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COMPLIANCE EMISSION TEST REPORT FOR PARTICULATE (PM) AND VISIBLE EMISSIONS ON THE TRUCK RECEIVING BAGHOUSE EXHAUST STACK AND VISIBLE EMISSIONS ON THE TRUCK RECEIVING DOORS AT THE ADM FACILITY LOCATED IN OTTAWA LAKE, MICHIGAN

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STACK TEST GROUP PROJECT NO. 14-2536

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1.0 EXECUTIVE SUMMARY

On June 26, 2014 the Stack Test Group performed Particulate and visible emissions testing at the ADM facility located in Ottawa Lake, Michigan. Testing was conducted on the exhaust stack of the Truck Receiving Baghouse for particulate and visible emissions. Visible emissions were done on receiving doors 1, 2 and 3. Testing was done on the receiving doors while trucks were present. Presented below are the average results of these three tests.

Truck Receiving Exhaust:		
Particulate Concentration:	0.0003	Grains per DSCF
Particulate Emission Rate:	0.11	Pounds per Hour
Particulate Emission Rate:	4.46E-08	Pounds per DSCF
Opacity (Highest 6 min. avg.):	0.0	Percent

Visible Emissions:		
Receiving Door #1	0.4	Percent
Receiving Door #2	0.6	Percent
Receiving Door #3	0.8	Percent
Receiving Door #4		No Trucks

2.0 INTRODUCTION

The Stack Test Group conducted particulate emission testing on the exhaust stack of the Truck Receiving Baghouse Exhaust. Testing was performed at the ADM facility located in Ottawa Lake, Michigan on May 26, 2014. Three tests were conducted on this source. The purpose of this testing was to determine the concentrations and emissions rates of the particulate matter exhausting from the stack and to prove compliance with the existing permit condition.

U.S. EPA Methods 1, 2, 3, 4, 5 were used to determine the filterable particulate emissions. EPA Method 9 was used to determine visible emissions.

The particulate matter was determined by analyzing the filterable portion and the prefilter rinses of the U.S. EPA Method 5 sampling train.

Testing was conducted while ADM personnel operated the grain receiving pit and the baghouses at normal conditions. Refer to Appendix E for the actual tonnage processed during each test.

Testing was supervised by Mr. Nicholas Sergenti of the Stack Test Group, Inc. and coordinated by Mr. Perry Coxs of ADM. Opacity observations were made by Mr. Zac McGrogan of the Stack Test Group, Inc. Mr. Nathan Hude of the Department of Environmental Quality (MDEQ) was present to witness the testing.

All testing followed the guidelines of U.S. EPA Reference Methods 1, 2, 3, 4, 5, and 9. This report contains a summary of results for the above mentioned tests and all the supporting field, process, and computer generated data.

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 truck receiving baghouse. The number of velocity traverse and sample measurement points for the stack was determined using EPA Method 1. The test ports were located approximately 240 inches (5.0 equivalent diameters) downstream and approximately 120 inches (2.5 equivalent diameters) upstream of the nearest flow disturbance. The stack inside diameter measured 48 inches. Velocity and particulate measurements were taken at each of 24 points, 12 points across each of the two ports set 90 degrees horizontal to each other.

3.1.2 Velocity Traverse

Velocity measurements were performed during each particulate 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.

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 particulate emission test. Gas analysis was conducted using a Fyrite 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

3.2.1 Sample Collection

Particulate emissions were determined following the guidelines of USEPA Reference Methods 1, 2,3,4,5 and 9. These Methods are titled:

Method 1	Sample and Velocity Traverses for Stationary Sources
Method 2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Standard Type 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

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

The Method 5 sampling train consisted of the following components.

1. Appropriately sized nozzle.
2. Glass lined probe unheated.
3. Unheated glass fiber filter.
4. Four impingers in an insulated ice water bath in the following sequence:
   A. Modified Greenburg-Smith design containing100 mls of water.
   B. Greenburg-Smith design containing 100 mls of water.
   C. Modified Greenburg-Smith design empty.
   D. Known amount of Silica Gel.
5. Sampling gas measuring system.

3.2.2 Sample Duration and Frequency

Three Method 5 train samples were collected with each test lasting minutes in duration. A minimum sample size of 60 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.

3.2.4 Analytical Procedures

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

The acetone wash containing the particulate from the prefilter wash was placed into a tared beaker, 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 Method 5 trains were prepared by recovering an acetone sample 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.

4.0 TEST RESULTS

Presented in this section are the results of this test series. Test results are reported in Table 4.1. Table 4.1 reports the stack gas conditions for the baghouse exhaust 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).

Tables 4.1 also presents the results in grains per dry standard cubic feet (grains/DSCF), pounds per dry standard cubic feet (lb/dscf) and pounds per hour (lb/hr), for the filterable particulates. The opacity results are presented in terms of percent for the highest six minute average of each run.

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 analytical results are presented in Appendix C. Copies of equipment calibrations are presented in Appendix D.

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Table 4.1

Particulate Results
ADM
Ottawa Lakes, MI
06/25/14

Baghouse Exhaust Stack
Truck Receiving

Test No:	T1	T2	T3	Avg.
Start Time:	02:17 PM	03:38 PM	04:54 PM	
Finish Time:	03:20 PM	04:44 PM	06:00 PM	
Stack Gas Temperature, degrees F:	75.5	76.4	75.8	75.9
% Carbon Dioxide:	0.0	0.0	0.0	0.0
% Oxygen:	21.0	21.0	21.0	21.0
% Moisture:	0.96	1.18	1.35	1.17
Molecular Weight dry, lb/lb-Mole:	28.84	28.84	28.84	28.84
Molecular Weight wet, lb/lb-Mole:	28.74	28.71	28.69	28.71
Velocity and Flow Results:				
Average Stack Gas Velocity FPS:	58.19	58.86	59.60	58.88
Stack Gas Flow Rate, ACFM:	43,887	44,392	44,950	44,410
Stack Gas Flow Rate, SCFM:	41,612	42,045	42,568	42,075
Stack Gas Flow Rate, DSCF/HR:	2,472,760	2,492,941	2,519,586	2,495,095
Stack Gas Flow Rate, DSCFM:	41,213	41,549	41,993	41,585
Particulate Results:				
Grains Per DSCF:	0.0002	0.0003	0.0004	0.0003
LBS/DSCF:	3.40E-08	3.74E-08	6.23E-08	4.46E-08
LBS/HR:	0.08	0.09	0.16	0.11

APPENDIX A

SAMPLE CALCULATIONS