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ALUMINUM FURNACE FABRIC FILTER EXHAUST STACK COMPLIANCE EMISSIONS TEST REPORT FRITZ SECONDARY ALUMINUM RIVER ROUGE, MICHIGAN

Test Dates: September 20 and 21, 2017

Report Date: November 16, 2017

Prepared for:

SNC Lavalin
300 Woodcliff Dr.
Canonsburg, PA 15317

Prepared by:

Montrose Air Quality Services, LLC.
1050 William Pitt Way
Pittsburgh, Pennsylvania 15238
412-826-3636

Project No. 018AS-163763

CERTIFICATION STATEMENT

This statement certifies that "to the best of their knowledge," based on state and federal regulations, operating permits, plan approvals applicable to each source tested, and reasonable inquiry, the statements and information presented in the attached document are true, accurate, and complete.

ALUMINUM FURNACE FABRIC FILTER EXHAUST STACK
COMPLIANCE EMISSIONS TEST REPORT
FRITZ SECONDARY ALUMINUM
RIVER ROUGE, MICHIGAN

Test Dates: September 20 and 21, 2017

Project No. 018AS-163763

William P Cowell — 11/16/2017

William P. Cowell, QSTI — Date
Client Project Manager
Montrose Air Quality Services, LLC.

11/16/2017

Matthew Dallesasse, QSTI — Date
District Manager
Montrose Air Quality Services, LLC.

David Splan — 11-16-17

David Splan — Date
Vice President
Fritz Enterprises, Inc.

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ALUMINUM FURNACE FABRIC FILTER EXHAUST STACK COMPLIANCE EMISSIONS TEST REPORT FRITZ SECONDARY ALUMINUM RIVER ROUGE, MICHIGAN

1 TEST RESULTS SUMMARY

Installation Permit Number: 15-01A			
Source Name: Aluminum Furnace		**Source ID: Fabric Filter Exhaust Stack**	
Pollutant	**Average Result**	**Limit**	**Compliant / Non-compliant**
Dioxins and Furans	5.3 X 10^{-5} grains of D/F TEQ per ton of feed	2.1 X 10^{-4} grains of D/F TEQ per ton of feed	Compliant
Hydrogen Chloride	1.58 lb/hr	2.0 lb/hr	Compliant
	0.25 lb/ton of feed	0.40 lb/ton of feed	Compliant

2 INTRODUCTION

SNC-Lavalin (SNC) contracted Montrose Air Quality Services, LLC. (Montrose) to perform an emission evaluation of the aluminum furnace fabric filter exhaust stack outlet at Fritz Products, Inc. (Fritz) located in River Rouge, Michigan. Performance testing was conducted to comply with United States Environmental Protection Agency (USEPA), Title 40, Code of Federal Regulations (CFR), Part 63 and their Michigan Department of Environmental Quality Operating Permit No. 15-01A.

The aluminum furnace fabric filter outlet stack was tested for dioxin/furan (D/F) concentrations, and hydrogen chloride (HCl) in accordance with the approved test protocol, revised and sent final on September 14, 2017.

3 CONTACT INFORMATION

Company	**Consultant**	**Testing Firm**
Mr. David Splan Fritz Enterprises, Inc. 1650 West Jefferson Trenton, Michigan 48183 (734) 362-5240 – Telephone dsplan@fritzinc.com	Mr. Joseph Duckett SNC Lavalin 300 Woodcliff Dr. Canonsburg, PA 15317 724-916-3310– Telephone joseph.duckett@snclavalin.com	Mr. William Cowell, QSTI Montrose Air Quality Services, LLC. 1050 William Pitt Way Pittsburgh, Pennsylvania 15238 (412) 826-3636 – Telephone wcowell@montrose-env.com

4 TEST DATES AND PERSONNEL INFORMATION

Testing was conducted September 20 and 21, 2017. The following table details the personnel present for this test program:

