Monitoring Solutions
an ESC Spectrum company

2022 FGMELTING & EUFINISHING REPORT
BREMBO NORTH AMERICA, INC.
HOMER, MICHIGAN
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES & ENERGY PERMIT NUMBER 199-14C

Testing Conducted July 26-28, 2022

Monitoring Solutions Report Number RPT 2022-055

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This report was prepared by Monitoring Solutions, an ESC Spectrum Company and contains the results of testing that was conducted on the EUFINISHING and the FGMELTING at the Brembo North America, Inc. facility in Homer, Michigan on July 26-28, 2022.

We certify that we have examined the information contained in this report and believe the results presented are true, accurate, and complete. The undersigned do so attest as certificate that the results herein have been reviewed for the authenticity and accuracy of the testing details and results, to the best of our knowledge, uphold standards of quality assurance. Any questions concerning this report should be directed to the undersigned.

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FACILITY INFORMATION

Facility Name: Brembo North America, Inc.

Facility Address: 29991 M-60 | East Homer, Michigan, 49256 - Calhoun County

Facility Contact: Jessy Conard, HSE Manager, jconard@us.brembo.com, (734) 468-2092

EPA Facility Registry Service Number (FRS): 110000783082; **Facility ID:** N6226

This facility operated in accordance with Michigan Department of Environment, Great Lakes & Energy Permit Number 199-14C.

Source Name	*Emission Unit or Flexible Group*	*Stack & Vent ID*	*Target Parameters*
Finishing	EUFINISHING	SVFINISHING	Filterable Particulate Matter (FPM) and Condensable Particulate Matter (CPM) as PM_{10} and $PM_{2.5}$
Melt	FGMELTING	SVMELTBH	FPM and CPM as PM_{10} and $PM_{2.5}$

TESTER INFORMATION

Testing Company: Monitoring Solutions, an ESC Spectrum Company

Address: 4404 Guion Road | Indianapolis, Indiana, 46254 - Marion County

Field Team Leader: Joseph Ward, Operations Manager, (307) 262-1384, jward@escspectrum.com

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1. Executive Summary

1.1 Introduction

Brembo North America, Inc. ("Brembo North America, Inc.") contracted Monitoring Solutions, an ESC Spectrum Company ("Monitoring Solutions" or "MonSol") to conduct air emissions testing at the Brembo North America, Inc. facility in Homer, Michigan. The objective of the test program was to accurately measure emissions of Particulate Matter (PM) from the EUFINISHING and FGMELTING.

Coordinating the field portion of the test program were Jessy Conard of Brembo North America, Inc. and Joseph Ward of Monitoring Solutions.

1.2 Summary of Test Program

The test program conducted followed the procedures prescribed in Title 40 of the Code of Federal Regulations (40CFR60) Appendix A, 40CFR51 Appendix M, and 40CFR63 Subpart EEEEE. Monitoring Solutions conducted the following testing:

Parameters	Test Method
Test Sample Points	40CFR60 Appendix A Method 1
Stack Gas Velocity	40CFR60 Appendix A Method 2
Gas Molecular Weight	40CFR60 Appendix A Method 3
Gas Moisture Content	40CFR60 Appendix A Method 4
Particulate Matter	40CFR60 Appendix A Method 5
Determination of PM_{10}	40CFR60 Appendix A Method 201A
Determination of $PM_{2.5}$	40CFR60 Appendix A Method 201A
Determination of Condensable PM	40CFR60 Appendix A Method 202

Concentrations/emissions of these parameters were measured from the rooftop access on July 26-28, 2022. Laboratory analysis was completed by Monitoring Solutions in Indianapolis, IN. The complete description of the Test Program is provided in Section 2.

Sampling was conducted while the foundry was operating under normal conditions. The methodologies utilized during this testing program are found under Section 2.1. Comments concerning the results of this testing program and any deviations utilized are found under Section 2.2 of this report. A summary of the results are found in Section 1.4; within Section 3 are detailed tables outlining the testing results and parameters. Appendices are listed under Section 4.

Appendix A contains website hyperlinks to Methodologies utilized in this testing program. Appendix B contains examples of calculations utilized within this report. Appendix C contains reference method test data entry and raw data collected during this test program. Appendix D contains calibrations of equipment and equipment certifications relevant to this report. Appendix E contains quality control data maintained during the testing program. Appendix F contains laboratory reports of the analytes collected during this testing program.

1.3 Facility and Source Description

Brembo operates a grey iron foundry in Homer, Michigan operating under Michigan Department of Environment, Great Lakes & Energy Permit Number 199-14C.

