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EMISSION TEST REPORT

Report Title	TEST REPORT FOR THE VERIFICATION OF PARTICULATE MATTER AND VISIBLE EMISSIONS FROM HOT MIX ASPHALT MANUFACTURING PROCESSES
Test Date(s)	June 29, 2016

Facility Information	
Name	Yeager Paving Materials, LLC
Street Address	3666 Carrollton Road
City, County	Carrollton, Saginaw

Facility Permit Information			
State Registration No.:	P0443	Permit to Install No.:	75-13

Testing Contractor	
Company Mailing Address	Derenzo Environmental Services 39395 Schoolcraft Road Livonia, Michigan 48150
Phone	(734) 464-3880
Project No.	1605008

TEST REPORT
FOR THE VERIFICATION OF
PARTICULATE MATTER AND VISIBLE EMISSIONS FROM
HOT MIX ASPHALT MANUFACTURING PROCESSES

YEAGER PAVING MATERIALS, LLC.
CARROLLTON, MICHIGAN

Test Date(s): June, 29, 2016

1.0 INTRODUCTION

Yeager Paving Materials, LLC (Yeager) operates a hot mix asphalt (HMA) manufacturing process at its facility located in Carrollton, Saginaw County, Michigan. The Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD) has issued Permit to Install (PTI) No. 75-13 (dated August 19, 2013) to Yeager for the HMA facility (emission unit, EUHMAPLANT) and associated activities.

HMA is produced in a two-stage, horizontal mixer/dryer drum that is fired exclusively with natural gas. Exhaust gas from the dryer/mixer is directed to two particulate matter fabric filtration baghouses manufactured by ALmix. The primary baghouse (Baghouse 1) is installed on the exhaust from the dryer/mix drum. The filtered process air from the baghouse is exhausted through a vertical stack to the atmosphere (BHSTACK).

Conditions of PTI No. 75-13 and 40 CFR Part 60 Subpart I (Standards of Performance for Hot Mix Asphalt Facilities), specify that Yeager Paving Materials:

- Perform particulate matter (PM) emission tests using USEPA Reference Method 5; and
- Quantify stack opacity using USEPA Reference Method 9.

The emission testing was performed June 29, 2016 by Derenzo Environmental Services (DES) personnel Jason Logan, Jeff Schlaf and Daniel Wilson. Mr. Tom Maza and Ms. Gina McCann from the MDEQ-AQD were on-site to observe portions of the compliance testing.

A test protocol was submitted to the MDEQ-AQD prior to the testing project and a test plan approval letter was issued by the regulatory agency. The following items provide information required in MDEQ-AQD *Format for Submittal of Source Emission Test Plans and Reports*, dated December 2013.

Appendix A provides a copy of the MDEQ-AQD test plan approval letter.

Questions concerning this emission report should be directed to:

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This test report was prepared by Derenzo Environmental Services based on the field sampling data collected by DES. Certain analyses were contracted to and performed by third parties and the results are presented in this report and its appendices. Facility process data were collected and provided by Yeager employees or representatives.

Report Prepared By:

Daniel C. Wilson
Environmental Consultant

Reviewed By:

Robert L. Harvey, P.E.
General Manager

2.0 SUMMARY OF TEST RESULTS

The exhaust gases from the HMA production process (emission unit EUHMAPLANT) were sampled for filterable PM content and emission rate using a USEPA Method 5 sampling train. Exhaust gas opacity observations were performed on the emission unit exhaust (BHSTACK) using USEPA Method 9

The PM emission test data were reduced to grains PM per dry standard cubic foot (gr/dscf) of exhaust gas and PM emissions per ton of HMA material produced (lb/ton of HMA) for comparison to the allowable emission limits specified in PTI No. 75-13.

Table 2.1 presents a summary of the measured particulate matter emission rates and visual opacity readings for the process.