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Organization	Personnel	Responsibility
MDEQ	Mr. Jonathan Lamb	On-Site Agency Representative
USEPA	Ms. Katharina Bellairs	On-Site Representative
Fritz Enterprises, Inc.	Mr. David Splan	Test Liaison
SNC	Mr. Joseph Duckett	Test Liaison
Montrose	Mr. William P. Cowell, QSTI, Client Project Manager	Team Leader; Operator, RM 23 and 26A Operator
	Mr. Tyler Larson, Field Technician	Sample Recovery
	Mr. Craig Blohm, Field Technician	Manlift-probe pusher, sample recovery

5 ANALYTICAL LABORATORY CONTACT INFORMATION

USEPA Method 23	USEPA Method 26A
Vista Analytical Laboratory Ms. Martha Maier 1104 Windfield Way El Dorado Hills, CA 95762 (916) 673-1520 mmaier@vista-analytical.com	Enthalpy Analytical Inc. Ms. Ashley Miller 2202 Ellis Road Durham, North Carolina 27703 (919) 850-4392 –Telephone valgena.respass@enthalpy.com

6 PROCESS DESCRIPTION AND PROCESS DATA

6.1 Process Description

Fritz operates a Group I secondary aluminum production unit (SAPU) in River Rouge, Michigan. Aluminum scrap is introduced through a scrap preheater to a melting furnace fired with natural gas, where the scrap is melted. Gaseous chlorine is added as a flux into the bottom of the bath and solid sodium chloride and potassium chloride are spread over the top of the bath, also as fluxes. The impurities of the melt, especially magnesium, form a dross layer on the surface of the melt and are skimmed several times during the melting cycle. The molten aluminum is then poured into molds.

The exhaust from the melting furnace is captured by two ducts, one from the preheater, and the other from the furnace. The ducts combine into a common duct which directs the exhaust to a spark arrestor thru three negative pressure fabric filters and then to the atmosphere through a stack. Two of the three baghouses are in operation at a time. The plant has been modified to inject both Powdered Activated Carbon (PAC) into the exhaust gas stream via the duct from the scrap preheater and Lime into the common duct.

The facility operated the furnace and control systems during the performance test in accordance with 40 C.F.R. Sections 63.7(3) and 63.1511(b)(1) , and with respect to the description provided in the CAA National Stack Testing Guidance dated April 27, 2009 as to what constitutes "representative (normal) conditions.

The EPA provided guidance for stack testing under the Clean Air Act in its memorandum dated April 27, 2009 under subject heading "Issuance of the Clean Air Act National Stack Testing Guidance". That guidance provides: "EPA recommends that performance tests be performed under those representative (normal) conditions that:

- represent the range of combined process and control measure conditions under which the facility expects to operate (regardless of the frequency of conditions); and
- Are likely to most challenge the emissions control measures of the facility with regard to meeting the applicable emissions standards, but without creating an unsafe condition."

The Guidance continues: "For a facility operating under an emission rate standard (e.g., lb/hr) or concentration standard, normal process operating conditions producing the highest emissions or loading to a control device would generally constitute the most challenging conditions with regard to the emissions standard."

As set out above and in the conference call with the EPA on December 5, 2016, Fritz was to seek out, and accumulate for charging during the next stack test, aluminum scrap charge requiring chlorine addition rates approaching the maximum rate possible. The object of accumulating such scrap was to present operating conditions which Fritz may be required to address in the future and which were likely to most challenge the emission control measures at the plant. As noted in the Guidance, the operating conditions which most challenge the emission control measures at the facility are appropriate for a performance test regardless of the expected frequency of those conditions.

Consequently, the charging of scrap requiring chlorine addition rates approaching the maximum rate possible meets the requirements of 63.1511(b), 63.7(e) and as provided in the CAA National Stack Testing Guidance dated April 27, 2009.

