AIR DYNAMICS TESTING

Compliance Test Report for Aludyne
5353 Wilcox St., Montague, MI 49437
Verification and Quantification of
Particulate/PM10/PM2.5 Emissions on
the EU-Chip Dryer

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Date of Test: 10/18/19

Prepared For:

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EXECUTIVE SUMMARY

Air Dynamics Testing, LLC. (Air Dynamics) has prepared this source test report on behalf of Aludyne Montague LLC. (Aludyne). Air Dynamics conducted source emissions testing on October 18, 2019 at Aludyne's facility in Montague, MI in fulfillment of the submitted test plan for the EU-Dryer to demonstrate compliance with the Michigan Department of Environmental Quality (MDEQ) request for information and to demonstrate compliance with the regulations set forth in National Emission Standard for Hazardous Air Pollutants (NESHAP) Subpart RRR.

The test results are summarized below in Table ES-1 and ES-2.

Table ES-1. Emissions Results Summary of Test #1

Unit	Test Parameter	Emission Rate	Limit^
Chip Dryer with Afterburner	Filterable + Condensable PM2.5	1.79 lbs/ton	0.3 Filterable + Condensable PM lbs/ton
	Filterable + Condensable PM10	1.79 lbs/ton	

^Limits from NESHAPs Subpart RRR

Table ES-2. Emissions Results Summary of Test #2

Unit	Test Parameter	Emission Rate	Limit^
Chip Dryer with Afterburner	Filterable + Condensable PM2.5	1.94 lbs/ton	0.3 Filterable + Condensable PM lbs/ton
	Filterable + Condensable PM10	1.94 lbs/ton	

^Limits from NESHAPs Subpart RRR

1.0 INTRODUCTION

Air Dynamics Testing, LLC. (Air Dynamics) has prepared this source test report on behalf of Aludyne. Air Dynamics conducted source emissions testing on October 18, 2019 at their facility in Montague, MI in fulfillment of the submitted test plan for the EU-Dryer to demonstrate compliance with the United States Environmental Protection Agency Section 114 request for information and to demonstrate compliance with the regulations set forth in National Emission Standard for Hazardous Air Pollutants (NESHAP) Subpart RRR.

Table 1-1 below presents the emission unit(s) and parameters that were tested. The test was conducted in accordance with approved Environmental Protection Agency (EPA) Registered Test Methods and the accepted MDEQ Compliance Test Protocol Form included in the Appendix of this document.

Table 1-1. Emissions Sampling Summary

TEST LOCATION	PARAMETER	TEST METHOD	# OF TEST RUNS	SAMPLE DURATION (MIN)	ANALYTICAL APPROACH
EU-DRYER	EXHAUST FLOW	USEPA METHOD 1,2	3	60	PITOT TUBE
	EXHAUST TEMP	USEPA METHOD 1,2	3	60	THERMOCOUPLE
	O2/CO2	USEPA METHOD 3	3	60	FYRITE
	MOISTURE	USEPA METHOD 4	3	60	GRAVIMETRIC
	FILTERABLE PM	USEPA METHOD 5	3	60	GRAVIMETRIC
	CONDENSABLE PM	USEPA METHOD 202	3	60	GRAVIMETRIC

Table 1-2. Project Personnel

Firm	Contact	Title	Phone No.
Air Dynamics	Noah Dicen	Field Technician/Principal	855.839.8378
Air Dynamics	Mark Weintraut	Field Technician	855.839.8378
Chassix	Mary Twa	EHS Manager	231.894.9051
MDEQ	Eric Grinstern	Environmental Quality Scientist	231.878.6687
MDEQ	Jeremy Howe	Environmental Quality Analyst	231.878.6687

2.0 FACILITY DESCRIPTION AND SOURCE INFORMATION

2.1 Facility and Process Description

Aludyne Montague LLC., is located in Montague, Michigan, manufactures aluminum iron cast and machined chassis sub-frame automotive components. An aerial view of the facility is included below in Figure 2-1.

Figure 2-1. Aerial View of Facility

The source tested consist of:

Chip dryer consisting of an enclosed heated screw conveyor utilizing waste heat from the melting furnaces. The dryer has a fuel rating of 6.6 MMBtu/hr of natural gas.

