AIR EMISSION TEST REPORT

Title	AIR EMISSION TEST REPORT FOR THE VERIFICATION OF CHIP DRYER DIOXIN AND FURAN EMISSIONS
Report Date	July 13, 2017
Test Dates	May 24-25, 2017

Facility Information	
Name	Dicastal North America, Inc.
Street Address	1 Dicastal Drive
City, County	Greenville, Montcalm
SRN	N7688

Facility Permit Information	
Permit No.	78-15D
Emission Units	EU-ChipDryer

Testing Contractor	
Company	Derenzo Environmental Services
Mailing Address	39395 Schoolcraft Road Livonia, MI 48150
Phone	(734) 464-3880
Project No.	1702029

AIR EMISSION TEST REPORT
FOR THE VERIFICATION OF
CHIP DRYER DIOXIN AND FURAN EMISSIONS

DICASTAL NORTH AMERICA, INC.
GREENVILLE, MI

1.0 INTRODUCTION

Dicastal North America, Inc. (Dicastal) owns and operates a facility located in Greenville, Montcalm County, Michigan (State Registration No. N7688) that manufactures aluminum alloy wheels. The facility generally consists of foundry processes and finishing processes. In the foundry, ingots and chips are melted in natural-gas fired melting furnaces and the molten aluminum is poured into molds to form the wheels. The chips are recovered from downstream machining operations and conveyed to the foundry for remelting. Before melting, the chips are dried in a thermal chip dryer (emission unit EU-ChipDryer) to remove any machining fluids and oils. The effluent gas from the chip dryer is directed to a thermal oxidizer (TOX) for the reduction of organic compounds before being released to atmosphere.

Condition V.2 for EU-ChipDryer in PTI No. 78-15D specifies that:

> *Within 90 days after commencement of trial operation, the permittee shall verify dioxin/furan emission rates while processing unpainted aluminum chips from EU-ChipDryer by testing at owner's expense, in accordance with Department requirements. No less than 60 prior to testing, the permittee shall submit a complete test plan to the AQD Technical Programs Unit and District Office.*

The compliance testing was performed by Derenzo Environmental Services (DES), a Michigan-based environmental consulting and testing company. DES representatives Jason Logan and Clay Gaffey performed the field sampling and measurements May 24-25, 2017.

The exhaust gas sampling and analysis was performed using procedures specified in the Test Plan dated March 25, 2017 that was reviewed and approved by the Michigan Department of Environmental Quality (MDEQ). Mr. Thomas Gasloli of the MDEQ Air Quality Division (AQD) was onsite to witness portions of the test event.

Questions regarding this emission test report should be directed to:

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Report Certification

This test report was prepared by Derenzo Environmental Services based on field sampling data collected by DES. Facility process data were collected and provided by Dicastal employees or representatives. This test report has been reviewed by Dicastal representatives and approved for submittal to the MDEQ.

I certify that the testing was conducted in accordance with the specified test methods and submitted test plan unless otherwise specified in this report. I believe the information provided in this report and its attachments are true, accurate, and complete.

Report Prepared By:

Jason Logan
Project Manager
Derenzo Environmental Services

Reviewed By:

Robert L. Harvey, P.E.
General Manager
Derenzo Environmental Services

I certify that the facility and emission units were operated at maximum routine operating conditions for the test event. Based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate and complete.

Responsible Official Certification:

Nathaniel Kelly
Environmental Health & Safety Specialist
Dicastal North America, Inc.

2.0 SOURCE AND SAMPLING LOCATION DESCRIPTION

2.1 General Process Description

Dicastal operates an aluminum alloy wheel manufacturing facility. In the foundry, ingots and chips are melted in natural-gas fired melting furnaces and the molten aluminum is poured into molds to form the wheels. The chips are recovered from downstream machining operations and conveyed to the foundry for remelting. Before melting, the chips are dried in a thermal chip dryer (emission unit EU-ChipDryer) to remove any machining fluids and oils.

