DIOXIN AND FURAN COMPLIANCE TEST REPORT GROUP I SECONDARY ALUMINUM PRODUCTION UNIT FRITZ ENTERPRISES, INC. RIVER ROUGE, MICHIGAN

Test Date: June 30, 2015

Report Date: August 26, 2015

Prepared for:

SNC Lavalin America, Inc.
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Prepared by:

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Project No. 15-203

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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	9.2×10^{-4} grains of D/F TEQ per ton of feed/charge	2.1×10^{-4} grains of D/F TEQ per ton of feed/charge	Non-compliant

2 INTRODUCTION

Air/Compliance Consultants, Inc. (ACCI) was contracted to perform an emission evaluation of the aluminum furnace fabric filter exhaust stack outlet at Fritz Enterprises, 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 in accordance with the approved test protocol from 2013 with the exception that Hydrogen Chloride and Particulate Matter would not be tested. The approved test protocol and relevant agency and client correspondence can be found in Appendix A.

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 America, Inc. 6585 Penn Avenue Pittsburgh, Pennsylvania 15206 412-365-3707 – Telephone joseph.duckett@snclavalin.com	Mr. William P. Cowell, QSTI Air/Compliance Consultants, Inc. 1050 William Pitt Way Pittsburgh, Pennsylvania 15238 (412) 826-3636 – Telephone wcowell@montrose-env.com

4 TEST DATES AND PERSONNEL INFORMATION

Testing was conducted June 30, 2015. The following table details the personnel present for this test program:

Organization	Personnel	Responsibility
MDEQ	Mr. Mark Dziadosz	On-Site Agency Representative
	Mr. Sam Amer	On-Site Agency Representative
USPEA (Region 5)	Ms. Katy Bellairs	On-Site Agency Representative
Fritz Enterprises, Inc.	Mr. David Splan	Test Liaison
SNC Lavalin America, Inc.	Mr. Joseph Duckett	Test Liaison
ACCI	Mr. William P. Cowell, QSTI, Senior Scientist I	Team Leader; Operator, RM 23 – sample recovery
	Mr. Richard S. Williams, QSTI, Scientist I	Manlift-probe pusher, sample recovery

5 ANALYTICAL LABORATORY INFORMATION

USEPA Method 5/23

Vista Analytical Laboratory
Ms. Martha Maier
1104 Windfield Way
El Dorado Hills, CA 95762
(916) 673-1520
mmaier@vista-analytical.com

6 PROCESS DESCRIPTION, PROCESS DATA, AND MISCELLANEOUS SUBPART RRR REQUIREMENTS

6.1 Process Description

Fritz operates a Group I Secondary Aluminum Production Unit (SAPU) in River Rouge, Michigan. Aluminum scrap is introduced 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 a flux. The impurities form a layer on the surface of the melt and are skimmed off 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. The ducts combine into a common duct which directs the exhaust to a cyclone, a negative pressure fabric filter system and then discharges to the atmosphere through a stack. The MDEQ has determined that this plant is subject to the requirements of 40 Code of Federal Regulations (CFR) Part 63, Subpart RRR – *National Emission Standards for Hazardous Air Pollutants for Secondary Aluminum Production* (Subpart RRR). The facility must comply with dioxin and furan (D/F) standards of Subpart RRR. The facility has previously (September 2104) demonstrated compliance with the PM and HCl limits expressed in their operating permit.

6.2 Process Data

Pertinent process operating and production parameters recorded during the test:

- Aluminum Production Rate
- Feed/Charge Rate (by calculation from production rate)
- Inlet Fabric Filter Temperature
- Fabric Filter Pressure Drops at each Baghouse
- Reactive Chlorine Flux Rate
- Lime Feed Rate
- Fuel Usage
- Baghouse Leak Detector Signal

Process data can be found in Appendix B.

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.

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 C.

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 C. 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.

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 23 trains.

7.4 Dioxin / Furan Concentration – USEPA Method 23

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

7.4.1 <u>Sampling Train Setup and Operation</u>

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 milliliters (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 cubic feet per minute (cfm) was achieved.

7.4.2 <u>Testing Procedures</u>

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 100 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 <u>Sample Recovery</u>

Container 1 – The filter was removed from the filter holder and placed in a labeled glass petri dish and sealed with Teflon® tape.

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 2 – Material in the nozzle, probe, front and back halves of the filter holder, impingers and connecting glassware was quantitatively rinsed with acetone. Acetone rinses were performed a minimum of 3 times. The volume of each rinse was added to Container No. 2, an amber glass sample bottle. The contents of Container 2 were sealed and submitted to the laboratory for Method 23 analysis.

Container 3 – Material in the nozzle, probe, both halves of the filter holder, impingers 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 acetone rinse. Methylene Chloride was not used in this test program as allowed by USEPA for SAPU testing.

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 D.

7.5 Calibrations

The following field equipment calibrations are contained in Appendix E:

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

7.6 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 F.