Under NESHAP 40 CFR 63 Subpart RRR, the chip dryer is considered a thermal chip dryer at an area source. While federally enforceable emission limitations for PM-10 and PM-2.5 do not apply, limitations established in PTI 41-00D are as follows:
EU_Dryer, I(2,3): Emission Limits of 0.30 lb of PM-10 and PM-2.5 per ton of feed charge of aluminum chips to the chip dryer.

3.0 SUMMARY OF EVENTS AND RESULTS

3.1 Summary of Test Events

Air Dynamics arrived at Aludyne the afternoon of October 17th, 2019 to setup equipment for testing on the EU-Dryer. On the 18th Air Dynamics performed the 6 test runs for Particulate Matter/PM10/PM2.5. Two sets of tests were conducted, and the times of the runs are located in Table 3-1 and 3-2.

3.2 Deviation from Test Plan

Deviations from the Test Plan included the following:

After submittal of the test protocol and before conduction of the testing, a decision was made to conduct two sets of three 1-hour test runs instead of one set of three 1-hour test runs.

3.3 Results – EU Chip Dryer

Table 3-1. Results – Test #1 Particulate Matter/PM10/PM2.5

Stack Gas Characteristics	Run 1 10/18/19 (7:45 – 8:48)	Run 2 10/18/19 (9:13 – 10:15)	Run 3 10/18/19 (10:33 – 11:36)	Average
Filterable (gr/dscf)	0.0098	0.0080	0.0085	0.0088
Filterable (lbs/hr)	0.67	0.52	0.54	0.57
Condensable (gr/dscf)	0.012	0.012	0.021	0.015
Condensable (lbs/hr)	0.81	0.78	1.30	0.96
Filterable + Condensable (gr/dscf)	0.022	0.020	0.029	0.024
Filterable + Condensable (lbs/hr)	1.48	1.29	1.84	1.54
Filterable + Condensable (lbs/ton)	1.83	1.45	2.08	1.79
Oxygen %	21.0	20.5	20.5	20.7
Carbon Dioxide %	0.0	0.0	0.0	0.0
Actual Cubic Feet / Minute	10,996	10,504	10,636	10,712
Dry Standard Cubic Feet / Minute	7,940	7,517	7,363	7,607
Avg. Stack Temp. (deg. F)	240.8	248.8	251.3	247.0
Stack Gas Velocity (feet/sec)	32.81	31.35	31.74	31.97
%Isokinetics (Vn/Vs)	99.3	101.9	102.5	101.2
% Moisture of Stack Gas	2.4	2.2	5.1	3.2
Sample Volume (cubic feet)	43.3	42.5	42.3	42.7
Production Rate (tons/hr)	0.81	0.89	0.88	0.86

Table 3-2. Results – Test #2 Particulate Matter/PM10/PM2.5

Stack Gas Characteristics	Run 1 10/18/19 (12:40 – 13:40)	Run 2 10/18/19 (14:00 – 15:02)	Run 3 10/18/19 (15:20 – 16:21)	Average
Filterable (gr/dscf)	0.0072	0.0040	0.0051	0.0054
Filterable (lbs/hr)	0.45	0.25	0.31	0.34
Condensable (gr/dscf)	0.041	0.016	0.016	0.024
Condensable (lbs/hr)	2.58	0.99	1.00	1.52
Filterable + Condensable (gr/dscf)	0.048	0.020	0.021	0.030
Filterable + Condensable (lbs/hr)	3.04	1.24	1.31	1.86
Filterable + Condensable (lbs/ton)	3.20	1.26	1.36	1.94
Oxygen %	21.0	20.5	20.5	21.0
Carbon Dioxide %	0.0	0.0	0.0	0.0
Actual Cubic Feet / Minute	10,413	10,299	10,048	10,253
Dry Standard Cubic Feet / Minute	7,354	7,256	7,142	7,251
Avg. Stack Temp. (deg. F)	252.1	257.0	251.5	253.5
Stack Gas Velocity (feet/sec)	31.08	30.73	29.98	30.60
%Isokinetics (Vn/Vs)	99.7	101.5	99.0	100.1
% Moisture of Stack Gas	3.0	2.6	2.5	2.7
Sample Volume (cubic feet)	41.4	41.9	40.3	41.2
Production Rate (tons/hr)	0.95	0.98	0.96	0.96