2.2 Rated Capacities and Air Emission Controls

In PTI 78-15D, the following description is provided for EU-ChipDryer: Machining fluid removal system and thermal chip dryer. A spinner will use centrifugal force to mechanically remove excess emulsion fluid from the chips, followed by a thermal chip dryer for volatilizing remaining emulsion on the chips using natural gas combustion (6.0 MMBtu/hr) for heat.

Conditions of the permit specify that the feedstock to EU-ChipDryer shall only be unpainted / uncoated chips.

The effluent gas from the chip dryer is directed to a high efficiency cyclone for PM control and a TOX for the reduction of organic compounds before being released to atmosphere.

The TOX consists of a natural gas fired oxidation chamber that operates at a minimum temperature of 1292°F (700°C) and is equipped with an air-to-air heat exchanger (recuperator) that preheats the incoming gas stream from the chip dryer and cools the exhaust gas stream from the oxidation chamber. The cooled exhaust is released to atmosphere through a vertical exhaust stack.

2.3 Sampling Locations

The chip dryer exhaust gas is released to the atmosphere through a dedicated vertical exhaust stack. The exhaust stack has an inner diameter of 32 inches at the sampling location. The stack is equipped with two (2) sample ports, opposed 90°, that provide a sampling location greater than 64 inches (>2 duct diameters) upstream and greater than 224 inches (>7 duct diameters) downstream from any flow disturbance and satisfies the USEPA Method 1 criteria for a representative sample location.

Individual traverse points were determined in accordance with USEPA Method 1.

Appendix 1 provides diagrams of the emission test sampling location.

3.0 SUMMARY OF TEST RESULTS AND OPERATING CONDITIONS

3.1 Purpose and Objective of the Tests

Condition V.2 for EU-ChipDryer in PTI No. 78-15D specifies that:

> *Within 90 days after commencement of trial operation, the permittee shall verify dioxin/furan emission rates while processing unpainted aluminum chips from EU-ChipDryer by testing at owner's expense, in accordance with Department requirements. No less than 60 prior to testing, the permittee shall submit a complete test plan to the AQD Technical Programs Unit and District Office.*

Additionally, certain processes within the foundry are subject to the requirements of the National Emission Standards for Hazardous Air Pollutants for Secondary Aluminum Production (Secondary Aluminum NESHAP), 40 CFR Part 63 Subpart RRR. 40 CFR §63.1505(c) of the Secondary Aluminum NESHAP specifies that... *the owner or operator of a thermal chip dryer must not discharge or cause to be discharged to the atmosphere emissions in excess of:*

> *(2) 2.50 micrograms (µg) of D/F TEQ per Mg (3.5×10^{-5} gr per ton) of feed/charge from a thermal chip dryer at a secondary aluminum production facility that is a major or area source.*

3.2 Operating Conditions During the Compliance Tests

The testing was performed while the process operated at maximum normal operating conditions. Dicastal representatives provided the chip charge rate, oxidizer chamber temperature, oxidizer fan speed, cyclone inlet and outlet pressure, and chip dryer temperature in approximatley 10-15 minute intervals for each test period.

Appendix 2 provides operating records provided by Dicastal representatives for the test periods.

Table 3.1 presents a summary of the average operating conditions during the test periods.

3.3 Summary of Air Pollutant Sampling Results

The gas exhausted from the chip dryer stack was sampled for three (3) four-hour test periods during the compliance testing performed May 24-25, 2017.

Table 3.2 presents the average measured dioxin and furan emission rates (average of the three test periods). Emissions are presented as a combined dioxin and furan emission rate relative to the toxic equivalency quotient. If an analyte was non-detect, the detection limit was used as a worst case scenario.

Test results for each four-hour sampling period are presented in Table 6.1.

