

FINAL REPORT



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MUELLER INDUSTRIES, INC

PORT HURON, MI

SOURCE TESTING REPORT:
EUCHIPDRYER AND FGSYSTEMC & E
VOC, PARTICULATE MATTER, AND LEAD

RWDI #2405025

September 12, 2024

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) was retained by NTH Consultants, Ltd. to complete the emission sampling program at the Mueller Industries, Inc. (Mueller Brass) facility located at 2199 Lapeer Avenue, Port Huron, Michigan. The purpose of the emissions test program was to verify emissions required by Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit to Install 180-00E. The test program consisted of the following:

- EUCHIPDRYER for Particulate Matter (PM, PM₁₀ and PM_{2.5}), Lead (Pb), and Volatile Organic Compounds (VOC).
- FGSYSTEMC North/South and FGSYSTEME for PM (filterable only), PM₁₀/PM_{2.5} (filterable and condensable), and Lead.

Testing was completed on July 23rd to 24th, 2024.

Executive Table i: Average Emission Data – EUCHIPDRYER, FGSYSTEMC (North and South) and FGSYSTEME

Location	Parameter	Emission Rate				
		Run 1	Run 2	Run 3	Average	Limit
EUCHIPDRYER	Particulate Matter (PM/PM ₁₀ /PM _{2.5})	0.16 lb/hr	0.10 lb/hr	0.11 lb/hr	0.12 lb/hr	2.4 lb/hr
	Lead	0.00004 lb/hr	0.00016 lb/hr	0.00008 lb/hr	0.00009 lb/hr	0.2 lb/hr
	VOC	<0.007 lb/hr	<0.007 lb/hr	<0.007 lb/hr	<0.007 lb/hr	4.0 lb/hr
FGSYSTEMC Total (North and South Combined)	Particulate Matter (PM/PM ₁₀ /PM _{2.5})	0.67 lb/hr	0.53 lb/hr	0.51 lb/hr	0.56 lb/hr	1.0 lb/hr
	Lead	0.00032 lb/hr	0.00032 lb/hr	0.00034 lb/hr	0.00033 lb/hr	0.035 lb/hr
FGSYSTEME	Particulate Matter (PM/PM ₁₀ /PM _{2.5})	0.29 lb/hr	0.62 lb/hr	0.35 lb/hr	0.42 lb/hr	1.0 lb/hr
	Lead	0.00015 lb/hr	0.00017 lb/hr	0.00021 lb/hr	0.00017 lb/hr	0.035 lb/hr

Notes: lb/hr – pounds per hour, dry basis

"<" – the removal of methane from the Total Hydrocarbon recorded value resulted in a negative value, therefore <0.1 ppm was conservatively used as a VOC (Total Hydrocarbon minus methane) concentration

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1 INTRODUCTION

RWDI USA LLC (RWDI) was retained by NTH Consultants, Ltd. (NTH) to complete the emission sampling program at the Mueller Industries, Inc. (Mueller Brass) facility located at 2199 Lapeer Avenue, Port Huron, Michigan. The purpose of the emissions test program was to verify emissions required by Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit to Install 180-00E. The test program consisted of the following:

- EUCHIPDRYER for Particulate Matter (PM, PM₁₀ and PM_{2.5}), Lead (Pb), and Volatile Organic Compounds (VOC).
- FGSYSTEMC North/South and FGSYSTEME for PM (filterable only), PM₁₀/PM_{2.5} (filterable and condensable), and Lead.

1.1 Location and Dates of Testing

The test program was completed on July 23rd and 24th, 2024 at the Mueller Brass facility in Port Huron, Michigan.

1.2 Purpose of Testing

The purpose of the emissions test program was to verify emissions required by Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit to Install 180-00E. Testing requirements are covered under EUCHIPDRYER, FGSYSTEMC and FGSYSTEME.

1.3 Description of Source

Mueller Brass is a manufacturer of standard and Pb-free brass alloys for various industrial uses.

FGSYSTEME – Melting Line E consisting of Caster 4.

FGSYSTEMC – Melting Line C consisting of Caster 3.

EUCHIPDRYER is a natural gas-fired chip dryer with which dries metal chips using indirect natural gas heaters rated at 4 MMBtu/hr.

1.4 Testing Personnel

The following table presents personnel that were involved with the testing program.

Table 1.1.1: Summary of Testing Personnel

Name	Title & Affiliation	Address	Contact Number
Mr. Dave Struble	Senior Process Engineer Mueller Brass	2199 Lapeer Avenue Port Huron, MI 48060	810.966.0250
Mr. Chuck Blanton	Corporate EHS Director Mueller Brass		810.208.1010
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Mr. Brad Bergeron	Technical Director RWDI USA LLC	2239 Star Court Rochester Hills, MI 48309	248.234.3885
Mr. Steve Smith	Project Manager RWDI USA LLC		734.751.9701
Mr. David Trahan	Senior Field Technician RWDI USA LLC		248.841.8442
Mr. Ben Durham	Senior Field Technician RWDI USA LLC		
Mr. Mike Nummer	Senior Field Technician RWDI USA LLC		
Mr. Cade Smith	Field Technician RWDI USA LLC		
Ms. Kate Strang	Field Technician RWDI USA LLC		
Mr. Shane Rabideau	Field Technician RWDI USA LLC		
Mr. Roy Zimmer	Field Technician RWDI USA LLC		
Mr. Hunter Griggs	Field Technician RWDI USA LLC		

2 SUMMARY OF RESULTS

2.1 Operating Data

Operational data collected during the testing is provided in **Appendix A**.

2.2 Applicable Permit Number

The Facility operates under Permit to Install 180-00E.

3 SOURCE DESCRIPTION

3.1 Description of Process and Emission Control Equipment

Refer to Section 1.3 for a description of the process.

FGSYSTEMC and FGSYSTEME sources use baghouses to control emissions. FGSYSTEMC and E use baghouses rated at 120,000 and 75,000 cfm, respectively.

EUCHIPDRYER is controlled by a cyclone, thermal oxidizer, dry lime injection, and a baghouse. EUCHIPDRYER – 8,000 lb/hr of metal chips

3.2 Process Flow Sheet or Diagram

Each source has a single outlet. The figures can be found in the **Figure Section**.

