.045	0.032	0.039
<b>Hydrogen Chloride Data</b>				
Emission Rate, lb/hr	0.033	0.041	2.3	0.81
Limit, lb/hr	--	--	--	1.95
Percent of Limit, %	--	--	--	41
Emission Factor, lb/ton	0.0046	0.0053	0.30	0.10
Limit, lb/ton	--	--	--	0.40
Percent of Limit, %	--	--	--	26
<b>Hydrogen Fluoride Data</b>				
Emission Rate, lb/hr	0.010 <sup>3</sup>	0.010	0.010 <sup>3</sup>	0.010
Emission Factor, lb/ton	0.0015 <sup>3</sup>	0.0013	0.0013 <sup>3</sup>	0.0014
<b>Dioxin/Furan Data</b>				
Emission Factor, gr TEQ/ton <sup>4</sup>	4.3E-06	6.9E-06	3.4E-06	4.9E-06
Limit, gr TEQ/ton	--	--	--	2.1E-04
Percent of Limit, %	--	--	--	2
Process Operating / Control System Data				
Run Number	Run 2	Run 3	Run 4	Average <sup>1</sup>
Date	9/24/13	9/24/13	9/24/13	--
Total Scrap Charge, lb (3hr cycle)	44,918	48,864	47,668	47,148
Feed Rate, lb/hr	14,185	15,350	15,460	14,998
Flux Addition, lb	6,020	4,130	4,680	4,943
Lime Injection Rate, lb/hr	34	34	34	34
Baghouse Inlet Temperature, °F	148	161	162	157

<sup>1</sup> Run 1 was voided - see Section 1.4

<sup>2</sup> PM2.5 and PM10 emission rates are the summation of the filterable PM and condensable PM emission rates.

<sup>3</sup> Laboratory data was reported as below the detection limit (BDL), therefore, the detection limit was used for emission calculation purposes.

<sup>4</sup> D/F TEQ values were calculated using 1989 NATO TEFs.

Table 2-2  
Summary of Results – Rotary Furnace, Condition 1

Emissions Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	9/25/13	9/25/13	9/25/13	--
<b>Particulate Matter Data</b>				
PM Emission Rate, lb/hr	0.23	0.19	0.36	0.26
PM Emission Factor, lb/ton	0.076	0.061	0.13	0.088
Limit, lb/ton	--	--	--	0.40
Percent of Limit, %	--	--	--	22
PM2.5/PM10 Emission Rate, lb/hr <sup>1</sup>	0.39	0.35	0.49	0.41
Limit, lb/hr	--	--	--	1.7
Percent of Limit, %	--	--	--	24
PM2.5/PM10 Emission Factor, lb/ton <sup>1</sup>	0.13	0.11	0.17	0.14
<b>Hydrogen Chloride Data</b>				
Emission Rate, lb/hr	0.055	0.040	0.047	0.047
Limit, lb/hr	--	--	--	1.5
Percent of Limit, %	--	--	--	3
Emission Factor, lb/ton	0.018	0.013	0.016	0.016
<b>Hydrogen Fluoride Data</b>				
Emission Rate, lb/hr	0.0092 <sup>2</sup>	0.0092 <sup>2</sup>	0.0079 <sup>2</sup>	0.0088
Limit, lb/hr	--	--	--	1.0
Percent of Limit, %	--	--	--	1
Emission Factor, lb/ton	0.0030 <sup>2</sup>	0.0030 <sup>2</sup>	0.0027 <sup>2</sup>	0.0029
<b>Dioxin/Furan Data</b>				
Emission Factor, gr TEQ/ton <sup>3</sup>	5.2E-06	1.2E-05	1.1E-05	9.4E-06
Limit, gr TEQ/ton	--	--	--	2.1E-04
Percent of Limit, %	--	--	--	4
Process Operating / Control System Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	9/25/13	9/25/13	9/25/13	--
Batch Charge (total scrap), lb	22,930	22,940	23,060	22,977
Feed Rate, lb/hr	6,034	6,200	5,765	6,000
Flux Addition, lb	4,550	4,300	4,200	4,350
Lime Injection Rate, lb/hr	41	38	38	39
Baghouse Inlet Temperature, °F	141	162	161	155

<sup>1</sup> PM2.5 and PM10 emission rates are the summation of the filterable PM and condensable PM emission rates.

<sup>2</sup> Laboratory data was reported as below the detection limit (BDL), therefore, the detection limit was used for emission calculation purposes.

<sup>3</sup> D/F TEQ values were calculated using 1989 NATO TEFs.