4.0 METHODOLOGY

The sampling procedures used by Air Dynamics were performed according to Title 40 CFR Part 60 Appendix A and are as follows:

Table 4-1. Sampling Procedures

Method	Description
US EPA Method 1	Determination of Velocity Traverses for Stationary Sources
US EPA Method 2	Determination of Stack Gas Velocity and Volumetric Flow Rate
US EPA Method 3	Gas Analysis for the Determination of Molecular Weight
US EPA Method 4	Determination of Moisture Content in Stack Gas
US EPA Method 5	Determination of Particulate Matter Emissions
US EPA Method 202	Determination of Condensable Particulate Matter

4.1 Sample Point Determination-EPA Method 1

Sampling point locations were determined according to EPA Reference Method 1.

Table 4-2. Sampling Points

Locations	Dimensions	Ports	Points Per Port	Total Points
EU-Dryer Stack	32"	2	12	24

** Exact measurement points and distances to disturbances are listed in Appendix B - Field Data.

4.2 Velocity and Volumetric Flow Rate – EPA Method 2

EPA Method 2 was used to determine the gas velocity and flow rate at the stack. Each set of velocity determinations included the measurement of gas velocity pressure and gas temperature at each of the Method 1 determined traverse points. The velocity pressures were measured with a Type S pitot tube. Gas temperature measurements were made with a Type K thermocouple and digital pyrometer.

4.3 Gas Composition and Molecular Weight – EPA Method 3

The oxygen and carbon dioxide concentrations were determined in accordance with EPA Method 3 using a Fyrite analyzer. The remaining stack gas constituent was assumed to be nitrogen for the stack gas molecular weight determination.

4.4 Moisture Content – EPA Method 4

The flue gas moisture content at the testing locations was determined in accordance with EPA Method 4. The gas moisture was determined by quantitatively measuring condensed moisture in the chilled impingers and silica absorption. The amount of moisture condensed was determined gravimetrically. A dry gas meter was used to measure the volume of gas sampled. Moisture content is used to determine stack gas velocity.

4.5 Determination of Filterable PM– EPA Method 5

Particulate matter (PM) was withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, was determined gravimetrically after the removal of uncombined water. A diagram of the Method 5 train is shown below in Figure 4-1.