3.3 Type and Quantity of Raw and Finished Materials

The raw material used in process are lead free brass alloys and natural gas for EUCHIPDRYER

3.4 Normal Rated Capacity of Process

FGSYSTEMC and E use baghouses rated at 120,000 and 75,000 cfm, respectively.

EUCHIPDRYER – 8,000 lb/hr of metal chips

Process data is provided in **Appendix A**.

3.5 Process Instrumentation Monitored During the Test

- Baghouse pressure drop (FGSYSTEMC, FGSYSTEME, and EUCHIPDRYER)
- Combustion chamber temperature (EUCHIPDRYER)
- Lime injection rate (EUCHIPDRYER)

4 TESTING METHODOLOGIES

The emission test program utilized the following test methods codified at Title 40, Part 60, Appendix A of the Code of Federal Regulations (40 CFR 60, Appendix A)

- Method 1 – Sample and Velocity Traverses for Stationary Sources
- Method 2 – Determination of Stack Gas Velocity and Volumetric Flowrate
- Method 3 – Determination of Molecular Weight of Dry Stack Gases (fyritye)
- Method 3A - Determination of Molecular Weight of Dry Stack Gases (instrumental procedure)
- Method 4 – Determination of Moisture Content in Stack Gases
- Method 5 – Determination of Particulate Matter from Stationary Sources
- Method 25A – Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer
- Method 205 – Verification of Gas Dilution Systems for Field Instrument Calibrations
- Method 202 – Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources
- Method 12 - Determination of Inorganic Lead Emissions from Stationary Sources

4.1 Stack Velocity, Temperature, and Volumetric Flow Rate by USEPA Method 1-4

The exhaust velocities and flow rates were determined following the USEPA Method 2, “Determination of Stack Gas Velocity and Flow Rate (Type S Pitot Tube)”. Velocity measurements were taken with a pre-calibrated S-Type pitot tube and incline manometer. Volumetric flow rates were determined following the equal area method as outlined in USEPA Method 2. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type “k” thermocouple in conjunction with a digital temperature indicator. One (1) preliminary flowrate was conducted on each source prior to testing in order to determine the nozzle size required for each source’s particulate matter testing and check for the presence of cyclonic flow.

The dry molecular weight of the stack gas was determined following calculations outlined in USEPA Methods 3 or 3A, “Determination of Molecular Weight of Dry Stack Gas”. Two separate Fyritye measurements were taken per test for each source or one (1) bag sample was collected over the duration of each test for each source. Stack moisture content was determined through direct condensation and according to USEPA Method 4, “Determination of Moisture Content of Stack Gas” over the duration of each test for each source.

4.2 VOC by USEPA Method 25A

Regular performance checks on the CEMS were carried out by zero and span calibration checks using USEPA Protocol calibration gases. These checks verified the ongoing precision of the monitor over time by introducing pollutant-free (zero) air followed by known calibration gas (span) into the monitor. The response of the monitor to pollutant-free air and the corresponding sensitivity to the span gases are reviewed frequently as an ongoing indication of analyzer performance.

Prior to testing, a 4-point analyzer calibration error check was conducted using USEPA protocol gases. The calibration error check was performed by introducing zero, low, mid, and high-level calibration gases directly into the analyzer. The calibration error check was performed to confirm that the analyzer response was within $\pm 5\%$ of the certified calibration gas introduced. At the conclusion of each test run a system-bias check was performed to evaluate the percent drift from pre- and post-test system bias checks. The system bias checks were used to confirm that the analyzer did not drift greater than $\pm 3\%$ throughout a test run.

Zero and upscale calibration checks were conducted both before and after each test run to quantify measurement system calibration drift and sampling system bias. During these checks, the calibration gases were introduced into the sampling system at the probe tip so that the calibration gases were analyzed in the same manner as the flue gas samples.

A gas sample was continuously extracted from the stack and delivered to the JUM. The probe tip was equipped with a sintered stainless-steel filter for particulate removal or heated filter system. The end of the probe was connected to a heated Teflon sample line, which delivers the sample gas from the stack to the CEM system. The heated sample line is designed to maintain the gas temperature above 250°F in order to prevent condensation of stack gas moisture within the line.

4.3 Gas Dilution System by USEPA Method 205

Calibration gas was mixed using an Environics 4040 Gas Dilution System. The mass flow controllers are factory calibrated using a primary flow standard traceable to the United States National Institute of Standards and Technology (NIST). Each flow controller utilizes an 11-point calibration table with linear interpolation, to increase accuracy and reduce flow controller nonlinearity. The calibration is done yearly, and the records are included. A multi-point EPA Method 205 check was executed in the field prior to testing to ensure accurate gas-mixtures. The gas dilution system consists of calibrated orifices or mass flow controllers and dilutes a high-level calibration gas to within $\pm 2\%$ of predicted values. The gas divider is capable of diluting gases at set increments and was evaluated for accuracy in the field in accordance with US EPA Method 205 *"Verification of Gas Dilution Systems for Field Instrument Calibrations"*. Before testing, the gas divider dilutions were measured to evaluate that the responses are within $\pm 2\%$ of predicted values. In addition, a certified mid-level calibration gas within $\pm 10\%$ of one of the tested dilution gases was introduced into an analyzer to ensure the response of the gas calibration is within $\pm 2\%$ of gas divider dilution concentration.

4.4 Particulate Matter (PM, PM₁₀, and PM_{2.5}) and Condensable Particulate Matter by USEPA Method 5/202

Particulate matter (PM/PM₁₀/PM_{2.5}) was sampled following procedures outlined in USEPA Method 5 (filterable PM) and Method 202 (Condensable Particulate Matter). The sample gas was sampled isokinetically through a stainless-steel nozzle, then a glass/quartz probe-liner, and finally through a glass-fiber filter. The probe and filter are designed to keep the sampling temperature at 248 ± 25 °F per the method standards. The back half glassware was set up following USEPA Method 202 with a condenser, pot belly impinger, empty impinger, water filled impinger, and silica gel.