Table 3.1 Average operating conditions during the test periods

Parameter	EU-ChipDryer
Chip Charge Rate (ton/hour)	0.92
Oxidizer Chamber Temp (°C)	725.5
Oxidizer Fan Speed (scfm)	5,665
Cyclone Inlet Pressure ("H_2O)	-5.6
Cyclone Outlet Pressure ("H_2O)	-0.7
Chip Dryer Temperature (°C)	224.9

Table 3.2 Average measured emission rates (three-test average)

Emission Unit	D/F TEQ Emission Rate* (gr/ton charged)
EU-ChipDryer	3.21E-07
Permit Limit	3.5E-05

*Detection limits were used for analytes with non-detect

4.0 SAMPLING AND ANALYTICAL PROCEDURES

A test protocol for the air emission testing was reviewed and approved by the MDEQ. This section provides a summary of the sampling and analytical procedures that were used during the testing periods.

4.1 Summary of Sampling Methods

USEPA Method 1	Exhaust gas velocity measurement locations were determined based on the physical stack arrangement and requirements in USEPA Method 1
USEPA Method 2	Exhaust gas velocity pressure was determined using a Type-S Pitot tube connected to a red oil incline manometer; temperature was measured using a K-type thermocouple connected to the Pitot tube.
USEPA Method 3A	Exhaust gas O_2 and CO_2 content was determined using zirconia ion/paramagnetic and infrared instrumental analyzers, respectively.
USEPA Method 4	Exhaust gas moisture was determined based on the water weight gain in chilled impingers.
USEPA Method 23	High resolution gas chromatography and high resolution mass spectrometry analysis
USEPA ALT 034	Broadly-applicable alternative to EPA Method 23 that eliminates the use of methylene chloride at secondary aluminum facilities.

4.2 Exhaust Gas Velocity Determination (USEPA Method 2)

The exhaust stack gas velocities and volumetric flow rates were determined using USEPA Method 2 during each isokinetic test period. An S-type Pitot tube connected to a red-oil manometer was used to determine velocity pressure at each traverse point across the stack cross section. Gas temperature was measured using a K-type thermocouple mounted to the Pitot tube.

Appendix 3 provides exhaust gas flowrate calculations and field data sheets.

4.3 Exhaust Gas Molecular Weight Determination (USEPA Method 3A)

CO_2 and O_2 content in the exhaust gas stream was measured continuously throughout each test period in accordance with USEPA Method 3A. The CO_2 content of the exhaust was monitored using a single beam single wavelength (SBSW) infrared gas analyzer. The O_2 content of the exhaust was monitored using a gas analyzer that uses a paramagnetic sensor.

During each sampling period, a continuous sample of the exhaust gas stream was extracted from the stack using a stainless steel probe connected to a Teflon® heated sample line. The sampled gas was conditioned by removing moisture prior to being introduced to the analyzers; therefore, measurement of O_2 and CO_2 concentrations correspond to standard dry gas conditions. Instrument response data were recorded using an ESC Model 8816 data acquisition system that monitored the analog output of the instrumental analyzers continuously and logged data as one-minute averages.

Prior to, and at the conclusion of each test, the instruments were calibrated using upscale calibration and zero gas to determine analyzer calibration error and system bias (described in Section 5.0 of this document). Sampling times were recorded on field data sheets.

Appendix 4 provides O_2 and CO_2 calculation sheets. Raw instrument response data are provided in Appendix 5.

4.4 Exhaust Gas Moisture Content (USEPA Method 4)

Moisture content of the exhaust gas was determined in accordance with USEPA Method 4 using a chilled impinger sampling train as a component of the USEPA sampling procedures for dioxins and furans (i.e., not as a separate measurement train). During each sampling period, a gas sample was extracted at an isokinetic rate from the source where moisture was removed from the sampled gas stream using impingers that were submersed in an ice bath. At the conclusion of each sampling period, the moisture gain in the impingers was determined gravimetrically by weighing each impinger to determine net weight gain.

4.5 Dioxin and Furan Concentration Measurements (USEPA Methods 23 and ALT034)

Exhaust gas was sampled from the stack at an isokinetic rate using a USEPA Method 23 sampling train. The sampling train consisted of a "goose-neck" nozzle constructed of borosilicate glass connected to a borosilicate glass probe liner within a heated stainless steel probe. The probe liner was attached to a heated glass filter holder containing a quartz filter. The back half of the filter holder was connected to a glass coil condenser, which was connected to XAD-2 resin trap (glass container charged with adsorbent XAD-2 resin material). The XAD-2 trap was connected to the impinger train.