6.2 Process Data

Pertinent process operating and production parameters recorded during the test:

- Chlorine Usage
- Feed/Charge Rate
- Aluminum Production Rate
- Fuel Usage
- Baghouse Pressure Drop
- Baghouse Leak Detection System Signal
- Total Reactive Chlorine Flux Rate
- Lime Feed Rate
- Powdered Activated Carbon (PAC) Feed Rate
- PAC Brand Name
- PAC Manufacturer Recommended Carrier Flowrate
- Baghouse inlet Temperature
- Location of PAC Injection

6.3 Miscellaneous Subpart RRR Requirements

6.3.1 Inlet Gas Temperature to the Fabric Filter

As required by Subpart RRR, these procedures were used to establish the inlet temperature range into the fabric filter:

- Continuously measure and record temperature at the inlet to the fabric filter using the required temperature monitoring device every 15 minutes during the performance tests;
- Determine and record the 15-minute block average temperatures for the 3 test runs; and
- Determine and record the 3-hour block average of the recorded temperature measurements for the 3-test runs.

6.3.2 Flux Injection Rate

As required by Subpart RRR, these procedures were used to establish the total reactive chlorine flux injection rate:

- Continuously measure and record the weight of the gaseous or liquid reactive flux injected for each 15-minute period, determine and record the 15-minute block average weights and calculate and record the total weight of the gaseous or liquid reactive flux for the 3 test runs;
- Record the identity, composition, and total weight of each addition of solid reactive flux for the 3 test runs; and
- Determine the total reactive chlorine flux injection rate using the procedures in Subpart RRR, Section 63.1512(o).

6.3.3 Feed/Charge Weight Measurements

As required by Subpart RRR, the aluminum production weights were measured and recorded for each of the 3 test runs and the total weight of scrap charge was calculated and recorded.

6.3.4 Lime and PAC Injection rates

The lime and activated carbon injection rates were recorded at 15 minute intervals throughout the 3 test runs, and the average injection rates were summarized for each test run. The average lime and activated carbon injection rate for the three test runs was calculated and recorded. The lime feeder and activated carbon feeder settings during the test were recorded and included in the test report.

Process Data can be found in Appendix A.

7 TEST PROCEDURES

Testing was conducted in accordance with the procedures outlined in the USEPA, Title 40, CFR, Part 60, Appendix A, Testing Methods. All field data sheets can be found in Appendix B.

7.1 Velocity and Volumetric Flow Rate – USEPA Methods 1 and 2

USEPA Method 1, *Sample and Velocity Traverses for Stationary Sources*, was followed to select sample points across the duct. USEPA Method 2, *Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube),* was used in conjunction with USEPA Methods 3 and 4 to determine the gas velocity and volumetric flow rate at the stack.

Each set of velocity determinations includes the measurement of gas velocity pressure and gas temperature at each of the USEPA Method 1 traverse points. The velocity pressures were measured with a Type S Pitot tube. Pitot tube calibration followed the geometric calibration protocol specified in Section 4.1 of 40 CFR Appendix A, Method 2. Gas temperature measurements were made using a Type K thermocouple and digital pyrometer. The thermocouple was calibrated in accordance with Section 4.3 of 40 CFR Appendix A, Method 2. A cyclonic flow check was performed prior to testing to verify that cyclonic flow conditions do not exist at the exhaust stack. A copy of the cyclonic flow check is included in Appendix B. Figure 1 details the stack dimensions and sampling points used in the field.

7.2 Gas Composition and Molecular Weight – USEPA Method 3

The oxygen (O_2) concentration, carbon dioxide (CO_2) concentration, and molecular weight of the stack gas was obtained and analyzed in accordance with USEPA Method 3, *Gas Analysis for the Determination of Dry Molecular Weight.* A Fyrite analyzer was used to measure the oxygen and carbon dioxide concentrations. Because the readings were ambient, only one set of readings was conducted and ambient conditions were recorded for each run.