Prior to testing, a leak check was performed on the sampling train to ensure a leak-free system. The probe nozzle is then set to the first sampling point, and sampling begins once all temperatures and flow rates are established. Sampling occurred for a pre-determined amount of time and at all pre-determined sampling points. Sampling rate is determined based on in-stack conditions including flow rate and stack gas temperature. Once testing was completed, a post-test leak check was done to show a leak-proof sampling system. The system was leak checked at a vacuum (Hg") at or above the maximum vacuum seen during the test.

Once all sampling procedures are complete, recovery begins as soon as possible following USEPA Method 5 for the front half and Method 202 for the back half. The impingers in the train were weighed prior to testing for use in moisture content analysis. For USEPA Method 5, all used sampling equipment up to the filter is rinsed three times with acetone. The probe and nozzle were rinsed and brushed three times for glass/quartz. The front half of the filter holder was rinsed three times with acetone into the same glass sample jar as the probe and nozzle rinse. The filter was then collected and placed in a petri dish. For Method 202, the glassware was rinsed with high purity DI water, acetone, and hexane. Samples were collected in discrete, labeled sample jars. The CPM filter was also recovered and put in a petri dish. All USEPA Method 5 recovered samples are analyzed gravimetrically by RWDI USA LLC and the Method 202 recovered samples are analyzed by ALS Environmental.

4.5 Lead by USEPA Method 12

A sample of stack gas was drawn isokinetically from the stack to measure lead. The sampling train consisted of a Teflon coated nozzle, a glass-lined probe, quartz filter, and four (4) impingers in series. Particulate metals were collected in the nozzle, probe, and filter. The gaseous emissions were collected in the back half impingers with the first two impingers containing 0.1N HNO₃, an empty third impinger, and the final impinger containing silica gel. The recovery process followed USEPA Method 12, and all samples were sent to Enthalpy Laboratory for analysis.

4.6 Description of Recovery and Analytical Procedures

All sample recovery and analytical procedures following the prescribed methods of USEPA Method 1 to 5, 202, 12 and 25A.

4.7 Sampling Port Description

All sampling ports meet USEPA Method 1 locations and can be found in the **Figure Section**.

Table 4.7.1: Summary of the Stack Characteristics

Source	Parameter	Diameter	Duct Diameters from Flow Disturbance	Number of Ports	Points per Traverse	Total Points per Test
EUCHIPDRYER	Method 1-4, 5/202, 12, and 25A	41.5"	4.3 downstream and 10.1 upstream	2	12 PM/Lead 1 VOC	24 PM/Lead 1 VOC
FGSYSTEMC North	Method 1-4, 5/202, and 12	58"	4.1 downstream and 0.5 upstream	2	12	24 PM/Lead
FGSYSTEMC South	Method 1-4, 5/202, and 12	58"	4.1 downstream and 0.5 upstream	2	12	24 PM/Lead
FGSYSTEME	Method 1-4, 5/202, and 12	65"	3.7 downstream and 5.5 upstream	2	12	24 PM/Lead

5 TEST RESULTS AND DISCUSSION

5.1 Detailed Results

Detailed results for VOCs from EUCHIPDRYER are provided in **Appendix B**. Results for Particulate are provided in **Appendix C**. Lead Results are provided in **Appendix D**.

Table 5.1.1: Average Emission Data – EUCHIPDRYER, FGSYSTEMC (North and South) and FGSYSTEME

Location	Parameter	Emission Rate				
		Run 1	Run 2	Run 3	Average	Limit
EUCHIPDRYER	Particulate Matter (PM ₁₀ /PM _{2.5})	0.16 lb/hr	0.10 lb/hr	0.11 lb/hr	0.12 lb/hr	2.4 lb/hr
	Lead	0.00004 lb/hr	0.00016 lb/hr	0.00008 lb/hr	0.00009 lb/hr	0.2 lb/hr
	VOC	<0.007 lb/hr	<0.007 lb/hr	<0.007 lb/hr	<0.007 lb/hr	4.0 lb/hr
FGSYSTEMC Total (North and South Combined)	Particulate Matter (PM/PM ₁₀ /PM _{2.5})	0.67 lb/hr	0.53 lb/hr	0.51 lb/hr	0.56 lb/hr	1.0 lb/hr
	Lead	0.00032 lb/hr	0.00032 lb/hr	0.00034 lb/hr	0.00033 lb/hr	0.035 lb/hr
FGSYSTEME	Particulate Matter (PM/PM ₁₀ /PM _{2.5})	0.29 lb/hr	0.62 lb/hr	0.35 lb/hr	0.42 lb/hr	1.0 lb/hr
	Lead	0.00015 lb/hr	0.00017 lb/hr	0.00021 lb/hr	0.00017 lb/hr	0.035 lb/hr

Notes: lb/hr – pounds per hour, dry basis

"<" – the removal of methane from the Total Hydrocarbon recorded value resulted in a negative value, therefore <0.1 ppm was conservatively used as a VOC (Total Hydrocarbon minus methane) concentration

5.2 Process Upset Conditions During Testing

Production stopped at FGSYSTEMC (North and South) prior to completion of Test 3 on July 23rd, 2024. Trevor Drost from State of Michigan Department of Environment, Great Lakes and Energy (EGLE) Technical Program Unit (TPU) confirmed that it would be acceptable to stop Test 3 and complete Test 3 on the following morning when production resumed.

5.3 Maintenance Performed in Last Three Months

There has been no maintenance in the last three months.

5.4 Re-Test

This was not a retest.

5.5 Audit Samples

This test did not require any audit samples.

5.6 Process Data

Process data can be found in **Appendix A**.

5.7 Field Data Sheets

Field Data sheets can be found in **Appendix E**.

5.8 Calibration Data

Calibration can be found in **Appendix F**.

5.9 Laboratory Data

Laboratory data can be found in **Appendix G**.

5.10 Example Calculations

Example calculations can be found in **Appendix H**.

5.11 Source Testing Plan and Correspondence

Copy of source testing plan and EGLE correspondence can be found in **Appendix I**.

6 CONCLUSIONS

The testing program was completed on July 23rd and 24th, 2024. Testing followed the methodology outlined in the Source Testing Plan attached in **Appendix A**. All sources were under their respective limits.