Table 2.1 Summary of measured particulate matter emission rates and visual opacity readings for EUHMAPLANT

Emission Unit	PM Mass Emission Rate (lb/hr)	Exhaust Gas PM Content (gr/dscf)	PM Mass Emissions (lb/ton of HMA)	Highest 6-Minute Average (% opacity)
EUHMAPLANT	2.94	0.023	0.014	0
Permit Limit		**0.04**	**0.03**	**27**

3.0 SOURCE DESCRIPTION

3.1 General Process Description and Type of Raw and Finished Materials

The process produces HMA material by combining aggregate and liquid asphalt cement in a horizontal, rotating counter-flow drum. Aggregate is introduced into the drum and moves towards the opposite (burner) end of the drum counter-flow with the hot gases of combustion. The dried aggregate is dropped into 14-foot mixing drum where it is combined with liquid asphalt cement. The system is designed to use up to 50% recycled asphalt pavement (RAP), or a blend of RAP and recycled asphalt shingles (RAS). On average, the facility uses approximately 40% RAP (or RAP/RAS mix). The finished HMA material discharged from the mixing drum is conveyed to the storage / loadout silos. The exhaust gases exit the drum and are directed to a particulate control system.

3.2 Emission Control System Description

Exhaust gas from the dryer/mixer is directed to two particulate matter fabric filtration baghouses manufactured by ALmix. The primary baghouse (Baghouse 1) is installed on the exhaust from the dryer/mix drum. The baghouse has a total cloth surface area of 7,310 square feet and a rated particulate matter removal efficiency of 99.96% by weight.

The test plan approval letter required Yeager to monitor and record the pressure drop across the baghouse, the rate of fuel consumption, product temperature (°F) and percentage of products used during each test period.

Appendix B provides process and control device operating records for the test periods.

3.3 Sampling Location

Filtered exhaust gas is discharged to the ambient air through a rectangular 43-inch x 32-inch exhaust stack (BHSTACK). Five (5) sample ports were installed in the 32-inch width. The sample ports were located 17.5 feet downstream of the nearest flow disturbance and 26 feet upstream from the stack exit. Four (4) sample points were sampled in each port for a total of 20 sampling points.

Appendix C provides a drawing for the exhaust stack sampling location.

4.0 SUMMARY OF USEPA TEST METHODS

The following USEPA reference test methods and sampling trains were used to perform the emission compliance testing.

4.1 Exhaust Gas Flowrate and Particulate Matter Sampling Methods

USEPA Method 1	Velocity and sampling locations were selected based on physical stack measurements in accordance with USEPA Method 1.
USEPA Method 2	Exhaust gas velocity pressure and temperature using a Type-S Pitot tube connected to a red oil incline manometer and K-type thermocouple.
USEPA Method 3	All material processing operations determined by Fyrite® combustion gas analyzer.
USEPA Method 4	Exhaust gas moisture determined using the chilled impinger method (as part of the particulate sampling train).
USEPA Method 5	Filterable PM was determined using isokinetic sampling procedures and analysis of the front half of the particulate matter sampling train (filter and acetone rinse).
USEPA Method 9	Exhaust gas opacity during each sampling period was determined by a certified observer of visible emissions.

5.0 SAMPLING AND ANALYSIS PROCEDURES

Testing was performed to verify filterable PM emission rates and opacity from the hot mix asphalt mix/dryer drum. The exhaust gas existing the baghouse was sampled for three (3) one-hour test periods using isokinetic sampling methods. Filterable PM emissions were determined based on the amount of filterable PM catch in the sample train and the measured exhaust gas volumetric flowrate.

5.1 Velocity Measurements (USEPA Methods 1 and 2)

The representative sample locations were determined in accordance with USEPA Method 1 based on the measured distance to upstream and downstream disturbances. The absence of significant cyclonic flow was determined at each sampling location.

Exhaust gas velocity was measured using USEPA Method 2 throughout each test period as part of the isokinetic sampling procedures. Velocity pressure measurements were performed at each stack traverse point using an S-type Pitot tube and red-oil manometer. Temperature measurements were performed at each traverse point using a K-type thermocouple and a calibrated digital thermometer.

5.2 Diluent Gas Sampling Procedures (USEPA Method 3)

Exhaust gas CO_2 and O_2 content were measured using a Fyrite® gas analyzer that contains scrubbing solutions to selectively remove O_2 and CO_2 from the gas sample. Samples were withdrawn from the air stream during each test period using a sample probe and hand-held aspirator and introduced to the Fyrite® solutions through the scrubbing tube inlet valve. The sampled gas was passed through the appropriate scrubbing solution several times and the gas concentration (O_2 or CO_2) is determined by the solution volume change as indicated by the calibrated scale on the Fyrite® scrubber chamber.