Table 2-3  
Summary of Results – Rotary Furnace, Condition 2

Emissions Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	9/26/13	9/26/13	9/26/13	--
<b>Particulate Matter Data</b>				
PM Emission Rate, lb/hr	0.23	0.47	0.61	0.43
PM Emission Factor, lb/ton	0.065	0.13	0.16	0.12
Limit, lb/ton	--	--	--	0.40
Percent of Limit, %	--	--	--	29
PM2.5/PM10 Emission Rate, lb/hr <sup>1</sup>	2.5	1.0	1.3	1.6
Limit, lb/hr	--	--	--	1.7
Percent of Limit, %	--	--	--	94
PM2.5/PM10 Emission Factor, lb/ton <sup>1</sup>	0.71	0.27	0.33	0.44
<b>Hydrogen Chloride Data</b>				
Emission Rate, lb/hr	0.38	1.0	1.5	0.97
Limit, lb/hr	--	--	--	1.5
Percent of Limit, %	--	--	--	65
Emission Factor, lb/ton	0.11	0.27	0.40	0.26
<b>Hydrogen Fluoride Data</b>				
Emission Rate, lb/hr	0.023	0.034	0.013	0.023
Limit, lb/hr	--	--	--	1.0
Percent of Limit, %	--	--	--	2
Emission Factor, lb/ton	0.0067	0.0090	0.0033	0.0063
<b>Dioxin/Furan Data</b>				
Emission Rate, gr TEQ/ton <sup>2</sup>	7.8E-05	1.6E-04	2.0E-04	1.5E-04
Limit, gr TEQ/ton	--	--	--	2.1E-04
Percent of Limit, %	--	--	--	70
Process Operating / Control System Data				
Run Number	Run 1	Run 2	Run 3	Average
Date	9/26/13	9/26/13	9/26/13	--
Batch Charge (total scrap), lb	25,222	26,169	27,027	26,139
Feed Rate, lb/hr	7,006	7,477	7,722	7,402
Flux Addition, lb	3,270	3,050	2,800	3,040
Lime Injection Rate, lb/hr	38	36	36	37
Baghouse Inlet Temperature, °F	181	196	197	191

<sup>1</sup> PM2.5/PM10 emission rates are the summation of the filterable PM and condensable PM emission rates.

<sup>2</sup> D/F TEQ values were calculated using 1989 NATO TEFs.

## **Testing Methodology**

### 3.0 Testing Methodology

The emission testing program was conducted in accordance with the U.S. EPA Reference 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 (VFR)	1 & 2	Full Velocity Traverses
Oxygen/Carbon Dioxide (O <sub>2</sub> /CO <sub>2</sub> )	3/3A	Integrated Bag / Instrumental Analysis
Moisture Content (BWS)	4	Volumetric / Gravimetric Analysis
Particulate Matter (PM)	5/202	Isokinetic Sampling
Dioxin/Furan (D/F)	23/ALT-034	Isokinetic Sampling
Hydrogen Chloride (HCl)/ Hydrogen Fluoride (HF)	26	Constant Rate Sampling

#### 3.1 U.S. EPA Reference Test Methods 1 & 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. A full velocity traverse was 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 an S-type pitot tube and inclined manometer while the stack gas temperature was measured with a K-type thermocouple and pyrometer.

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

The oxygen and carbon dioxide concentrations were determined in accordance with U.S. EPA Reference Test Method 3/3A. One (1) integrated Tedlar bag sample was collected during each test run. The bag samples were analyzed on site with a California Analytical Instruments Model 200P O<sub>2</sub>/CO<sub>2</sub> analyzer. The remaining stack gas constituent was assumed to be nitrogen for the stack gas molecular weight determination. The quality assurance/quality control measures are described in Section 3.7.

#### 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. The impinger contents were pre and post-measured to determine the amount of moisture condensed during each test run.

#### 3.4 U.S. EPA Reference Test Methods 5/202 – Particulate Matter

The particulate matter testing was conducted in accordance with U.S. EPA Reference Test Methods 5 and 202. The complete sampling system consisted of a Teflon-coated stainless steel nozzle, heated glass-lined probe, pre-weighed quartz filter, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning train consisted of five

(5) chilled impingers. The first, second and fourth impingers were initially empty, the third contained 100 milliliters (mL) of de-ionized water and the last impinger contained approximately 200-300 grams of silica gel. An un-weighed 90 mm Teflon filter was placed between the second and third impingers.

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. The nitrogen purge was omitted from the sample clean due to minimal condensate collected in the dry impingers.

The contents of the impingers were measured gravimetrically to determine the moisture gain. The contents of impinger 1 and 2 were recovered in Container 1. Impingers 1 and 2, the coil condenser and all connecting glassware were rinsed with water and then rinsed with acetone and hexane. The water rinses were added to Container 1 while the solvent rinses were recovered in Container 2. The un-heated Teflon filter was removed from the filter holder and placed in Container 3. The front half of the filter holder was rinsed with water and then with acetone and hexane. The water rinse was added to Container 1 while the solvent rinses were added to Container 2. All containers were sealed, labeled and liquid levels marked for transport to AST's laboratory in Decatur, Alabama for condensable particulate matter analysis.