TABLES



Table 1: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests per Stack	Sampling Parameter	Sampling Method
Chip Dryer (EUCHIPDRYER)	3	Velocity & Temperature	U.S. EPA ^[1] Methods 1 & 2
		Oxygen & Carbon Dioxide	U.S. EPA ^[1] Method 3A
		Moisture	U.S. EPA ^[1] Method 4
		Particulate Matter	U.S. EPA ^[1] Method 5-202
		Metals (Lead)	U.S. EPA ^[1] Method 12
		VOC	U.S. EPA ^[1] Method 25a
System C North & South (FGSYSTEMC)	3	Velocity & Temperature	U.S. EPA ^[1] Methods 1 & 2
		Oxygen & Carbon Dioxide	U.S. EPA ^[1] Method 3
		Moisture	U.S. EPA ^[1] Method 4
		Particulate Matter	U.S. EPA ^[1] Method 5-202
		Metals (Lead)	U.S. EPA ^[1] Method 12
System E (FGSYSTEME)	3	Velocity & Temperature	U.S. EPA ^[1] Methods 1 & 2
		Oxygen & Carbon Dioxide	U.S. EPA ^[1] Method 3
		Moisture	U.S. EPA ^[1] Method 4
		Particulate Matter	U.S. EPA ^[1] Method 5-202
		Metals (Lead)	U.S. EPA ^[1] Method 12

Notes:

[1] U.S. EPA - United States Environmental Protection Agency

Table 2: Sampling Summary and Sample Log

Source and Test #	Sampling Date	Start Time	End Time	Filter ID / Trap ID
Chip Dryer - Particulate Matter / VOC				
Blank	23-Jul-24	-	-	A-343
Test #1	23-Jul-24	9:38 AM	11:12 AM	A-396
Test #2	23-Jul-24	11:42 AM	1:15 PM	A-366
Test #3	23-Jul-24	2:04 PM	3:38 PM	A-392
System C North - Particulate Matter				
Test #1	23-Jul-24	7:43 AM	9:42 AM	A-380
Test #2	23-Jul-24	11:54 AM	1:36 PM	A-383
Test #3	23-Jul-24 to 24-Jul-24	2:42 PM 23-Jul-24	7:36 AM 24-Jul-24	A-397
System C South - Particulate Matter				
Test #1	23-Jul-24	7:43 AM	9:42 AM	A-381
Test #2	23-Jul-24	11:54 AM	1:36 PM	A-382
Test #3	23-Jul-24 to 24-Jul-24	2:42 PM 23-Jul-24	7:36 AM 24-Jul-24	A-398
System E - Particulate Matter				
Test #1	23-Jul-24	7:29 AM	9:18 AM	A-385
Test #2	23-Jul-24	9:55 AM	11:34 AM	A-375
Test #3	23-Jul-24	12:29 PM	2:06 PM	A-399
Chip Dryer - Metals (Lead)				
Blank	24-Jul-24	-	-	A-424
Test #1	24-Jul-24	7:08 AM	8:43 AM	A-417
Test #2	24-Jul-24	9:03 AM	10:41 AM	A-419
Test #3	24-Jul-24	11:05 AM	12:38 PM	A-418
System C North - Metals (Lead)				
Test #1	24-Jul-24	8:46 AM	10:29 AM	A-404
Test #2	24-Jul-24	11:08 AM	12:46 PM	A-393
Test #3	24-Jul-24	1:32 PM	3:09 PM	A-406
System C South - Metals (Lead)				
Test #1	24-Jul-24	8:46 AM	10:29 AM	A-403
Test #2	24-Jul-24	11:08 AM	12:46 PM	A-360
Test #3	24-Jul-24	1:32 PM	3:09 PM	A-420
System E - Metals (Lead)				
Test #1	24-Jul-24	6:55 AM	8:34 AM	A-423
Test #2	24-Jul-24	9:07 AM	10:42 AM	A-422
Test #3	24-Jul-24	11:13 AM	12:50 PM	A-341

Table 3a: Sampling Summary - Flow Characteristics - EUCHIPDRYER

Stack Gas Parameter		Test No. 1	Test No. 2	Test No. 3	Average
Source		EUCHIPDRYER - Particulate			
Testing Date		23-Jul-24	23-Jul-24	23-Jul-24	
Stack Temperature	°F	186	190	189	188
Moisture	%	4.4%	5.4%	5.4%	5.1%
Velocity	ft/s	23.1	23.5	22.5	23.0
Referenced Flow Rate	CFM	10,003	10,026	9,620	9,883
Oxygen	%	19.8	20.0	19.5	19.8
Carbon Dioxide	%	1.4	1.5	1.6	1.5
Sampling Isokinetic Rate	%	101.2	102.1	101.6	101.6
Source		EUCHIPDRYER - Lead			Average
Testing Date		24-Jul-24	24-Jul-24	24-Jul-24	
Stack Temperature	°F	183	182	184	183
Moisture	%	4.4%	5.3%	6.4%	5.4%
Velocity	ft/s	22.7	22.5	22.9	22.7
Referenced Flow Rate	CFM	9,862	9,680	9,741	9,761
Oxygen	%	19.8	19.8	19.7	19.8
Carbon Dioxide	%	1.5	1.5	1.6	1.5
Sampling Isokinetic Rate	%	100.1	101.1	102.4	101.2

Table 3b: Sampling Summary - Flow Characteristics - FGSYSTEMC - North and South

Stack Gas Parameter		Test No. 1	Test No. 2	Test No. 3		Test No. 1	Test No. 2	Test No. 3	
Source FGSYSTEMC - North - Particulate					Average	FGSYSTEMC - South - Particulate			Average
Testing Date		23-Jul-24	23-Jul-24	23-Jul-24		23-Jul-24	23-Jul-24	23-Jul-24	
Stack Temperature	*F	117	131	122	123	115	130	118	121
Moisture	%	2.8%	2.2%	2.6%	2.5%	2.7%	2.4%	2.4%	2.5%
Velocity	ft/s	38.2	34.3	42.3	38.3	31.2	34.4	27.9	31.2
Referenced Flow Rate	CFM	36,661	32,308	40,297	36,422	30,045	32,449	26,868	29,787
Oxygen	%	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Carbon Dioxide	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	98.9	98.5	98.5	98.6	100.1	100.2	101.2	100.5
Source FGSYSTEMC - North - Lead					Average	FGSYSTEMC - South - Lead			Average
Testing Date		24-Jul-24	24-Jul-24	24-Jul-24		24-Jul-24	24-Jul-24	24-Jul-24	
Stack Temperature	*F	116	112	116	115	114	111	114	113
Moisture	%	3.0%	3.2%	2.7%	3.0%	3.0%	2.8%	2.6%	2.8%
Velocity	ft/s	40.6	34.9	41.0	38.8	33.9	41.2	36.1	37.1
Referenced Flow Rate	CFM	38,925	33,603	39,379	37,302	32,605	39,818	34,820	35,748
Oxygen	%	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Carbon Dioxide	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	100.0	101.0	100.1	100.4	101.1	100.9	100.1	100.7