5.3 Moisture Determination (USEPA Method 4)

Moisture content was measured concurrently with the particulate matter sampling trains and determined in accordance with USEPA Method 4. Moisture from the gas sample was removed by the chilled impingers of the isokinetic sampling train. The net moisture gain from the gas sample was determined by either volumetric or gravimetric analytical techniques in the field. Percent moisture was calculated based on the measured net gain from the impingers and the metered gas sample volume of dry air.

5.4 Particulate Matter Sampling Procedures (USEPA Method 5)

Filterable PM was determined using USEPA Method 5. Exhaust gas was withdrawn from the emission unit exhaust stack at an isokinetic sampling rate using an appropriately-sized stainless steel sample nozzle and heated probe. The collected exhaust gas was passed through a pre-tared glass fiber filter that was housed in a heated filter box. The heated filter box was connected directly to the PM impinger train.

Recovered filters and acetone rinses of the nozzle, filter holder, and sample probe were sent to Bureau Veritas North America, Inc. (Novi, Michigan) for gravimetric measurements.

5.5 Opacity Observations (USEPA Method 9)

USEPA Method 9 procedures were used to evaluate the opacity of the exhaust gas during each 60-minute test period. In accordance with USEPA Method 9, the qualified observer stood at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to his back. As much as possible, the line of vision was approximately perpendicular to the plume direction.

Opacity observations were made at the point of greatest opacity in the portion of the plume where condensed water vapor was not present. Observations were made at 15-second intervals for the duration of the 60-minute testing period.

All visible emissions determinations were performed by a qualified observer in accordance with USEPA Method 9, Section 3.

Table 6.2 presents the opacity reading test results for the three (3) test runs conducted on June 29, 2016.

5.6 Number and Length of Sampling Runs

The emission verification test consisted of triplicate (3), one-hour sampling periods. Each PM test was paused each time the sampling train was moved to the next sampling port; therefore, the total test period exceeded one-hour from the beginning of the test to the end (the sampling time was one hour).

Because the production did not pause when the PM sampling train was paused, the opacity readings had the same start time as the PM sampling, but were one (1) continuous hour.

5.7 Quality Assurance/Quality Control Procedures

Appendix E provides sampling equipment quality assurance and calibration data. A summary of these procedures is provided in this section.

5.7.1 Flow Measurement Equipment

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

Prior to performing the initial velocity traverse, and periodically throughout the test program, the S-type Pitot tube and manometer lines were leak-checked at the test site. These checks were made by blowing into the impact opening of the Pitot tube until 3 or more inches of water were recorded on the manometer, then capping the impact opening and holding it closed for 15 seconds to ensure that it was leak free. The static pressure side of the Pitot tube was leak-checked using the same procedure.

5.7.2 Isokinetic Sampling for Particulate Matter

The dry gas meter sampling console was calibrated prior to and after the testing program using the critical orifice calibration technique presented in USEPA Method 5. The metering console calibration exhibited no data outside the acceptable ranges required by USEPA Method 5. The

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

The sampling nozzle diameter was determined using the three-point calibration technique.

The sampling rate for all test periods was within 10% of the calculated isokinetic sampling rate required by USEPA Method 5.

5.7.3 Particulate Matter Analyses

All recovered particulate matter samples were stored and shipped in pre-rinsed glass sample bottles with Teflon® lined caps. The liquid level on each bottle was marked with permanent marker and the caps were secured closed with tape. Samples of the reagents used in the test project (200 milliliters of acetone) were sent to the laboratory for analysis to verify that the reagents used to recover the samples have low particulate matter residue values.

6.0 TEST RESULTS AND DISCUSSION

6.1 Particulate Matter Emission Test Results

Exhaust gas filterable PM content was calculated based on the amount of dry stack gas metered through the sampling system and the laboratory results for PM contained in the USEPA Method 5 sampling train (filter and nozzle/probe/filter housing rinses). The PM mass emission rate was calculated based on the measured PM content and exhaust gas flowrate. The average PM content was 0.02 grains PM per dry standard cubic foot (gr/dscf) of exhaust gas.

The average measured exhaust gas flowrate was 15,404 dscfm resulting in a calculated PM mass emission rate of 2.94 pounds per hour (lb/hr).