The pre-weighed quartz filter was carefully removed and placed in Container 4. 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 5. All containers were sealed, labeled and liquid levels marked for transport to AST's laboratory in Decatur, Alabama for filterable particulate matter analysis.

The mass of filterable particulate matter collected in the probe and nozzle was determined by evaporating the water rinse in a pre-weighed glass beaker and then weighing the residue until a constant weight was obtained. The filter loading was determined by subtracting the initial constant filter weight from the final constant weight. The filterable particulate loading was determined by adding these two (2) weights. All weight measurements were performed on the same balance (accurate to 0.1 mg). The total particulate loading was determined by adding the filterable particulate mass and the condensable particulate mass.

### **3.5 U.S. EPA Reference Test Method 23/Alternative Method 034 – Dioxin/Furan**

The dioxin and furan concentrations were determined in accordance with EPA Reference Method 23 with guidance from Alternative Method 034. All glassware leading to the XAD adsorbing resin was cleaned at AST's laboratory before mobilizing to the site. Glassware cleaning consisted of washing with warm soapy water and rinsing with distilled water and acetone. Once the glassware was dry, the open ends were sealed with Teflon tape. SGS Analytical Perspectives in Wilmington, North Carolina provided the pre-cleaned filters and pre-cleaned, packed and spiked XAD resin traps.

The impinger train was assembled in the sample recovery area. The first impinger (shortened stem) was empty and used for a knockout impinger. The next two (2) impingers were standard Greenberg-Smith impingers with each containing 100 mL of high performance liquid chromatography grade water. The fourth impinger was empty while the fifth and sixth impinger was charged with approximately 200 grams of indicating silica gel. The pre-cleaned glass fiber filter was placed in a glass filter holder with a Teflon-coated filter support and connected to the condenser

coil. All open ends of the sampling train were sealed with Teflon tape prior to complete assembly at the sampling location.

The complete sampling system consisted of a Teflon-coated stainless steel nozzle, heated glass-lined probe, glass filter holder with pre-cleaned glass-fiber filter, condenser coil, XAD resin trap, gas conditioning train, pump and calibrated dry gas meter. The probe and filter box temperatures were maintained at approximately 250°F. The sorbent module resin and impinger temperatures were maintained at or below 68°F throughout the testing.

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. The filter was removed from the filter holder and placed in sample Container 1. The XAD sorbent module was sealed on both ends and placed on ice. The nozzle, probe liner, filter holder, condenser and all connecting glassware were triple-rinsed with acetone, and these rinses were recovered in sample Container 2. All glassware cleaned for sample Container 2, except the condenser, was also triple-rinsed with toluene. Three (3) 5-minute soaks with toluene were conducted on the condenser. The toluene rinses were recovered in sample Container 3.

All samples were sealed, labeled, stored on ice and shipped to SGS Analytical Perspectives via an overnight courier. The sample analysis was performed by high resolution gas chromatography and high resolution mass spectrometry.

### **3.6 U.S. EPA Reference Test Method 26 – Hydrogen Chloride & Hydrogen Fluoride**

The hydrogen chloride and hydrogen fluoride concentrations were determined in accordance with U.S. EPA Reference Test Method 26. The complete sampling system consisted of a heated glass-lined probe, Teflon filter, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning train consisted of four (4) impingers contained in an ice/water bath. The first and second impingers contained 100 mL of 0.1 N H<sub>2</sub>SO<sub>4</sub>, the third was empty and the fourth impinger contained approximately 200 grams of silica gel. The probe and filter box temperatures were maintained above 250°F, and the impinger temperature was maintained below 68°F throughout the testing.

Following the completion of the 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. After determining the amount of condensed moisture in each impinger, the contents of the first, second and third impingers were placed into a sample container. The back-half of the filter holder, first, second and third impingers and all glassware leading to the outlet of the third impinger were triple-rinsed with DI water, and these rinses were recovered in the sample container. The samples were sealed, labeled and liquid levels marked for transport to Maxxam Analytics, Inc. of Mississauga, Ontario, Canada.

### **3.7 Quality Assurance/Quality Control – U.S. EPA Reference Test Method 3A**

Cylinder calibration gases were supplied by AirGas – South or NexAir which met Protocol 1 (+/- 2%) standards.

Low Level gases were introduced directly to analyzer. After adjusting the analyzer to the Low Level gas concentration and once the analyzer reading was stable, the analyzer reading was recorded. This process was repeated for the High Level gas. Next, Mid Level gases were introduced directly to analyzer and reading was recorded. All recording readings were within +/- 2 percent of the Calibration Span.

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.