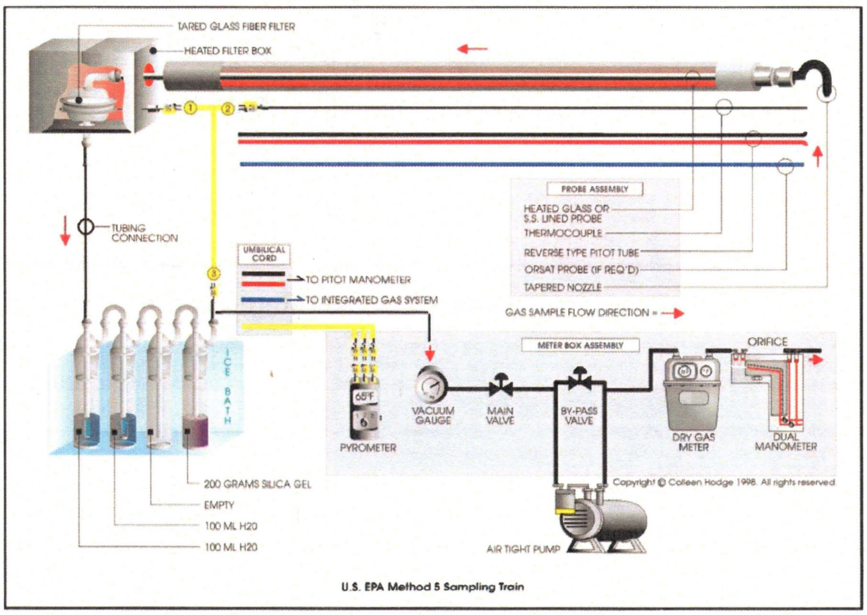

Figure 4-1. Method 5 Sampling Train

4.6 Determination of Condensable PM – EPA Method 202

The CPM was collected in dry impingers after filterable PM was collected on a filter maintained as specified in either Method 5 of Appendix A-3 to part 60, Method 17 of Appendix A-6 to part 60, or Method 201A of Appendix M. The organic and aqueous fractions of the impingers and an out-of-stack CPM filter were then desiccated and weighed by a subcontracted lab. The total of the impinger fractions and the CPM filter represents the CPM. A diagram of the Method 202 sampling train is presented below in Figure 4-2.

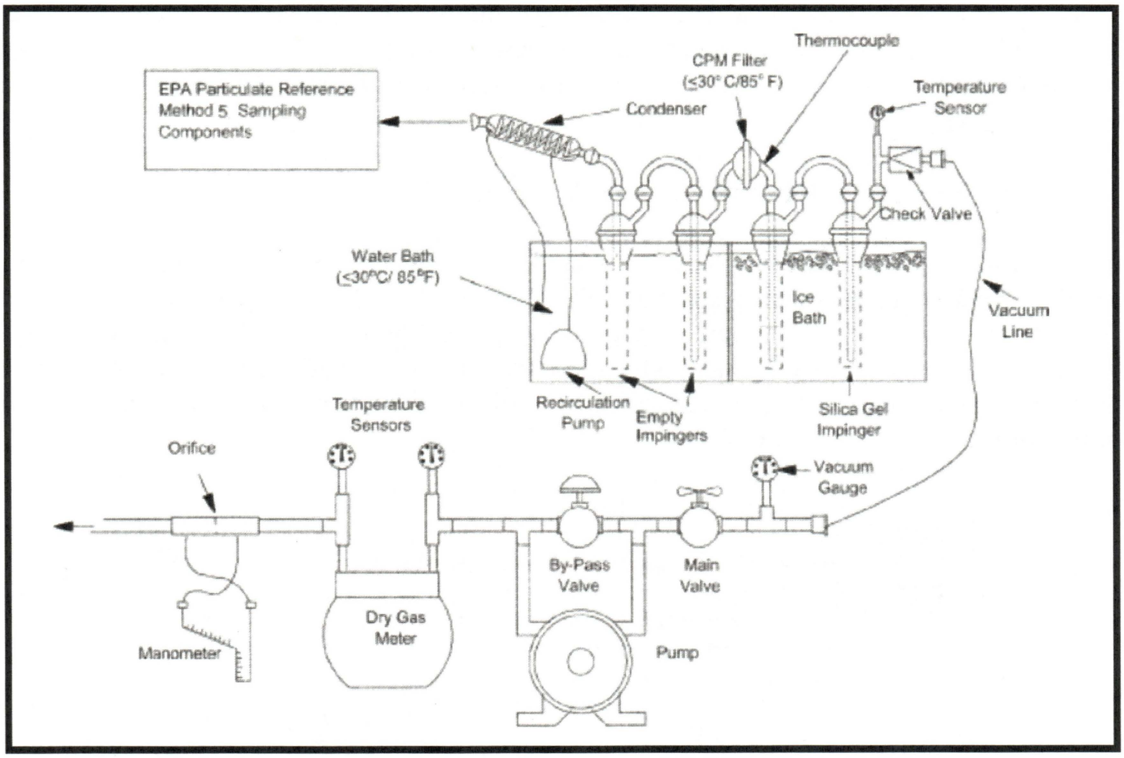

Figure 4-2 Method 202 Sampling Train

5.0 AIR DYNAMICS QUALITY ASSURANCE AND QUALITY CONTROL

5.1 Sampling Protocol

Air Dynamics Testing (Air Dynamics) is organized to facilitate sample management, analytical performance management, and data management. Personnel are assigned specific tasks to ensure implementation of the quality assurance/quality control (QA/QC) program. The Senior Project Manager in charge of air emission measurement projects reports directly to the Director of Air Analysis Services and are the QA officers responsible for program effectiveness and compliance.

