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REPORT OF PARTICULATE, PM-10, PM-2.5, METALS (HEXAVALENT CHROMIUM LEAD & MERCURY) AND VOLATILE ORGANIC COMPOUND (VOC) EMISSION TESTING ON THE EU-SHREDDER EXHAUST STACK AT THE LOUIS PADNOS IRON & METAL FACILITY LOCATED IN HOWELL, MI

EMISSION UNIT: EUSHREDDER

Prepared for:

LOUIS PADNOS IRON & METAL
645 LUCY ROAD
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Prepared by:

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MARCH 13 &14, 2024
STACK TEST GROUP, INC. PROJECT NO. 24-3652

Report Prepared By:

Bill J. Byczynski
President

1.0 EXECUTIVE SUMMARY

On March 13 & 14, 2024 the Stack Test Group, Inc. performed particulate, PM-10, PM-2.5, metals (hexavalent chromium, mercury & lead), and VOC emissions testing on the EU-Shredder exhaust stack at Louis Padnos Iron & Metal facility located in Howell, MI.. Three tests were conducted on the EU-Shredder exhaust stack for the above mentioned parameters. Presented below are the average results of these tests.

Total Particulate/PM-10/PM-2.5:	
PM/PM-10/PM-2.5 Concentration:	0.0141 Grains per DSCF
PM/PM-10/PM-2.5 Emission Rate:	1.43 Pounds per Hour
PM/PM-10/PM-2.5 Concentration:	0.027 Pounds per 1000 Pounds Gas
Hexavalent Chromium Emission Rate:	4.81E-04 Pounds per Hour
Lead Emission Rate:	2.72E-03 Pounds per Hour
Mercury Emission Rate:	1.10E-03 Pounds per Hour
VOC Concentration:	155.4 Parts per Million
VOC Emission Rate:	13.38 Pounds per Hour

2.0 INTRODUCTION

The Stack Test Group, Inc. conducted particulate, PM-10, PM-2.5, metals (hexavalent chromium, lead & mercury) and VOC emissions testing on the EI-Shredder exhaust stack. Testing was performed at Louis Padnos Iron & Metal facility located in Howell, MI. Testing was conducted on March 13 & 14, 2024. The purpose of this testing was to determine the concentrations and emissions rates of the above listed parameters exhausting from the stack. The permit number for this facility is 141-19.

Testing was supervised:
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Testing was coordinated by:
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All testing followed the guidelines of U.S. EPA Reference Methods 1 through 5, 25A, 29 and 202. This report contains a summary of results for the above mentioned tests and all the supporting field, process, and computer generated data.

Testing was conducted while Louis Padnos Iron & Metal personnel operated the EU Shredder at normal conditions and as close to the maximum rate as possible. Process data recorded during this test series is included in Appendix F.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 Exhaust Gas Parameters

3.1.1 Traverse and Sampling Points

Testing was conducted on the exhaust stack of the EU Shredder. The number of velocity traverse and sample measurement points for the stack was determined using EPA Method 1. The test port were located approximately 25 feet downstream (10 diameters) and 30 feet upstream (12 diameters) of the nearest flow disturbance. Velocity and sample measurements were taken at each of 12 points, 6 points in each of the two ports set at 90° to each other. The diameter of the stack is 30". The test points in both ports A & B were located at the following locations from the inside wall of the stack.

Point 1	1.3"
Point 2	4.4"
Point 3	8.9"
Point 4	21.1"
Point 5	25.6"
Point 6	28.7"

3.1.2 Velocity Traverse

Velocity measurements were performed during each emission test in accordance with EPA Method 2. An "S" type Pitot Tube with an attached type "K" thermocouple was used to conduct the velocity traverse. A cyclonic flow check was performed prior to the commencement of testing. The results of this test are included in Appendix B. The results are within the acceptable limit of 20 percent.

3.1.3 Gas Composition

Gas composition for oxygen, carbon dioxide, and nitrogen was determined employing EPA Method 3. An integrated gas sample was collected during each emission test. Gas analysis was conducted using a calibrated O2/CO2 analyzer.