Table 3c: Sampling Summary - Flow Characteristics - FGSYSTEME

Stack Gas Parameter		Test No. 1	Test No. 2	Test No. 3	Average
Source		FGSYSTEME - Particulate			
Testing Date		23-Jul-24	23-Jul-24	23-Jul-24	
Stack Temperature	°F	123	128	134	128
Moisture	%	2.2%	2.3%	2.0%	2.2%
Velocity	ft/s	47.9	47.9	47.7	47.8
Referenced Flow Rate	CFM	57,545	56,911	56,325	56,927
Oxygen	%	21.0	21.0	21.0	21.0
Carbon Dioxide	%	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	101.9	98.0	100.7	100.2
Source		FGSYSTEME - Lead			Average
Testing Date		24-Jul-24	24-Jul-24	24-Jul-24	
Stack Temperature	°F	102	121	115	113
Moisture	%	2.8%	2.4%	2.4%	2.5%
Velocity	ft/s	49.3	48.9	50.7	49.6
Referenced Flow Rate	CFM	60,880	58,789	61,479	60,383
Oxygen	%	21.0	21.0	21.0	21.0
Carbon Dioxide	%	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	101.0	100.2	100.6	100.6

Table 4: Emission Summary - THC, Methane, and VOC - EUCHIPDRYER

Source: Mueller Brass Chip Dryer

RWDI Project # 2405025

Parameter	Test 1	Test 2	Test 3	Average
Date	23-Jul-24	23-Jul-24	23-Jul-24	--
Start Time:	9:38	11:42	14:04	--
Stop Time:	11:12	13:15	15:38	--
Duration (mins):	94	93	94	--
Outlet Flow Rate (dscfm):	10,003	10,026	9,620	9,883
Outlet Flow Rate (dm ³ /s):	4.74	4.75	4.56	4.68
Moisture:	4.4%	5.4%	5.4%	5.1%
Outlet THC Concentration (as propane) (ppm _w):	0.53	0.39	0.51	0.48
Outlet THC Concentration (as propane) (ppm _d):	0.55	0.41	0.54	0.50
Outlet THC Concentration (as propane) (mg/m ³ _d):	1.01	0.75	0.99	0.92
Outlet THC Concentration (as propane) (lb/hr _d):	0.04	0.03	0.04	0.03
Outlet Methane Correction Factor	2.32	2.31	2.34	2.33
Outlet CH4 Concentration (as methane) (ppm _w):	1.25	1.00	1.19	1.15
Outlet CH4 Concentration (as Methane) (ppm _d):	1.31	1.06	1.26	1.21
Outlet CH4 Concentration (as Propane) (ppm _d):	0.56	0.46	0.54	0.52
Outlet CH4 Concentration (as propane) (mg/m ³ _d):	1.03	0.84	0.98	0.95
Outlet CH4 Concentration (as propane) (lb/hr _d):	0.04	0.03	0.04	0.04
Outlet VOC Concentration (as Propane) (ppmd):	<0.10	<0.10	<0.10	<0.10
Outlet VOC Concentration (as propane) (mg/m ³ _d):	<0.18	<0.18	<0.18	<0.18
Outlet VOC Concentration (as propane) (lb/hr _d):	<0.0069	<0.0069	<0.0066	<0.0068

Note: "d" indicated based on dry conditions

<" removal of methane resulted in a negative VOC value, as such a MDL of 0.1 ppm was used and the data is reported as less than 0.1 (< 0.1)

Table 5: Emission Table - Particulate Results - EUCHIPDRYER

Company	Mueller Brass			
Source	Chip dryer			
Date	23-Jul-24	23-Jul-24	23-Jul-24	
Test Number	Test 1	Test 2	Test 3	Average
Start Time	9:38	11:42	14:04	-
End Time	11:12	13:15	15:38	-

Stack Information

Flow ft3 (Actual)	13,016	13,253	12,703	12,991
Flow ft3 (Standard Wet)	10,460	10,597	10,174	10,411
Flow ft3 (Standard Dry)	10,003	10,026	9,620	9,883
Flow m3 (Standard Dry)	283	284	272	280

Percent Moisture	4.4	5.4	5.4	5.1
Pressure Ps ("Hg)	29.41	29.44	29.44	29.43
Average Stack Temperature Ts (F)	185.9	189.8	188.8	188.2
Molecular Weight of Stack Gas dry (Md)	29.02	29.03	29.03	29.03
Molecular Weight of Stack Gas wet (Ms)	28.54	28.44	28.43	28.47
Stack Gas Specific Gravity (Gs)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction	0.0	0.1	0.1	0.1
Average Stack Velocity Vs (ft/sec)	23.1	23.5	22.5	23.0
Area of Stack (ft2)	9.4	9.4	9.4	9.4
Percent Carbon Dioxide	1.4	1.5	1.6	1.5
Percent Oxygen	19.8	20.0	19.5	19.8
Percent Carbon Monoxide	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location	1908.6	2675.3	1521.4	2035.1