7.3 Moisture Content – USEPA Method 4

The flue gas moisture content at the stack was determined in accordance with USEPA Method 4, *Determination of Moisture Content in Stack Gases.* The gas moisture was determined by quantitatively condensing the water in chilled impingers. The amount of moisture condensed was determined by the volume of condensate collected and weight differential in the silica gel. A dry

gas meter was used to measure the volume of gas sampled. The amount of water condensed and the volume of gas sampled was used to calculate the gas moisture content in accordance with USEPA Method 4. The moisture sampling train was incorporated with the USEPA Method 5 and 23 trains.

7.4 Dioxin / Furan Concentration – USEPA Method 23

The Dioxin/Furan concenctrations were determined in accordance with USEPA Method 23, *Determination of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans from Municipal Waste Combustors.*

7.4.1 Sampling Train Setup and Operation

The sampling apparatus contains a glass-lined temperature-controlled probe equipped with a Type S Pitot tube and a sharp-edged stainless-steel buttonhook nozzle. The exit of the probe was connected to a high-efficiency glass fiber filter supported in a glass-filter holder inside an oven heated to 248°F ± 25°F. The exit of the filter holder was connected to a water-jacketed condenser followed by a water jacketed packed column of adsorbent material (XAD-2) and a knock-out impinger followed by a series of four full-sized impingers. The condenser and XAD-2 trap was continually cooled with a water circulating pump inserted in the ice bath and tubing leading to the two glass pieces. Temperature entering the XAD-2 trap was monitored with an in-gas thermocouple and maintained at a temperature below 68°F. The knockout impinger was empty and the second and third impingers each contained 100 ml of deionized water. The fourth impinger was empty and the fifth impinger contained a pre-weighed amount of silica gel.

The impinger train was connected to a commercially available metering system. Prior to sampling, the dry gas meter was calibrated utilizing the procedures detailed in USEPA Method 5.

The sample train was assembled, allowed to reach operating temperature, and leak checked by plugging the nozzle with a rubber septum and pulling a vacuum of approximately 15" of Hg. Sampling did not proceed until an acceptable leak check of less than 0.02 cfm is achieved.

7.4.2 Testing Procedures

Once an acceptable leak check was achieved, the sampling train was placed at the first traverse point and sampling began immediately. The sampling train was operated at an isokinetic rate with

an isokinetic variation greater than 90% and less than 110%. Three runs were performed; each run was at least 180 minutes in duration and had a minimum sample volume of 108 dry standard cubic feet (DSCF). At the conclusion of each test run, the sample train was cooled sufficiently, utilizing ambient air or ice, to allow the nozzle to be plugged with the rubber septum. The sampling train was leak-checked at a vacuum equal to or greater than the maximum value reached during sampling.

7.4.3 Sample Recovery

Container 1 – The filter was removed from the filter holder and placed in a labeled glass petri dish and sealed with Teflon® tape. Since PM was to be derived from this filter, the lab supplied pre-weighed filters for inclusion in the Method 23 sampling train. Following USEPA Method 5 procedures, the filter was desiccated for a minimum of 24 hours and weighed to a constant weight. The term constant weight means a difference of no more than 0.5 milligrams (mg) or 1% of total weight less tare weight (whichever is greater) between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Adsorbent Module – The module was removed for the sample train, sealed with Teflon® tape, and labeled. The module was stored on ice for transport to the laboratory.

Container 2A – Material in the nozzle, probe, and front half of the filter holder and connecting glassware was quantitatively rinsed with acetone. Acetone rinses were performed a minimum of 3 times, and consisted of at least 200 milliliters (ml) or 30 ml per foot. The volume of each rinse was added to Container No. 2A, an amber glass sample bottle. The contents of Container 2A were gravimetrically analyzed for particulate matter upon evaporation. The residue was then reconstituted with acetone and combined in Container 2B for submittal to the laboratory for Method 23 analysis.