The analysts perform the data reduction, analyses, and initial data review. Each analyst must check and initial their work, making certain that it is complete, determining that any instrumentation utilized has been properly calibrated, and ensuring that the analysis has been performed within the QA/QC limits.

The Senior Project Manager evaluates and verifies the data submitted by the analysts, verifies that the data and documentation are complete, confirms that all analysis has been performed within QA criteria specific to each method, checks calculations, assembles and signs the data package, and reviews the final report.

5.2 Equipment Maintenance and Calibration

The Field Supervisor and Field Technicians are in charge of routine maintenance and calibration of all source-testing equipment. Relevant calibration information is included in the Appendices of this report.

5.2.1 Equipment Maintenance

All major pieces of equipment have maintenance logs where all maintenance activities are recorded and documented. Table 5-1 shows routine maintenance that is performed on Air Dynamics source testing equipment.

Table 5-1. Test Equipment - Routine Maintenance Schedule

Equipment	Acceptance Limits	Frequency of Service	Methods of Service
Pumps	• Absence of leaks • Ability to draw vacuum within equipment specifications	Every 500 hours of operation or 6-months, whichever is less	• Visual inspection • Lubrication
Flow Meters	• Free mechanical movement • Absence of malfunction • Calibration within tolerance	Every 500 hours of operation or 6-months whichever is less	• Visual inspection • Clean • Calibrate
Electronic Instrumentation	• Absence of malfunction • Proper response to calibration gases and signals	As recommended by manufacturer or when required due to unacceptable limits	• Clean • Replace parts as necessary • Other recommended manufacturer service
Mobile Laboratory Sampling System	• Absence of leaks. • Sample lines clean and free of debris • Proper input flow rates to analyzers	At least once per month or sooner depending on nature of use.	• Change filters • Change gas dryer • Leak check • Check for contamination
Sample Lines	• Absence of soot and particulate buildup • Adequate sample flow	At least once per month or sooner depending on nature of use.	• Flush with solvents and water • Heat and purge line with nitrogen

5.2.2 Equipment Calibration

Current calibration information on equipment used during testing is included in the Appendices of this report.

The S-Type pitot tubes are calibrated initially upon purchase and then semiannually. Visual measurements are taken prior to each use to insure accidental damage has not occurred. Measurements are performed using a micrometer and protractor.

Each temperature sensor is marked and identified. This is done by marking each thermocouple end connector with a number. The sensor is calibrated as a unit with the control box potentiometer and associated lead wire as an identified unit. Calibrations are performed initially and annually at three set-points over the range of expected temperatures for that particular thermocouple. A reference output-voltage/thermocouple calibrator is used as a temperature reference source for the multi-point calibrations.

The field barometer is adjusted initially and semiannually to within 0.1" Hg of the actual atmospheric pressure at the Air Dynamics laboratory facility in Indianapolis, Indiana. All dry gas field meters are calibrated before initial use. Once the meter is placed in operation, its calibration is checked after each test series or bimonthly, whichever is less. Dry gas meters are calibrated against a NIST reference meter or orifice.

The dry gas meter orifice is calibrated before its initial use and then annually. This calibration is performed during the calibration of the dry gas test meter. The unit is checked in the field after every series of tests using a field gas-meter check procedure.

Analytical balances are internally calibrated prior to use following the manufacturer's instructions. The balances are further checked using Class S-1 analytical weights prior to daily usage. Field top loading balances are checked with a field analytical weight prior to usage.

6.0 AIR DYNAMICS DATA REDUCTION VALIDATION AND REPORTING

The data presented in final reports are reviewed three times. First, the analyst reviews and certifies that the raw data complies with technical controls, documentation requirements, and standard group procedures. Second, the Senior Project Manager reviews and certifies that data packages comply to specifications for sample holding conditions, chain of custody, data documentation, and the final report is free of transcription errors. Third, a QA review is performed by additional senior personnel. This review thoroughly examines the entire completed data report. Once the review process is completed, the report is approved by Air Dynamics senior personnel and issued. All raw laboratory data and final reports are stored for a minimum of 5 years.