Meter Info

Isokinetic Variation I	101.2	102.1	101.6	101.6
Meter Pressure Pm ("Hg)	29.5	29.5	29.5	29.5
Meter Temperature Tm (F)	77.1	75.4	74.9	75.8
Measured Sample Volume Vm	52.18	52.56	68.68	57.81
Sample Volume (Vm St ft3)	48.54	49.10	64.34	53.99
Sample Volume (Vm St m3)	1.37	1.39	1.82	1.53
Total Weight of Sampled Gas (m g lbs) wet	3.74	3.81	5.00	4.19
Total Weight of Sampled Gas (m g lbs) dry	3.64	3.68	4.83	4.05
Gas Density Ps wet	0.07	0.07	0.07	0.07
Gas Density Ps dry	0.08	0.08	0.08	0.08
Condensate Volume	2.22	2.80	3.71	2.91
Nozzle Size	0.00050	0.00050	0.00069	0.00
Impinger Gain	35.7	46.5	59.9	47.4
Silica Gel Gain	11.4	12.9	18.7	14.3
Total Gas Sampled (vm st ft3 + condensate volume)	50.76	51.90	68.05	56.90

Particulate Results

Nozzle/Probe/Filter Weight (mg)	2.1	1.9	2.4	2.1
Organic Condensable Particulate (mg)	2.4	2.1	3.8	2.8
Inorganic Condensable Particulate (mg)	3.2	1.6	1.4	2.1
Condensable Blank Correction (mg)	2.0	2.0	2.0	2.0
Total Particulate (mg)	5.7	3.6	5.6	5.0
lb/hr	0.16	0.10	0.11	0.12
lb/1000 lb (wet)	0.0034	0.0021	0.0025	0.0026
lb/1000 lb (dry)	0.0035	0.0022	0.0026	0.0027
mg/dscm (dry)	4.15	2.59	3.07	3.27
gr/dscf	0.0018	0.0011	0.0013	0.0014

Table 6: Emission Table - Particulate Results - FGSYSTEMC - North

Company	Mueller Brass			
Source	North C			
Date	23-Jul-24	23-Jul-24	7/23/2024 to 7/24/2024	
Test Number	Test 1	Test 2	Test 3	Average
Start Time	7:43	11:54	14:42 to 15:56	-
End Time	9:42	13:36	7:02 to 7:36	-
Stack Information				
Flow Rate (ft ³ /min) (Actual)	42,049	37,713	46,547	42,103
Flow (ft ³ /min) (Standard Wet)	37,707	33,022	41,352	37,360
Flow (ft ³ /min) (Standard Dry)	36,661	32,308	40,297	36,422
Flow (m ³ /min) (Standard Dry)	1,038	915	1,141	1,031
Percent Moisture (%)	2.8	2.2	2.6	2.5
Pressure Ps ("Hg)	29.31	29.31	29.31	29.31
Average Stack Temperature (T _s) (°F)	116.8	130.8	122.3	123.3
Molecular Weight of Stack Gas dry (M _d) (g/mole)	28.84	28.84	28.84	28.84
Molecular Weight of Stack Gas wet (M _s) (g/mole)	28.54	28.61	28.56	28.57
Stack Gas Specific Gravity (G _s) (kg/L)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction (%)	0.0	0.0	0.0	0.0
Average Stack Velocity (V _s) (ft/sec)	38.2	34.3	42.3	38.2
Cross Section Area of Stack (ft ²)	18.3	18.3	18.3	18.3
Percent Carbon Dioxide (%)	0.0	0.0	0.0	0.0
Percent Oxygen (%)	21.0	21.0	21.0	21.0
Percent Carbon Monoxide (%)	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location (%)	-	-	-	-
Meter Info				
Isokinetic Variation I (%)	98.9	98.5	98.5	98.6
Meter Pressure Pm ("Hg)	29.5	29.5	29.5	29.5
Meter Temperature Tm (°F)	78.8	87.3	86.2	84.1
Measured Sample Volume Vm (ft ³)	77.43	69.08	85.79	77.43
Sample Volume (Vm St ft ³)	73.38	64.38	80.31	72.69
Sample Volume (Vm St m ³)	2.08	1.82	2.27	2.06
Total Weight of Sampled Gas (lbs) wet	5.57	4.87	6.08	5.51
Total Weight of Sampled Gas (lbs) dry	5.47	4.80	5.99	5.42
Gas Density Ps wet ("Hg)	0.07	0.07	0.07	0.07
Gas Density Ps dry ("Hg)	0.07	0.07	0.07	0.07
Condensate Volume (ft ³)	2.09	1.42	2.10	1.87
Nozzle Size (in ²)	0.00041	0.00041	0.00041	0.00
Impinger Gain (g)	25.4	18.0	22.8	22.1
Silica Gel Gain (g)	19.0	12.2	21.8	17.7
Total Gas Sampled (vm st ft ³ + condensate volume)	75.47	65.80	82.42	74.56
Particulate Results				
Nozzle/Probe/Filter Weight (mg)	1.1	1.2	1.4	1.2
Organic Condensable Particulate (mg)	2.4	2.9	2.2	2.5
Inorganic Condensable Particulate (mg)	1.5	1.7	1.7	1.6
Condensable Blank Correction (mg)	2.0	2.0	2.0	2.0
Total Particulate (mg)	3.0	3.8	3.3	3.4
Total Particulate Emission Rate (lb/hr)	0.20	0.25	0.22	0.22
Total Particulate Concentration lb/1000 lb (wet)	0.0012	0.0017	0.0012	0.0014
Total Particulate Concentration lb/1000 lb (dry)	0.0012	0.0017	0.0012	0.0014
Total Particulate Concentration mg/dscm (dry)	1.44	2.08	1.45	1.66
Total Particulate Concentration (gr/dscf)	0.0006	0.0009	0.0006	0.0007