Container 2B – Material in the back half of the filter holder was rinsed 3 times with acetone, and material in the nozzle, probe, both halves of the filter holder and connecting glassware were then quantitatively rinsed with Methylene chloride ($MeCl_2$) three times into an amber glass sample bottle.

Container 3 – Material in the nozzle, probe, both halves of the filter holder and connecting glassware was quantitatively rinsed with Toluene three times. The volumes of these rinses were recorded and stored in an amber glass sample bottle designated as Container 3. As permitted, the toluene rinse was combined at the laboratory with the methylene chloride/acetone rinse.

Impinger Contents – The impinger contents were measured to within 1 ml utilizing a graduated cylinder and discarded. The volume was recorded to calculate moisture content of the effluent gas.

Silica Gel – The silica gel was transferred to the original container and weighed to the nearest ± 0.5 g.

All samples were maintained at 39°F or lower and protected from light. Each fraction was recorded on the sample chain of custody and transported to the laboratory for analysis, along with one complete blank sample train. The Polychlorinated dibenzodioxins (PCDD) and Polychlorinated dibenzofurans (PCDF) were extracted from the sample, separated by high-resolution gas chromatography, and measured by high-resolution mass spectroscopy. Analytical results, along with all method quality assurance/quality control data, are included in Appendix C.

7.5 Hydrochloric Acid (HCl) – USEPA Method 26A

The HCl emissions were determined with USEPA Method 26A, *Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Isokinetic Method.*

7.5.1 Sampling Train Setup and Operation

The sampling apparatus was a borosilicate glass-lined temperature-controlled (248°F-273°F) probe equipped with a Type S Pitot tube and a sharp-edged borosilicate glass button-hook nozzle. The probe liner and nozzle were connected utilizing a glass-coated stainless-steel union and graphite ferrules. The exit of the probe was connected to a high-efficiency Teflon® filter supported in a glass-filter holder inside an oven heated to 248°F-273°F. An in-gas stream thermocouple immediately following the filter measured gas temperature exiting the filter. The exit of the filter holder was connected to a series of four full-sized O-ring type Greenburg-Smith style impingers. Impingers 1 and 2 were standard-tipped Greenburg-Smith each containing 100 milliliters (ml) of 0.1N H_2SO_4; Impinger 3 was an empty modified Greenburg-Smith impinger. Impinger 4 contained a known quantity of silica gel.

The impinger train was connected to a commercially available metering system. The sample train was assembled, allowed to reach operating temperature, and leak checked by plugging the nozzle with a rubber septum and pulling a vacuum of approximately 10" of mercury (Hg). Sampling did not proceed until an acceptable leak check of less than 0.02 cubic feet per minute (cfm) was achieved.

Prior to sampling, the dry gas meter was calibrated utilizing the critical orifice procedures detailed in Section 16.2 of USEPA Method 5. A critical orifice set covering the anticipated sampling rates was utilized.

Once an acceptable leak check of less than 0.02 cfm was achieved, the sampling train was placed at the first traverse point and sampling could begin. The sampling train was operated at an isokinetic rate with an isokinetic variation greater than 90% and less than 110%. Three runs were performed, one at each baghouse combination; each run was 80 minutes in duration and hae a minimum sample volume of 36 dry standard cubic feet (DSCF). At the conclusion of each test run, the sample train was cooled sufficiently, utilizing ambient air or ice, to allow the nozzle to be plugged with the rubber septum. The sampling train was leak-checked at a vacuum equal to or greater than the maximum value reached during sampling. An acceptable leakage rate of less than 0.02 cfm or 4% of the average sampling rate (whichever is less) was observed and documented.

7.5.2 Sample Recovery and Analysis

Container 1: The filter was removed from the filter holder and placed in a labeled polystyrene Petri dish. The filter was not analyzed.

Container No. 2: The liquid in Impingers 1-3 was measured to the nearest ± 1 ml using a graduated cylinder. The contents were transferred to a high density polyethylene (HDPE) sample bottle. The impingers were rinsed three times with water, and these rinses were added to the same sample bottle. The bottle was labeled and stored at ambient temperature for shipment to the laboratory for analysis by ion chromatography (IC). Samples were analyzed by IC along with the audit sample.