The Finishing emissions are controlled by a baghouse and exhausted through SVFINISHING stack. This emission unit, the EUFINISHING, includes the grinding and shot blasting of cooled iron castings.

The Melt emissions are controlled by a baghouse and exhausted through the SVMELTBH stack. This flexible group, the FGMELTING, includes scrap handling and 4 electric induction melting furnaces.

1.4 Summary of Results

The following summarizes the pertinent results of the testing.

Source		Emission Rates		Emission Limits
Constituent	Method	gr/dscf	lb/hr	lb/hr
EUFINISHING				
FPM*	201A	0.001161	0.2564	
CPM**	202	0.000088	0.0197	
Total $PM_{2.5}$***	201A/202	0.000715	0.1582	0.05
Total PM_{10}****	201A/202	0.000997	0.2207	0.54
Total PM*****	201A/202	0.001250	0.2761	4.05
FGMELTING				
FPM*	5	0.000233	0.1729	2.20
FGMELTING				
FPM*	201A	0.001629	1.1537	
CPM**	202	0.000224	0.1577	
Total $PM_{2.5}$***	201A/202	0.001238	0.8764	1.65
Total PM_{10}****	201A/202	0.001704	1.2064	2.18
Total PM*****	201A/202	0.001853	1.3114	2.20

* FPM is composed of Filterable Particulate Matter
** CPM is composed of both organic and inorganic condensable particulate matter
*** Total $PM_{2.5}$ includes filterable PM less than 2.5 microns and the CPM
**** Total PM_{10} is the sum of filterable PM collected between 2.5 and 10 microns and $PM_{2.5}$
***** Total PM adds the particulate larger than 10 microns to PM_{10}

Detailed results are provided in Section 3. Data and calculations to support these results are shown in the Appendices.

2. Test Program Description

2.1 Test Method Description

2.1.1 Determination of Stack Sampling Points

40CFR60 Appendix A, Method 1 was used to determine sample points for traverses measuring velocity head and temperature.

Velocity and temperature sampling points were based on upstream and downstream distances from flow disturbances and the stack diameter according to Figure 1-1 as presented in Section 4.2 of this report.

Description	EUFINISHING	FGMELTING
Number of Ports	2	2
Port Length, inches	2	4.25
Stack Diameter, inches	47.5	75.25
Diameters from ports to stack exit (A)	7.58	3.83
Distance from ports to stack exit (A), inches	360	288
Diameters from ports to upstream disturbance (B)	13.64	6.78
Distance from ports to upstream disturbance (B), inches	648	510
Total number of sampling points	12	12
Number of sampling points per port (see location below)	6	6
Area, ft^2	12.306	30.884
Sampling Points, Distance from wall		
Traverse Point 1, inches	2 1/16	3 5/16
Traverse Point 2, inches	6 15/16	11
Traverse Point 3, inches	14 1/16	22 1/4
Traverse Point 4, inches	33 7/16	53
Traverse Point 5, inches	40 9/16	64 1/4
Traverse Point 6, inches	45 7/16	71 15/16

Cyclonic checks were performed on both sources; the data can be found in Appendix E. Both sources maintained an average flow angle of less than 20 degrees from being parallel to the gas stream.

2.1.2 Determination of Stack Gas Velocity

40CFR60 Appendix A, Method 2 procedures were followed to calculate stack gas velocity during each run.

The velocity and temperature sampling apparatus consisted of calibrated Stausscheibe (Type S) stainless steel pitot tube and a thermocouple to measure gas temperature. Velocity apparatus were checked for leaks before and after each test run. The thermocouples were verified in field following the testing by following the procedures in Method 2 Section 10.3 or ALT-011.

2.1.3 Determination of Molecular Weights

40CFR60 Appendix A, Method 3 procedures were followed to calculate molecular weight during each run.

The process was emitting essentially air, following the guidelines of Method 2 Section 8.6, the molecular weight of 29.0 was assigned.

2.1.4 Determination of Moisture Content

40CFR60 Appendix A, Method 4 procedures were followed to assemble the sampling equipment and to calculate moisture content during each run.

A sample of the stack gas was drawn into impingers immersed in an ice bath to cool the gas below 68°F, which condensed the moisture collected into the impingers. The total weight gain of the impingers (condensate) and the measured volume of the gas drawn through the impingers was used to calculate moisture concentration.

The Method 4 train was paired simultaneously as part of the Method 5 or 201A/202 trains.

2.1.5 Determination of Volumetric Flow Rate

Data collected from Methods 1-4 was used to determine the Volumetric Flow Rate.