Table 7: Emission Table - FGSYSTEMC - South

Company	Mueller Brass			
Source	South C			
Date	23-Jul-24	23-Jul-24	July 23 to 24, 2024	
Test Number	Test 1	Test 2	Test 3	Average
Start Time	7:43	11:54	14:42 to 15:57	-
End Time	9:42	13:36	7:02 to 7:36	-
Stack Information				
Flow Rate (ft ³ /min) (Actual)	34,315	37,903	30,742	34,320
Flow (ft ³ /min) (Standard Wet)	30,876	33,251	27,517	30,548
Flow (ft ³ /min) (Standard Dry)	30,045	32,449	26,868	29,787
Flow (m ³ /min) (Standard Dry)	851	919	761	843
Percent Moisture (%)	2.7	2.4	2.4	2.5
Pressure Ps ("Hg)	29.33	29.33	29.33	29.33
Average Stack Temperature (T _s) (°F)	115.2	130.0	118.2	121.1
Molecular Weight of Stack Gas dry (M _d) (g/mole)	28.84	28.84	28.84	28.84
Molecular Weight of Stack Gas wet (M _w) (g/mole)	28.55	28.58	28.58	28.57
Stack Gas Specific Gravity (G _s) (kg/L)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction (%)	0.0	0.0	0.0	0.0
Average Stack Velocity (V _s) (ft/sec)	31.2	34.4	27.9	31.2
Cross Section Area of Stack (ft ²)	18.3	18.3	18.3	18.3
Percent Carbon Dioxide (%)	0.0	0.0	0.0	0.0
Percent Oxygen (%)	21.0	21.0	21.0	21.0
Percent Carbon Monoxide (%)	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location (%)	-	-	-	-
Meter Info				
Isokinetic Variation I (%)	100.1	100.2	101.2	100.5
Meter Pressure Pm ("Hg)	29.4	29.5	29.4	29.4
Meter Temperature Tm (°F)	78.5	85.6	82.5	82.2
Measured Sample Volume Vm (ft ³)	62.19	68.08	56.66	62.31
Sample Volume (Vm St ft ³)	59.98	64.86	54.21	59.68
Sample Volume (Vm St m ³)	1.70	1.84	1.54	1.69
Total Weight of Sampled Gas (lbs) wet	4.55	4.91	4.10	4.52
Total Weight of Sampled Gas (lbs) dry	4.47	4.83	4.04	4.45
Gas Density Ps wet ("Hg)	0.07	0.07	0.07	0.07
Gas Density Ps dry ("Hg)	0.07	0.07	0.07	0.07
Condensate Volume (ft ³)	1.66	1.60	1.31	1.52
Nozzle Size (in ²)	0.00041	0.00041	0.00041	0.00
Impinger Gain (g)	20.1	18.9	13.2	17.4
Silica Gel Gain (g)	15.1	15.1	14.6	14.9
Total Gas Sampled (vm st ft ³ + condensate volume)	61.64	66.46	55.52	61.21
Particulate Results				
Nozzle/Probe/Filter Weight (mg)	1.5	1.2	1.5	1.4
Organic Condensable Particulate (mg)	2.4	2.8	2.9	2.7
Inorganic Condensable Particulate (mg)	5.1	2.2	2.0	3.1
Condensable Blank Correction (mg)	2.0	2.0	2.0	2.0
Total Particulate (mg)	7.0	4.2	4.4	5.2
Total Particulate Emission Rate (lb/hr)	0.47	0.28	0.29	0.34
Total Particulate Concentration lb/1000 lb (wet)	0.0034	0.0019	0.0024	0.0025
Total Particulate Concentration lb/1000 lb (dry)	0.0035	0.0019	0.0024	0.0026
Total Particulate Concentration mg/dscm (dry)	4.12	2.29	2.87	3.09
Total Particulate Concentration (gr/dscf)	0.0018	0.0010	0.0013	0.0014

Table 8: Emission Table - Particulate Results - FGSYSYSTEME

Company	Mueller Brass			
Source	FGSYSYSTEME			
Date	23-Jul-24	23-Jul-24	23-Jul-24	
Test Number	Test 1	Test 2	Test 3	Average
Start Time	7:29	9:55	12:29	-
End Time	9:18	11:34	14:06	-

Stack Information

Flow Rate (ft ³ /min) (Actual)	66,289	66,174	65,933	66,132
Flow (ft ³ /min) (Standard Wet)	58,841	58,277	57,466	58,194
Flow (ft ³ /min) (Standard Dry)	57,545	56,911	56,325	56,927
Flow (m ³ /min) (Standard Dry)	1,629	1,612	1,595	1,612

Percent Moisture (%)	2.2	2.3	2.0	2.2
Pressure Ps ("Hg)	29.33	29.33	29.33	29.33
Average Stack Temperature (T _s) (°F)	123.0	127.7	133.8	128.2
Molecular Weight of Stack Gas dry (M _d) (g/mole)	28.84	28.84	28.84	28.84
Molecular Weight of Stack Gas wet (M _w) (g/mole)	28.60	28.59	28.62	28.60
Stack Gas Specific Gravity (G _s) (kg/L)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction (%)	0.0	0.0	0.0	0.0
Average Stack Velocity (V _s) (ft/sec)	47.9	47.9	47.7	47.8
Cross Section Area of Stack (ft ²)	23.0	23.0	23.0	23.0
Percent Carbon Dioxide (%)	0.0	0.0	0.0	0.0
Percent Oxygen (%)	21.0	21.0	21.0	21.0
Percent Carbon Monoxide (%)	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location (%)	-	-	-	-

Meter Info

Isokinetic Variation I (%)	101.9	98.0	100.7	100.2
Meter Pressure Pm ("Hg)	29.5	29.5	29.5	29.5
Meter Temperature Tm (°F)	79.2	99.2	97.4	91.9
Measured Sample Volume Vm (ft ³)	71.94	70.94	71.97	71.62
Sample Volume (Vm St ft ³)	75.57	71.87	73.14	73.53
Sample Volume (Vm St m ³)	2.14	2.04	2.07	2.08
Total Weight of Sampled Gas (lbs) wet	5.71	5.44	5.52	5.56
Total Weight of Sampled Gas (lbs) dry	5.63	5.36	5.45	5.48
Gas Density Ps wet ("Hg)	0.07	0.07	0.07	0.07
Gas Density Ps dry ("Hg)	0.07	0.07	0.07	0.07
Condensate Volume (ft ³)	1.70	1.73	1.48	1.64
Nozzle Size (in ²)	0.00033	0.00033	0.00033	0.00
Impinger Gain (g)	16.1	16.8	12.1	15.0
Silica Gel Gain (g)	20.0	19.8	19.3	19.7
Total Gas Sampled (vm st ft ³ + condensate volume)	77.27	73.59	74.62	75.16