Container No. 3: The silica gel was transferred to the original container and weighed to the nearest ± 0.5 g.

All samples were maintained at ambient temperature.

7.6 Calibrations

The following field equipment calibrations are contained in Appendix D:

- Nozzle
- Pitot Tube
- Thermocouple
- Dry Gas Meter and Orifice
- Qualified Source Testing Individual (QSTI) Certifications

7.7 Calculations

Emission calculations were completed by using a computer spreadsheet format. The results of each pertinent parameter are detailed on the spreadsheet for each sampling run. A sample calculation for one complete test run is provided in Appendix E. Report Nomenclature can be found at the back of Appendix E.

8 TESTING SUMMARY

A summary of the D/F test results can be found in Table 1. A summary of the HCl test results can be found in Table 2. Note: A 4th run was conducted because Run 1 had a brief period where the damper for the No. 1 baghouse was mistakenly closed for a short time, therefore reducing air flow below "normal" conditions. The reduced flowrates caused the sample trains to collect less than the minimum sample volume for both the Method 23 and 26A trains. Only runs 2 thru 4 are therefore shown on the sampling results. This was discussed and approved by MDEQ in the field.

9 CONCLUSION

A compliance test program was completed on the Group 1 Melting Furnace fabric filter exhaust stack. Test results represent data that is considered to be representative of the emission rates at the prevailing operating conditions. As noted in the Test Result Summary, both the HCL and D/F measurements are in compliance with the applicable limits. This is true both on the average and for each individual test run.

To the best of Montrose's knowledge, this source test report has been checked for completeness and the results contained herein are accurate, error-free, and representative of the actual emissions measured during testing.

Both qualitative and quantitative factors contribute to field measurement uncertainty and should be taken into consideration when interpreting the results contained within this report. Whenever possible, Montrose Air Quality Services, LLC. (MAQS) personnel reduce the impact of these uncertainty factors through the use of approved and validated test methods. In addition, MAQS personnel perform routine instrument and equipment calibrations and ensure that the calibration standards, instruments, and equipment used during test events meet, at a minimum, test method specifications as well as the specifications of our Quality Manual and ASTM D 7036-04. The limitations of the various methods, instruments, equipment, and materials utilized during this test have been reasonably considered, but the ultimate impact of the cumulative uncertainty of this project is not fully identified within the results of this report.

Table 1. Dioxin/Furan Test Results , Melting Furnace Fabric Filter Baghouse Exhaust Stack
Fritz Enterprises, Inc., River Rouge Facility, River Rouge, Michigan