The impinger train (following the XAD-2 resin trap) was charged as follows:

1st impinger: empty
2nd impinger: 100 ml of H_2O
3rd impinger: 100 ml of H_2O
4th impinger: empty
5th impinger: pre-dried silica gel

Chilled water was recirculated to the glass coil condenser and the gas temperature into the XAD-2 resin (at the outlet of the condenser, before the resin) was monitored and recorded to verify that it was less than 68°F or less.

At the conclusion of the sample periods, the sample recovery procedures in Method 23 were followed to recover the filter and impinger contents. EPA Alternative Method 034 was followed which eliminates the use of methylene chloride in the recovery procedures (only toluene and acetone were used). Nonmetallic probe and nozzle brushes were used during the sample recovery. Glass sample bottles with Teflon® caps were used to recover the impinger contents and rinses. All samples containers were stored and shipped on ice.

Dioxin and furan analysis was performed by SGS North America, Inc. in Wilmington, NC. The measured D/F TEQ emission rate is reported relative to the amount of chips charged during the emission test periods (mass D/F TEQ emissions per mass of chips charged) for comparison to the emission standard. Detection limits were used for analytes listed as ND on the laboratory report for a worst case scenario.

Appendix 3 provides isokinetic sampling sheets.
Appendix 4 provides pollutant calculations.
Appendix 7 provides the analytical laboratory report.

5.0 QA/QC ACTIVITIES

5.1 Exhaust Gas Flow

Prior to arriving onsite, the instruments used during the source test to measure exhaust gas properties and velocity (barometer, pyrometer, and Pitot tube) were calibrated to specifications outlined in the sampling methods.

The Pitot tube and connective tubing were leak-checked prior to each traverse to verify the integrity of the measurement system.

The absence of significant cyclonic flow for the exhaust configurations were verified using an S-type Pitot tube and oil manometer. The Pitot tube was positioned at each velocity traverse point with the planes of the face openings of the Pitot tube perpendicular to the stack cross-sectional

plane. The Pitot tube was then rotated to determine the null angle (rotational angle as measured from the perpendicular, or reference, position at which the differential pressure is equal to zero).

5.2 Gas Divider Certification (USEPA Method 205)

A STEC Model SGD-710C 10-step gas divider was used to obtain appropriate calibration span gases. The ten-step STEC gas divider was NIST certified (within the last 12 months) with a primary flow standard in accordance with Method 205. When cut with an appropriate zero gas, the ten-step STEC gas divider delivered calibration gas values ranging from 0% to 100% (in 10% step increments) of the USEPA Protocol 1 calibration gas that was introduced into the system. The field evaluation procedures presented in Section 3.2 of Method 205 were followed prior to use of gas divider. The field evaluation yielded no errors greater than 2% of the triplicate measured average and no errors greater than 2% from the expected values.

5.3 Instrumental Analyzer Interference Check

The instrumental analyzers used to measure O_2 and CO_2 have had an interference response test performed prior to their use in the field, pursuant to the interference response test procedures specified in USEPA Method 7E. The appropriate interference test gases (i.e., gases that would be encountered in the exhaust gas stream) were introduced into each analyzer, separately and as a mixture with the analyte that each analyzer is designed to measure. All of analyzers exhibited a composite deviation of less than 2.5% of the span for all measured interferent gases. No major analytical components of the analyzers have been replaced since performing the original interference tests.

5.4 Instrument Calibration and System Bias Checks

At the beginning of each day of the testing program, initial three-point instrument calibrations were performed for the CO_2 and O_2 analyzers by injecting calibration gas directly into the inlet sample port for each instrument. System bias checks were performed prior to and at the conclusion of each sampling period by introducing the upscale calibration gas and zero gas into the sampling system (at the base of the stainless steel sampling probe prior to the particulate filter and Teflon® heated sample line) and determining the instrument response against the initial instrument calibration readings.