Table 6.1 presents particulate matter test results for the three (3) test periods.

Appendix F provides isokinetic sampling train data and mass emission rate calculations.

Appendix G provides a copy of the Bureau Veritas N.A. laboratory analytical report for gravimetric analysis of the filterable particulate matter samples.

6.2 Operating Conditions During Compliance Tests

The testing was performed while the process operated at normal maximum operating conditions. Yeager representatives provided production data at 15-minute intervals for each test period. With the exception of the Rate of Fuel Consumption. Which they took a beginning fuel reading and a final fuel reading for tests 2 and 3.

The average recorded Asphalt produced during the PM tests was 223.7 tons per hour for the three test periods. This resulted in an average PM emission rate of 0.014 lb/ton of HMA (0.03 lb/ton limit) during the compliance test periods.

The Asphalt produced during the PM tests varied from the production during the VE tests due to the PM testing delay in test one (1). Appendix B provides the comparative production data during the test.

Additionally, Yeager operators recorded the pressure drop across the baghouse, the rate of fuel consumption, product temperature (°F) and percentage of products used.

Appendix B provides process operating data collected during the compliance test.

6.3 Permit Compliance Determination

The test results presented in Table 6.1 indicate that the source operated in compliance with the applicable allowable PM emission rates:

- 0.04 gr/dscf of exhaust gas, and
- 0.03 lb/ton asphalt produced.

Opacity observations were made at the point of greatest opacity in the portion of the plume where condensed water vapor was not present. Observations were made at 15-second intervals for a 60-minute test period. The visual emission observation results presented in Table 6.2 indicate that the exhaust gas released via BHSTACK exhibits opacity that is less than that allowed in the Permit to Install and NSPS.

Appendix H provides visible emission data sheets and the observer certificate.

6.4 Variations from Normal Sampling Procedures or Operating Conditions

The testing was performed as described in the approved test plan and associated USEPA test methods. During the first test period, sampling was paused for 1 hour and 54 minutes due to a power surge and a loss of power for the sampling trailer. The facility remained in operation. The total time from the beginning of the test period to the end of the test period was slightly over 3 hours (sampling time was still one hour). This was witnessed by Mr. Tom Maza (MDEQ-AQD) on-site.

During the test periods the process was operated at normal operating conditions, at or near maximum achievable capacity and satisfied the parameters specified in the MDEQ-AQD test plan approval letter.

Table 6.1. Measured particulate matter emission rates for EUHMAPLANT exhaust

Test No. Test Date:	**1** 6/29/2016	**2** 6/29/2016	**3** 6/29/2016	**Avg**
Test Times	6:21-9:23	10:48-11:52	12:50-13:55	
HMA production rate (ton/hr)	252.02	218.0	201.2	223.7
Exhaust Gas Properties				
Exhaust gas flow (dscfm)	16,021	14,918	15,272	15,404
Temperature (°F)	267	261	265	264
Moisture (%H_2O)	19.2	24.0	22.0	21.8
Sample Train Data				
Sample volume (dscf)	33.2	33.1	32.8	33.0
PM catch primary filter (mg)	0.68	8.6	12.0	7.09
PM catch acetone rinse (mg)	21.0	54.0	48.0	41.0
Total PM catch (mg)	21.68	62.6	60.0	48.09
PM Emission Rate				
PM Emission Rate (lb/hr)	1.38	3.73	3.70	2.94
PM Concentration (gr/dscf)	0.010	0.029	0.028	0.023
PM Permit Limit (gr/dscf)				***0.04***
PM Mass Emissions (lb/ton)	0.006	0.017	0.018	0.014
PM Permit Limit (lb/ton)				***0.03***

Table 6.2 Measured exhaust plume opacity rates for the BHSTACK exhaust

Test ID	Test Date	Observation Times (EDT)	HMA Production (Tons)	6-Minute Average (%)	Highest 6-Minute Average (%)
Test 1	06/29/16	6:21-7:21	220.5	0.0	0.0
Test 2	06/29/16	10:48-11:48	218.0	0.0	0.0
Test 3	06/29/16	12:50-13:50	201.2	0.0	0.0
		Averages	213.2	0.0	**0.0**
			Permit Limit:	**20.0**	**27.0**