3.1.4 Moisture Content

The exhaust gas moisture content was determined using EPA Method 4 for all tests. Moisture content was determined by drawing the gas sample through four impingers in the sample train. Volumetric analysis was used to measure the condensed moisture in the first three impingers while gravimetric analysis of silica gel was used to measure moisture collected in the fourth impinger.

3.2 Particulate/PM-10/PM-2.5

3.2.1 Sample Collection

Particulate, PM-10 and PM-2.5 emissions were determined following the guidelines of USEPA Reference Methods 1, 2,3,4,5 and 202. These Methods are titled:

Method 1	Sample and Velocity Traverses for Stationary Sources
Method 2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Type "S" Pitot Tube)
Method 3	Gas Analysis for Carbon Dioxide, Oxygen, Excess Air and Dry Molecular Weight
Method 4	Determination of Moisture Content from Stationary Sources
Method 5	Determination of Particulate Emissions from Stationary Sources
Method 202	Determination of Condensable Particulate Emissions from Stationary Sources

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR), Part 60, Appendix A.

The Method 5/202 sampling train consisted of the following components.

1. Appropriately sized glass nozzle
2. Sample probe with heated glass liner
3. Heated Glass filter
4. Condenser, Drop out Impinger, 2 Modified Greenburg-Smith Impingers, Teflon CPM Filter in a dual insulated ice water bath in the following sequence:
   - A. Method 202 Vertical Condenser.
   - B. Method 23 Knockout Impinger.
   - C. Modified Greenburg-Smith Impinger Empty.
   - D. Glass Filter Assembly Containing a Teflon Filter.
   - E. Modified Greenburg-Smith Impinger with 100 mls of Water.
   - F. Known Amount of Silica Gel.
5. Sampling gas measuring system.

3.2.2 Sample Duration and Frequency

The Method 5/202 train samples were collected in triplicate with each test lasting sixty minutes in duration. A minimum sample size of 30 dry standard cubic feet (dscf) was collected for each test.

3.2.3 Sample Recovery

Upon completion of each test, the sampling train was removed from the stack. The probe, nozzle, and prefilter glassware were rinsed, brushed and placed into a labeled container. The filter was placed into a separate container. The impingers were weighed for moisture gain. The train was then purged at approximately15L/min for one hour The contents of the impingers were placed into a separate container along with the DI

rinses of the impingers. The impingers were then rinsed with acetone and hexane and placed into a separate container. The CPM filter was placed in a separate container.

3.2.4 Analytical Procedures

The total particulate mass was determined by adding the weight of the particulate from the probe and prefilter wash with the particulate on the filter and the condensables.

The acetone and hexane wash containing the particulate from the probe wash, train and prefilter glassware was placed into a tared beakers, evaporated to dryness, desiccated for 24 hours, and then weighed in 6 hour intervals to a constant weight. An acetone blank was also analyzed and subtracted from the particulate weight of the acetone wash.

The tared glass fiber filter was desiccated for 24 hours, and then weighed every six hours to constant weight.

3.2.5 Blanks

Blanks for the particulate sampling train were prepared by recovering a sampling train in the same manner listed above.

3.2.6 Calibrations

All sampling equipment was calibrated according to the procedures outlined in EPA Reference Method 5 and 202.

3.3 VOC TESTING

3.3.1 Sample Collection

Testing on the EU Shredder exhaust stack was performed using U.S. EPA Method 25A. A J.U.M. Model 3-500 Flame Ionization Detector (FID) was used to determine the emission concentrations. A sample was transported through a heated Teflon line from the exhaust stack to the FID which analyzed the sample continuously. The output signal from the FID were then recorded at on a datalogger at one minute averages throughout the test. Copies of this data may be found in Appendix E.

At the beginning of the test series, the analyzer was calibrated and then checked for calibration error by introducing zero, low-range, mid-range and high-range calibration gases to the back of the analyzer. Before and after each individual test run, a system bias was performed by introducing a zero and mid-range propane calibration gas to the outlet of the probe. Calibration gases used were U.S. EPA Protocol 1 certified.

3.3.2 Sample Duration and Frequency

The Method 25A samples were collected in triplicate with each test lasting sixty minutes in duration.