The instruments were calibrated with USEPA Protocol 1 certified concentrations of CO_2 and O_2 in nitrogen and zeroed using hydrocarbon free nitrogen. A STEC Model SGD-710C ten-step gas divider was used to obtain intermediate calibration gas concentrations as needed.

5.5 Meter Box Calibrations and Isokinetic Sampling

The dry gas meter isokinetic sampling console, which was used for D/F testing, was calibrated prior to and after the testing program. This calibration uses the critical orifice calibration

technique presented in USEPA Method 5. The metering console calibration exhibited no data outside the acceptable ranges presented in USEPA Method 5.

The calculated isokinetic variation for each four hour test period is within the method allowance: +/-10% of the isokinetic sampling rate.

The digital pyrometer in the metering console was calibrated using a NIST traceable Omega® Model CL 23A temperature calibrator.

All samples were appropriately packaged and shipped overnight on ice. All QA/QC was performed in accordance with USEPA Method 23.

Appendix 6 presents test equipment quality assurance data (instrument calibration and system bias check records, calibration gas and gas divider certifications, interference test results, meter box calibration records, Pitot tube, nozzle, and probe calibration records, etc.).

6.0 RESULTS

6.1 Test Results and Allowable Emission Limits

Process data and air pollutant emission measurement results for each four hour test period are presented in Table 6.1.

The D/F target analytes were only detected in the first test sample (test ID CD-1). The contract laboratory reported ND (non-detect) for analysis of the second and third test samples. The overall toxic equivalency (TEQ) was determined for each sample by adding the individual toxic equivalency quotients (ITEQ). For ND analytes, the detection limit was included in the TEQ emission calculation as a worst case scenario.

The measured D/F emission rate for EU-ChipDryer exhaust is less than the allowable limits specified in PTI 78-15D and 40 CFR Part 63 Subpart RRR; 3.5E-5 gr D/F TEQ per ton of feed charged.

6.2 Variations from Normal Sampling Procedures or Operating Conditions

The testing for all pollutants was performed in accordance with USEPA methods and the approved test protocol.

Table 6.1 Measured exhaust gas conditions and air pollutant emission rates for EU-ChipDryer

Test No.	CD-1	CD-2	CD-3	
Test date	5/24/17	5/25/17	5/25/17	Three Test
Test period (24-hr clock)	16:00-20:25	9:21-16:04	17:50-22:15	Average
Chip charge rate (ton/hour)	0.91	1.1	0.73	0.92
Oxidizer temperature (°C)	725	725	726	725
Fan air flow (scfm)	5,720	5,525	5,750	5,665
Cyclone inlet/outlet pressure ("H_2O)	-5.6/-0.7	-5.5/-0.6	-5.6/-0.7	-5.6/-0.7
Chip dryer temperature (°C)	225	224	226	225
Exhaust Gas Composition				
CO_2 content (% vol)	2.21	2.27	2.31	2.27
O_2 content (% vol)	17.4	17.4	17.5	17.4
Moisture (% vol)	5.4	5.5	5.5	5.5
Exhaust gas temperature (°F)	967	962	959	963
Exhaust gas flowrate (scfm)	6,563	6,932	6,809	6,768
Exhaust gas flowrate (dscfm)	6,208	6,549	6,433	6,397
Dioxin and Furan Emissions				
Sample Volume (std ft^3)	184	190	189	188
D/F Sample Weight[1] (pg)	2.29	N/D	N/D	0.76
Emission Factor (g/dscf)	1.25E-14	0.0	0.0	4.16E-14
Toxic Equivalency (TEQ)				
D/F TEQ in sample[2] (pg)	7.24	12.7	8.22	9.39
Emission Rate (g/hr)	1.47E-08	2.62E-08	1.68E-08	1.92E-08
Emission Rate (gr/ton charged)	2.49E-07	3.59E-07	3.54E-07	3.21E-07
Permit Limit (gr/ton charged)				*3.5E-05*

1. Total combined weight of individual dioxins and furans detected in sample.
2. Includes detection limit weight if analyte was listed as ND on the laboratory report.