8 TESTING SUMMARY

A summary of the test results can be found in Table 1. Table 2 contains the table nomenclature.

9 CONCLUSION

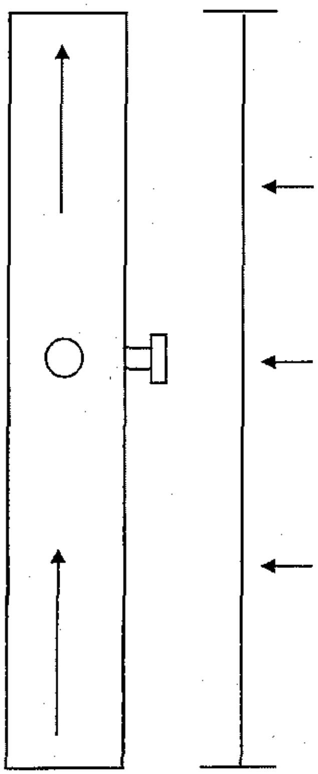
A compliance test program was completed on the Group 1 Melting Furnace fabric filter exhaust stack at Fritz Enterprises, Inc. in River Rouge, Michigan. Test results represent data that is considered to be representative of the emission rates at the prevailing operating conditions.

To the best of ACCI'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.

REPORT FIGURE

AIR/C … ONSULTANTS, INC.
USEPA METHOD 1 DATA SHEET

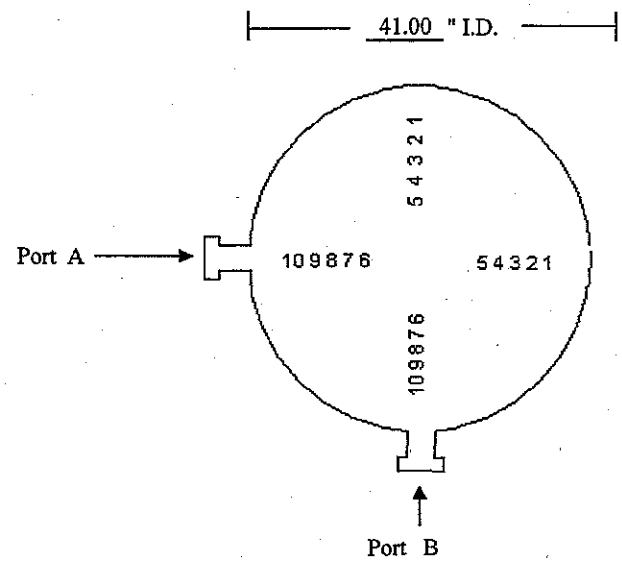
Note: This figure was revised on June 21, 2013 after performing diagnostic work and realizing stack disturbances changed after plant modifications.



30 Feet Upstream from Nearest Disturbance
8.8 Duct Diameters

2 Sampling Ports Located 90° Apart

20 Feet Downstream from Nearest Disturbance
5.9 Duct Diameters



Point Number Each Port	Method 1 Value (inches)
10	1.1
9	3.4
8	6.0
7	9.3
6	14.0
5	27.0
4	31.7
3	35.0
2	37.6
1	39.9

Air/Compliance Consultants, Inc.

Schematic of Sampling Point Locations and Duct Dimensions Fritz Enterprises, Inc., River Rouge, Michigan	Figure 1

REPORT TABLES

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

Test Data		Run 1	Run 2	Run 3	Average	
Date		6/30/2015	6/30/2015	6/30/2015		
Start Time		6:15 AM	10:20 AM	2:00 PM		
End Time		9:18 AM	1:22 PM	5:02 PM		
Flow Rate	(ACFM)	21,474	23,374	17,362	20,737	
Flow Rate	(SCFM)	20,262	21,717	15,639	19,206	
Flow Rate	(DSCFM)	19,843	21,238	15,262	18,781	
Dry Standard Exhaust Gas Flow Rate	(1000 lb exhaust gas/hr)	89.1	95.4	68.5	84.3	
Sample Volume	(DSCF)	138.0	150.0	102.1	130.0	
Carbon Dioxide	(dry volume %)	0.00	0.00	0.00	0.00	
Oxygen	(dry volume %)	21.00	20.83	21.00	20.94	
Water Vapor	(volume %)	2.07	2.20	2.41	2.23	
Stack Temperature	(°F)	84.8	93.3	110.7	96.2	
Percent of Isokinetic Sampling	(%)	104.0	105.6	100.1	103.2	
Operation						
Scrap Charge Rate	(ton/hr)	5.61	4.05	5.86	5.17	
hlorine Rate	(lb/hr)	146.0	74.0	166.0	128.7	
ver Flux Rate	(lb/hr)	233	230	318	260	
al Charge Rate	(ton/hr)	5.80	4.20	6.10	5.37	
Feed Rate	(lb/hr)	10.70	10.90	11.30	10.97	
ouse #1 Pressure Drop	(in w.c.)	3.7	--	4.3	4.0	
use #2 Pressure Drop	(in w.c.)	5.5	6.2	--	5.9	
nouse #3 Pressure Drop	(in w.c.)	--	2.3	1.8	2.1	
Fuel Use	(mmcf)	0.021	0.017	0.024	0.021	
Inlet Baghouse Temperature	(°F)	166.0	173.0	170.0	169.7	
Baghouse Leak	(pA)	46.4	44.3	41.9	44.2	
Results						**Limit**
Dioxins and Furans						
TEF Mass Collected	(ng)	40.35	42.58	22.79	35.24	
TEF Emission Concentration	(ng/m^3)	10.33	10.02	7.88	9.41	
TEF Emission Rate	(ng/hr)	348,141	361,683	204,339	304,721	
TEF Emission Rate	(gr/ton of total charge)	9.3E-04	1.3E-03	5.2E-04	9.2E-04	**2.1.E-04**