2.1.6 Determination of Particulate Matter Concentrations

Data collected from Methods 1, 2, 3, and 4 was used to determine the effluent volumetric flow rate. EPA Method 5 incorporates the parameters measured in Methods 1-4 with isokinetic sampling procedures to collect and quantify total filterable particulate concentration at the test location.

A sample of the gas stream was withdrawn isokinetically from the Method 1 traverse points and the particulate was collected on a button hook nozzle, probe, and filter. Gas velocity and temperature (Method 2), molecular weight (Method 3), moisture and sample volume (Method 4) are factors in the volumetric flow rate and isokinetic sampling conditions. Following procedures of 40CFR60 Appendix A, Method 5, the probe and filter were heated to 248 ±25°F to keep the moisture laden gas stream from condensing in the probe or on the filter.

Filterable particulate matter that collected in the nozzle, probe, and filter holder were recovered and analyzed per procedures and gravimetric techniques described in Method 5. The mass of particulate collected and the volume of gas sampled were used to calculate particulate concentrations. Particulate concentrations and the effluent (stack) gas flow rate was used to calculated emission rates. Example calculations are shown in Section 4.2.

2.1.7 Determination of Flow Rate and $PM_{2.5/10}$ Concentrations

40CFR51 Appendix M, Method 201A was used to measure filterable $PM_{2.5}$ and PM_{10} emissions. Particles greater than 10 microns were removed from the gas and collected in a customized (enlarged) in-stack cyclone-sizing device. Particles less than 10 microns but greater than 2.5 microns were collected downstream of the first cyclone and in a second cyclone. Particles less than 2.5 microns passed through both cyclones and collected on a high efficiency glass fiber filter located downstream of the cyclones. The recovered fractions were analyzed gravimetrically. The cut-points (sizes) were calculated and reported with the mass of particulate between PM_{10} and $PM_{2.5}$ and the mass of particulate less than $PM_{2.5}$.

Based on the sizing device specifications and the stack gas conditions, the required flow rate (ΔH) through the sizing device to maintain 10 and 2.5 micron cut points were calculated. The acceptable velocity range for each available nozzle (Δp_{min} and Δp_{max} values) was determined. Velocity pressure and average stack gas temperature data collected during a pre-test traverse were used to determine which points could be sampled isokinetically for the various nozzles. The nozzle which contained the necessary range of Δp's was chosen and the dwell times for each point calculated.

After a pre-heating (warm up) period, sampling was performed at a constant flow rate that maintained the 10/2.5-micron cut-points of the cyclones. The sampling time (dwell time) at each traverse point varied proportionally with each point's velocity.

The cyclones, turn around cup, front half of the filter holder and connecting tubes were recovered for particulate matter using a nylon brush and acetone rinse. After the conclusion of the test, the $PM_{10/2.5}$ flow rate at actual cyclone conditions was calculated. The test results were deemed acceptable if:

- The cut-point of the first cyclone is between 9µm < D50 < 11µm,
- The cut-point of the second cyclone is between 2.25µm < $D50_2$ < 2.75µm, and,
- No point is outside the Δp_{min} and Δp_{max}, or, that each point is 80-120% isokinetic and no more than one sampling point is outside the Δp_{min} and Δp_{max}.

Alternative procedures, as allows in Method 201A and described in 40CFR60 Appendix A, Method 5, were utilized. The probe and filter were heated to 248 ±25°F to keep the moisture laden gas stream from condensing in the probe or on the filter. Following procedures of 40CFR51 Appendix M, Method 202, the impinger train construction consisted of a condenser coil, two empty impingers, and a Teflon filter. The glassware used in this train was cleaned before the testing program by washing three times with Acetone, rinsing three times with Hexane, and then baked for six hours in an oven heated to 572°F.

2.2 Deviations from Published Test Methods and Testing Comments

No deviations from standard EPA air sampling methodologies were utilized during this testing program.

Finishing Comments

A total of three Method 201A/202 Runs were completed on the Finishing. Run 1 was discarded before the run was completed, and was not recovered to be analyzed or included in this report. The three valid runs were all checked for QA, see Appendix E.

The minimum volume sampled (Vmstd) was 44.970 dry standard cubic feet (dscf), with an average Vmstd of 46.180 dscf. The minimum isokinetic sampling rate was 98.9%, with a maximum isokinetic sampling rate of 100.2%. Out of the total of 36 sampling points, there was a total of one sampling point outside of 80-120% isokinetic, and three other points that were outside of 90-110%. The cut points maintained within the 2.25-2.75 and 9-11 microns.