3.3.3 Calibrations

All sampling equipment was calibrated according to the procedures outlined in EPA Reference Method 25A. The analyzer calibrations along with the protocol gas certification sheets are included in Appendix D.

3.4 METALS

3.4.1 Sample Collection

Metals emissions were determined in accordance with USEPA Reference Methods 1,2,3,4 and 29. These Methods are titled:

Method 1	Sample and Velocity Traverses for Stationary Sources
Method 2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Type "S" Pitot Tube)
Method 3	Gas Analysis for Carbon Dioxide, Oxygen, Excess Air and Dry Molecular Weight
Method 4	Determination of Moisture Content from Stationary Sources
Method 29	Determination of Metals Emissions from Stationary Sources

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR), Part 60, Appendix A.

The Method 29 sampling train consisted of the following components.

1. Appropriately sized glass nozzle
2. Sample probe with heated glass liner
3. Heated Quartz filter with Teflon frit
4. Six impingers in an insulated ice water bath in the following sequence:
   - A. Modified Greenburg-Smith design empty.
   - B. Modified Greenburg-Smith design containing 5%HNO_3/ 10%H_2O_2.
   - C. Greenburg-Smith design containing 5%HNO_3/10%H_2O_2.
   - D. Modified Greenburg-Smith design containing 4% $KmnO_4$ and 10% H_2SO_4.
   - E. Modified Greenburg-Smith design containing 4% $KmnO_4$ and 10% H_2SO_4.
   - F. Known amount of Silica Gel.
5. Sampling gas measuring system.

3.4.2 Sample Duration and Frequency

The Method 29 train samples were collected in triplicate with each test lasting 120 minutes in duration. A minimum sample size of 60 dry standard cubic feet (dscf) was collected for each test.

3.4.3 Sample Recovery

Upon completion of each test the sampling train was removed from the stack. The probe, nozzle, and prefilter glassware were rinsed and brushed with 0.1N nitric acid and placed into a labeled container. The filter was placed into a separate container. The impingers were weighed for moisture gain. The contents of the impingers were then placed into a separate labeled container. The impingers and all connecting glassware were then rinsed

three times with 0.1N nitric acid and placed into the same container. All sample containers were pre-cleaned glass amber jars with Teflon lined lids.

The samples were then placed on ice and transported to the laboratory along with the chain-of-custody records.

3.4.4 Analytical Procedures

The samples were analyzed according to the procedures of U.S. EPA Method 29. The laboratory report is included in Appendix C.

3.4.5 Blanks

Blanks for the Method 29 train were prepared by recovering a blank sample train in the same manner listed above.

3.4.6 Calibrations

All sampling equipment was calibrated according to the procedures outlined in EPA Reference Method 29.

4.0 TEST RESULTS

Presented in this section are the results of this test series. Test results are reported in Tables 4.1 and 4.2. Table 4.1 present the stack gas conditions including stack gas temperature, percent carbon dioxide and oxygen, percent moisture, molecular weight of the stack gas dry and wet, velocity in feet per second (fps), and flow rate in actual cubic feet per minute (acfm), standard cubic feet per minute (scfm), and dry standard cubic feet per minute (dscfm).

Table 4.1 presents the results of the particulate/PM-10/PM-2.5 and VOC testing. The particulate/PM-10/PM-2.5 results are presented in grains per dry standard cubic feet (grains/DSCF), pounds per dry standard cubic feet (lb/DSCF) and pounds per hour (lbs/hr). The VOC results are presented in terms of parts per million as propane (ppm), lb/scf and lb/hr.

Table 4.2 presents the results of the metals testing. The auxiliary data is presented in the same format as Table 4.1. The results for the individual metals (mercury, hexavalent chromium and lead) are presented in terms of Grain/DSCF, pounds per DSCF and lbs/hr.

Copies of the calculations used to determine these emission rates may be found in Appendix A. Copies of the field data sheets are presented in Appendix B. Copies of the analytical results are presented in Appendix C. Copies of equipment calibrations are presented in Appendix E.