Table 2.

TABLE NOMENCLATURE

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
%	- Percent	gpm	- Gallons per minute	NO_x	- Oxides of Nitrogen
% Volume	- Percent by volume	gr/DSCF	- Grains per dry standard cubic feet	O_2	- Oxygen
°F	- Degrees Fahrenheit	H_2O	- Water	OSHA	- Occupational Safety & Health Administration
<	- Less than	H_2SO_4	- Sulfuric acid	PADEP	- PA Department of Environmental Protection
>	- Greater than	HAP	- Hazardous air pollutant	Pb	- Lead
AB	- Acetone Blank	Hg	- Mercury	PEL	- Permissible exposure limit
ACFM	- Actual cubic feet per minute	HI	- Heat input	PM	- Particulate matter
BACT	- Best Available Control Technology	Hp	- Horsepower	PM_{10}	- Particulate matter less than 10 microns
BHP	- Brake horsepower	hr	- Hour	ppb	- Parts per billion
BTU	- British thermal units	HSCFH	- Hundred standard cubic feet per hour	PPE	- Personal protective equipment
BTU/scf	- British thermal units per standard cubic feet	IC	- Ion chromatography	ppm	- Parts per million
Btu/CF	- British thermal units per cubic feet	in H_2O	- Inches of Water	ppm_{dv}	- Parts per million, dry volume
C_3H_8	- Propane	in Hg	- Inches of Mercury	ppm_{wv}	- Parts per million, wet volume
CE	- Capture efficiency	Kg	- Kilograms	psia	- Pounds per square inch absolute
CEMS	- Continuous emission monitor system	lb	- Pound	psig	- Pounds per square inch gauge
cf	- Cubic foot	lb/hr	- Pound per hour	PTI	- Permit to Install
CFR	- Code of Federal Regulations	lb/MMCF	- Pound per million British cubic feet	PTE	- Permanent total enclosure
CH_4	- Methane	lb/lb-mole	- Pound per pound mole	RA	- Relative Accuracy
C_2H_6	- Ethane	MACT	- Maximum Achievable Control Technology	RATA	- Relative Accuracy Test Audit
Cl_2	- Chlorine	m^3	- Cubic meters	RM	- Reference Method
CO	- Carbon monoxide	MDL	- Minimum detection limit	RMD	- Relative mean difference
CO_2	- Carbon dioxide	mg	- Milligrams	rpm	- Revolutions per minute
COG	- Coke oven gas	mg/g	- Milligrams per gram	S	- Sulfur
DACF	- Dry actual cubic feet	min	- Minute	SCF	- Standard cubic feet
DACM	- Dry actual cubic meters	mL	- Milliliter	SCFM	- Standard cubic feet per minute
DE	- Destruction efficiency	mm HG	- Millimeters of mercury	SCM	- Standard cubic meters
DSCF	- Dry standard cubic feet	MMBtu	- Million British thermal units	SO_2	- Sulfur dioxide
DSCFM	- Dry standard cubic feet per minute	MNOC	- Maximum normal operating capacity	STD	- Standard
FID	- Flame Ionization Detector	MSDS	- Material Safety Data Sheet	TEQ	- Toxicity Equivalence Quotient
ft	- Foot	MW	- Megawatts	THC	- Total hydrocarbons
ft/sec	- Feet per second	N_2	- Nitrogen	tph	- Tons per hour
Ft^2	- Square feet	ND	- Non-detectable	tpy	- Tons per year
Ft^3	- Cubic feet	NDO	- Natural draft opening	µg	- Micrograms
ft^3/lb-mole	- Cubic feet per pound mole	NESHAP	- National Emission Standard for Hazardous Air Pollutants	USEPA	- United States Environmental Protection Agency
g	- Grams	ng	- Nanograms	VE	- Visible emissions
g/bhp-hr	- Grams of brake horsepower per hour	NMEVOC	- Non-methane, non-ethane volatile organic compounds	VOC	- Volatile organic compound
g/mL	- Gram per milliliter	NMVOC	- Non-methane volatile organic compound	vol.	- Volume
GC	- Gas Chromatography	NO_2	- Nitrous Oxide	w/o	- With out