Test Data	*Baghouse Operating Scenario*	**Run 2** *1 & 3*	**Run 3** *2 & 3*	**Run 4** *1 & 2*	**Average**	
Date		9/20/2017	9/20/2017	9/21/2017		
Start Time		11:45 AM	4:00 PM	8:00 AM		
End Time		2:49 PM	7:05 PM	11:40 AM		
Flow Rate	(ACFM)	26,182	29,565	28,631	28,126	
Flow Rate	(SCFM)	23,611	26,604	25,993	25,403	
Flow Rate	(DSCFM)	23,207	25,836	25,341	24,795	
Sample Volume	(DSCF)	110.1	137.3	135.9	127.8	
Carbon Dioxide	(dry volume %)	0.00	0.00	0.00	0.00	
Oxygen	(dry volume %)	21.00	21.00	21.00	21.00	
Water Vapor	(volume %)	1.71	2.89	2.51	2.37	
Stack Temperature	(°F)	115.7	116.7	112.9	115.1	
Percent of Isokinetic Sampling	(%)	105.5	98.5	99.4	101.2	
Operatiou						
Total Charge Rate	(ton/hr)	6.05	6.36	6.20	6.20	
Aluminum Production Rate	(ton/hr)	5.5	5.8	5.6	5.63	
Lime Injection Rate	(lb/hr)	23.9	20.5	23.6	22.7	
Chlorine Rate	(lb/hr)	210	187	196	198	
Carbon Injection	(lb/hr)	2.67	2.50	2.90	2.69	
Baghouse Pressure Drop (BH 1)	(in w.c.)	4.1	NA	3.6	3.9	
Baghouse Pressure Drop (BH 2)	(in w.c.)	NA	5.3	5.3	5.3	
Baghouse Pressure Drop (BH 3)	(in w.c.)	4.8	3.3	NA	4.1	
Baghouse Leak Detection (BH 1)	(PA)	1.8	NA	1.7	1.8	
Baghouse Leak Detection (BH 2)	(PA)	NA	1.7	4.5	3.1	
Baghouse Leak Detection (BH 3)	(PA)	2.1	4.0	NA	3.1	
Inlet Baghouse Temperature	(°F)	138	144	136	139	
Dross Usage	(lbs)	3,087	1,841	2,368	2,432	
Natural Gas Usage	(MMCF)	0.023	0.027	0.032	0.027	
Flux Usage	(lbs)	1,107	907	768	927	
Results						**Limit**
Dioxin/Furan						
TEF Mass Collected	(ng)	1.32	2.38	1.82	1.84	
TEF Emission Concentration	(ng/dsm^3)	0.42	0.61	0.47	0.50	
TEF Emission Rate	(ng/hr)	16,676	26,899	20,347	21,307	
TEF Emission Rate	(gr/ton of feed)	4.3E-05	6.5E-05	5.1E-05	5.3E-05	**2.10E-04**

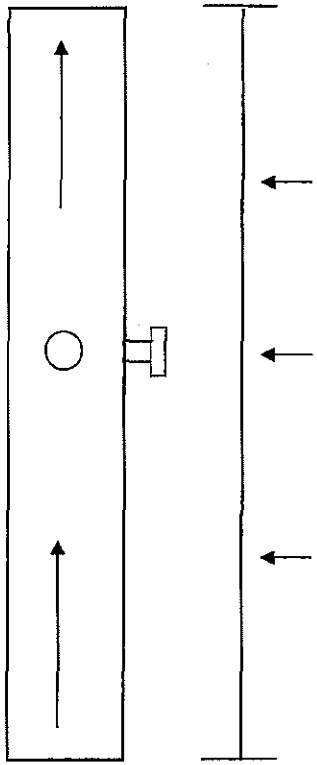
Note: Run 1 was voided due to a damper shutting during test run, causing flow to drop in half for a portion of the test run. Neither sample train collected the required sample volume.

Table 2. Hydrogen Chloride Test Results , Melting Furnace Fabric Filter Baghouse Exhaust Stack
Fritz Enterprises, Inc., River Rouge Facility, River Rouge, Michigan