Table 4.1

Particulate (PM), PM-10, PM-2.5 & VOC Results
Padnos Iron & Metal Company
Delaware, OH
03/13/24

EU-Shredder Exhaust Stack

Test No:	T1	T2	T3	Avg.
Start Time:	08:32 AM	10:12 AM	11:49 AM	
Finish Time:	09:39 AM	11:16 AM	12:53 PM	
Stack Gas Temperature, degrees F:	90.2	113.90	107.80	104.0
% Carbon Dioxide:	0.2	0.2	0.2	0.2
% Oxygen:	20.7	20.7	20.7	20.7
% Moisture:	3.56	3.71	4.29	3.85
Molecular Weight dry, lb/lb-Mole:	28.86	28.86	28.86	28.86
Molecular Weight wet, lb/lb-Mole:	28.47	28.46	28.39	28.44
Velocity and Flow Results:				
Average Stack Gas Velocity FPS:	50.04	46.86	41.80	46.23
Stack Gas Flow Rate, ACFM:	14,742	13,805	12,314	13,620
Stack Gas Flow Rate, SCFM:	13,655	12,259	11,053	12,323
Stack Gas Flow Rate, DSCF/HR:	790,146	708,273	634,734	711,051
Stack Gas Flow Rate, DSCFM:	13,169	11,805	10,579	11,851
Particulate, PM-10 and PM-2.5 Results:				
Grains Per DSCF:	0.0133	0.0143	0.0147	0.0141
LBS/DSCF:	1.90E-06	2.05E-06	2.10E-06	2.01E-06
LBS/HR:	1.50	1.45	1.33	1.43
LBS/1000 Pounds Gas:	0.025	0.027	0.028	0.027
VOC Results:				
VOC, PPM as Propane:	168.2	222.7	75.2	155.4
LBS/DSCF:	1.92E-05	2.54E-05	8.59E-06	1.77E-05
LBS/HR:	15.74	18.71	5.70	13.38

Table 4.2

Metals (Lead, Hexavalent Chromium & Mercury) Results
Padnos Iron & Metal Company
Delaware, OH
3/13 & 3/14/2024

EU-Shredder Exhaust Stack

Test No:	T1	T2	T3	Avg.
Start Time:	01:28 PM	08:34 AM	11:29 AM	
Finish Time:	08:11 AM	10:50 AM	01:33 PM	
Stack Gas Temperature, degrees F:	110.8	95.20	102.50	102.8
% Carbon Dioxide:	0.2	0.2	0.2	0.2
% Oxygen:	20.7	20.7	20.7	20.7
% Moisture:	3.84	3.67	4.00	3.84
Molecular Weight dry, lb/lb-Mole:	28.86	28.86	28.86	28.86
Molecular Weight wet, lb/lb-Mole:	28.44	28.46	28.43	28.44
Velocity and Flow Results:				
Average Stack Gas Velocity FPS:	34.99	33.83	33.45	34.09
Stack Gas Flow Rate, ACFM:	10,308	9,966	9,854	10,043
Stack Gas Flow Rate, SCFM:	9,204	9,177	8,956	9,112
Stack Gas Flow Rate, DSCF/HR:	531,016	530,419	515,881	525,772
Stack Gas Flow Rate, DSCFM:	8,850	8,840	8,598	8,763
Lead Results:				
Grains Per DSCF:	2.58E-05	4.97E-05	3.31E-05	3.62E-05
LBS/DSCF:	3.68E-09	7.11E-09	4.74E-09	5.18E-09
LBS/HR:	1.96E-03	3.77E-03	2.44E-03	2.72E-03
Hexavalent Chromium Results:				
Grains Per DSCF:	5.55E-06	7.64E-06	6.01E-06	6.40E-06
LBS/DSCF:	7.94E-10	1.09E-09	8.59E-10	9.15E-10
LBS/HR:	4.21E-04	5.79E-04	4.43E-04	4.81E-04
Mercury Results:				
Grains Per DSCF:	1.30E-05	1.53E-05	1.55E-05	1.46E-05
LBS/DSCF:	1.86E-09	2.18E-09	2.21E-09	2.08E-09
LBS/HR:	9.85E-04	1.16E-03	1.14E-03	1.10E-03