A traverse was performed before the run to calculate dwell times, with a traverse performed after the run to verify the flow was stable (within 10%). The pitot was leak checked before and after each traverse. Temperatures were monitored by personnel in the field to maintain the impingers below 68°F, and for the heated probe and filter to maintain 248 ±25°F. The sample train was leak checked before each run; at the conclusion of each run the cyclone was removed to leak check the train from the probe tip, this was done so that a vacuum did not disrupt the samples in the various stages of the cyclone.

Melt Comments – 201A/202

A total of three Method 201A/202 Runs were completed on the Melt. The QA data is provided in Appendix E.

The minimum Vmstd was 47.180 dscf, with an average Vmstd of 48.135 dscf. The minimum isokinetic sampling rate was 97.5%, with a maximum isokinetic sampling rate of 101.4%. Out of the total of 36 sampling points, there was a total of one point outside of 80-120% isokinetic, and ten other points that were outside of 90-110%. The cut points maintained within the desired 2.25-2.75 and 9-11 microns; with the exception on the third run. The third run calculates an initial cut point above 2.25, but when the data is reiterated then it calculates a cut point of 2.217 and 2.213.

A traverse was performed before the run to calculate dweel times, with a traverse performed after the run to verify the flow was stable (within 10%). The pitot was leak checked before and after each traverse. Temperatures were monitored by personnel in the field to maintain the impingers below 68°F, and for the heated probe and filter to maintain 248 ±25°F. The sample train was leak checked before each run; at the conclusion of each run the cyclone was removed to leak check the train from the probe tip, this was done so that a vacuum did not disrupt the samples in the various stages of the cyclone.

Melt Comments – 5

A total of 3 Method 5 Runs were completed on the Melt. The QA data is provided in Appendix E.

The minimum Vmstd was 67.113 dscf, with an average Vmstd of 67.847 dscf. The minimum isokinetic sampling rate was 97.6%, with a maximum isokinetic sampling rate of 100.2%.

The pitot was leak checked before and after each traverse. Temperatures were monitored by personnel in the field to maintain the impingers below 68°F, and for the heated probe and filter to maintain 248 ±25°F.

3. Test Results

3.1 Finishing Results

3.1.1 Method 201A/202

EUFINISHING Test Results	Units	Run 2	Run 3	Run 4	Avg.
Test Parameters					
Test Date	MM/DD/YY	**07/28/22**	**07/28/22**	**07/28/22**	
Run Start Time	HH:MM	12:07	15:46	18:48	
Run Finish Time	HH:MM	14:09	17:51	21:00	
Net Run Time	Minutes	120.00	120.00	120.00	
Dry Gas Meter Volume Sampled	Vm_{std}	44.97	47.18	46.39	46.18
Moisture Content of Stack Gas	%	2.61	1.21	1.53	1.78
Moisture Saturation at Stack Gas Temperature	%	16.47	11.37	12.92	13.59
Carbon Dioxide	%	0.30	0.30	0.30	0.30
Oxygen	%	20.95	20.95	20.95	20.95
Average Stack Gas Temperature	°F	133.08	119.58	124.17	125.61
Square Root of Average Velocity	$\sqrt{}$In. H_2O	0.6668	0.6927	0.6830	0.6808
Dry Volumetric Flow Rate	dscfm	24,916	26,495	25,954	25,788
Actual Wet Volumetric Flue Gas Flow Rate	acfm	30,009	30,732	30,441	30,394
Percent Isokinetic of Sampling Rate	%	100.2	98.9	99.3	99.5
D50I (dia. w/50% penetration probability)	10 µm	10.74	10.76	10.76	10.75
D50IV (dia. w/50% penetration probability)	2.5 µm	2.44	2.60	2.44	2.49
Pollutant Results					
Mass of Total Filterable and Condensable PM	**mg/sample**	**3.81**	**3.85**	**3.56**	
Concentration - Standard	gr/dscf	0.0013	0.0013	0.0012	0.0012
Emission Rate	lb/hr	0.2793	0.2857	0.2632	0.2761
Mass of CPM_{10}	**mg/sample**	**2.76**	**3.40**	**2.80**	
Concentration - Standard	gr/dscf	0.0009	0.0011	0.0009	0.0010
Emission Rate	lb/hr	0.2025	0.2525	0.2071	0.2207
Mass of $CPM_{2.5}$	**mg/sample**	**2.03**	**2.25**	**2.15**	
Concentration - Standard	gr/dscf	0.0007	0.0007	0.0007	0.0007
Emission Rate	lb/hr	0.1484	0.1671	0.1591	0.1582