Test Data	*Baghouse Operating Scenario*	**Run 2** *1 & 3*	**Run 3** *2 & 3*	**Run 4** *1 & 2*	**Average**	
Date		9/20/2017	9/20/2017	9/21/2017		
Start Time		12:20 PM	4:15 PM	9:00 AM		
End Time		2:10 PM	6:30 PM	10:43 AM		
Flow Rate	(ACFM)	25,579	27,997	28,037	27,204	
Flow Rate	(SCFM)	23,176	25,363	25,547	24,695	
Flow Rate	(DSCFM)	22,680	24,837	24,952	24,156	
Sample Volume	(DSCF)	59.330	60.894	61.605	60.610	
Carbon Dioxide	(dry volume %)	0.00	0.00	0.00	0.00	
Oxygen	(dry volume %)	21.00	21.00	21.00	21.00	
Water Vapor	(volume %)	2.14	2.07	2.33	2.18	
Stack Temperature	(°F)	113.0	112.7	110.9	112.2	
Percent of Isokinetic Sampling	(%)	102.8	96.3	97.0	98.7	
Operation						
Total Charge Rate	(ton/hr)	6.05	6.36	6.20	6.20	
Aluminum Production Rate	(ton/hr)	5.5	5.8	5.6	5.63	
Lime Injection Rate	(lb/hr)	23.9	20.5	23.6	22.7	
Chlorine Rate	(lb/hr)	210	187	196	198	
Carbon Injection	(lb/hr)	2.67	2.50	2.90	2.69	
Baghouse Pressure Drop (BH 1)	(in w.c.)	4.1	NA	3.6	3.9	
Baghouse Pressure Drop (BH 2)	(in w.c.)	NA	5.3	5.3	5.3	
Baghouse Pressure Drop (BH 3)	(in w.c.)	4.8	3.3	NA	4.1	
Baghouse Leak Detection (BH 1)	(PA)	1.8	NA	1.7	1.8	
Baghouse Leak Detection (BH 2)	(PA)	NA	1.7	4.5	3.1	
Baghouse Leak Detection (BH 3)	(PA)	2.1	4.0	NA	3.1	
Inlet Baghouse Temperature	(°F)	138	144	136	139	
Dross Usage	(lbs)	3,087	1,841	2,368	2,432	
Natural Gas Usage	(MMCF)	0.023	0.027	0.032	0.027	
Flux Usage	(lbs)	1,107	907	768	927	
Results						**Limit**
Hydrochloric Acid (HCl)						
Emission Mass (total)	(mg)	35.1	33.0	21.8	30.0	
Emission Concentration	(ppm_{dv})	13.8	12.6	8.3	11.6	
Emission Rate	(lb/hr)	1.78	1.78	1.17	1.58	**2.0**
Emission Rate	(lb/ton of feed)	0.29	0.28	0.19	0.25	**0.40**

Note: Run 1 was voided due to a damper shutting during test run, causing flow to drop in half for a portion of the test run. Neither sample train collected the required sample volume.

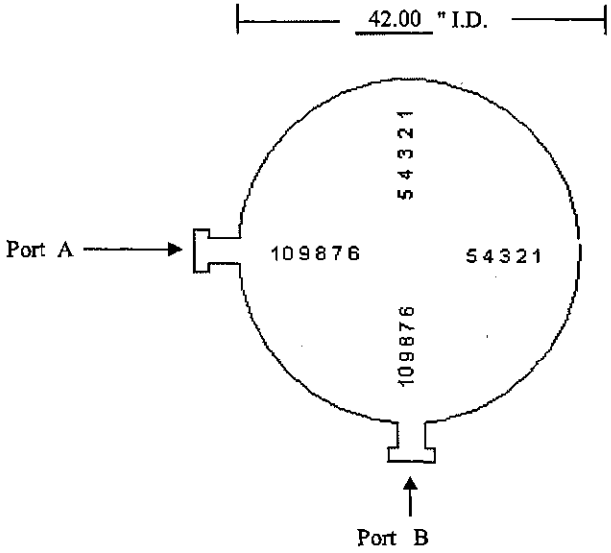
MONTROSE AIR QUALITY SERVICES
USEPA METHOD 1 DATA SHEET



30 Feet Upstream from Nearest Disturbance
8.6 Duct Diameters

2 Sampling Ports Located 90° Apart

20 Feet Downstream from Nearest Disturbance
5.7 Duct Diameters



Point Number Each Port	Method 1 Value (inches)
10	1.1
9	3.4
8	6.1
7	9.5
6	14.4
5	27.6
4	32.5
3	35.9
2	38.6
1	40.9

MONTROSE

Schematic of Sampling Point Locations and Duct Dimensions
Fritz Enterprises, Inc., River Rouge, Michigan

Figure 1

SNC Lavalin - River Rouge, MI Fritz Secondary Aluminum 2017 Compliance Emissions Test Report 018AS-163763Page 20 of 158