Particulate Results

Nozzle/Probe/Filter Weight (mg)	1.3	1.3	1.4	1.3
Organic Condensable Particulate (mg)	2.0	3.9	2.8	2.9
Inorganic Condensable Particulate (mg)	1.6	2.7	1.2	1.8
Condensable Blank Correction (mg)	2.0	2.0	2.0	2.0
Total Particulate (mg)	2.9	5.9	3.4	4.1
Total Particulate Emission Rate (lb/hr)	0.29	0.62	0.35	0.42
Total Particulate Concentration lb/1000 lb (wet)	0.0011	0.0024	0.0014	0.0016
Total Particulate Concentration lb/1000 lb (dry)	0.0011	0.0024	0.0014	0.0016
Total Particulate Concentration mg/dscm (dry)	1.36	2.90	1.64	1.97
Total Particulate Concentration (gr/dscf)	0.00059	0.00127	0.00072	0.00086

Table 9: Emission Table - EUCHIPDRYER - Lead Results

Company	Mueller Brass			
Source	Chip dryer			
Date	24-Jul-24	24-Jul-24	24-Jul-24	
Test Number	Test 1	Test 2	Test 3	Average
Start Time	7:08	9:08	11:05	-
End Time	8:43	10:41	12:38	-

Stack Information

Flow Rate (ft ³ /min) (Actual)	12,787	12,660	12,931	12,793
Flow (ft ³ /min) (Standard Wet)	10,320	10,221	10,407	10,316
Flow (ft ³ /min) (Standard Dry)	9,862	9,680	9,741	9,761
Flow (m ³ /min) (Standard Dry)	279	274	276	276

Percent Moisture (%)	4.4	5.3	6.4	5.4
Pressure Ps ("Hg)	29.38	29.38	29.38	29.38
Average Stack Temperature (T _s) (°F)	182.5	182.3	184.3	183.0
Molecular Weight of Stack Gas dry (M _{dj}) (g/mole)	29.03	29.03	29.04	29.03
Molecular Weight of Stack Gas wet (M _s) (g/mole)	28.54	28.45	28.33	28.44
Stack Gas Specific Gravity (G _s) (kg/L)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction (%)	0.0	0.1	0.1	0.1
Average Stack Velocity (V _s) (ft/sec)	22.7	22.5	22.9	22.7
Cross Section Area of Stack (ft ²)	9.4	9.4	9.4	9.4
Percent Carbon Dioxide (%)	1.5	1.5	1.6	1.5
Percent Oxygen (%)	19.8	19.8	19.7	19.7
Percent Carbon Monoxide (%)	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location (%)	1894.2	1903.9	1899.1	1899.1

Meter Info

Isokinetic Variation I (%)	100.1	101.1	102.4	101.2
Meter Pressure Pm ("Hg)	29.4	29.4	29.4	29.4
Meter Temperature Tm (°F)	71.0	76.0	76.5	74.5
Measured Sample Volume Vm (ft ³)	57.22	57.27	58.40	57.63
Sample Volume (Vm St ft ³)	53.81	53.36	54.37	53.85
Sample Volume (Vm St m ³)	1.52	1.51	1.54	1.52
Total Weight of Sampled Gas (lbs) wet	4.15	4.14	4.25	4.18
Total Weight of Sampled Gas (lbs) dry	4.04	4.00	4.08	4.04
Gas Density Ps wet ("Hg)	0.07	0.07	0.07	0.07
Gas Density Ps dry ("Hg)	0.08	0.08	0.08	0.08
Condensate Volume (ft ³)	2.50	2.98	3.72	3.07
Nozzle Size (in ²)	0.00057	0.00057	0.00057	0.00057
Impinger Gain (g)	44.7	53.8	64.9	54.5
Silica Gel Gain (g)	8.3	9.5	13.9	10.6
Total Gas Sampled (vm st ft ³ + condensate volume)	56.31	56.35	58.08	56.91

Lead Results

Sample Weight (ug)	1.54	6.65	3.16	3.78
Lead Concentration (lb/1000 lb (wet))	8.17E-07	3.54E-06	1.64E-06	2.00E-06
Lead Concentration (lb/1000 lb (dry))	8.41E-07	3.66E-06	1.71E-06	2.07E-06
Lead Concentration (mg/dscm (dry))	1.01E-03	4.40E-03	2.05E-03	2.49E-03
Lead Concentration (gr/dscf)	4.42E-07	1.92E-06	8.97E-07	1.09E-06
Lead Emission Rate (lb/hr)	3.75E-05	1.60E-04	7.52E-05	9.09E-05

Table 10: Emission Table - Lead Results - FGSYSTEMC - North

Company	Mueller Brass			
Source	North C			
Date	24-Jul-24	24-Jul-24	24-Jul-24	
Test Number	Test 1	Test 2	Test 3	Average
Start Time	8:46	11:08	13:32	-
End Time	10:29	12:46	15:09	-

Stack Information

Flow Rate (ft ³ /min) (Actual)	44,748	38,468	45,142	42,786
Flow (ft ³ /min) (Standard Wet)	40,123	34,719	40,473	38,438
Flow (ft ³ /min) (Standard Dry)	38,925	33,603	39,379	37,302
Flow (m ³ /min) (Standard Dry)	1,102	952	1,115	1,056

Percent Moisture (%)	3.0	3.2	2.7	3.0
Pressure Ps ("Hg)	29.25	29.25	29.25	29.25
Average Stack Temperature (T _s) (°F)	115.7	112.0	115.8	114.5
Molecular Weight of Stack Gas dry (M _d) (g/mole)	28.84	28.84	28.84	28.84
Molecular Weight of Stack Gas wet (M _s) (g/mole)	28.52	28.49	28.55	28.52
Stack Gas Specific Gravity (G _s) (kg/L)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction (%)	0.0	0.0	0.0	0.0
Average Stack Velocity (V _s) (ft/sec)	40.6	34.9	41.0	38.9
Cross Section Area of Stack (ft ²)	18.3	18.3	18.3	18.3
Percent Carbon Dioxide (%)	0.0	0.0	0.0	0.0
Percent Oxygen (%)	21.0	21.0	21.0	21.0
Percent Carbon Monoxide (%)	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location (%)	-	-	-	-

Meter Info

Isokinetic Variation I (%)	100.0	101.0	100.1	100.4
Meter Pressure Pm ("Hg)	29.4	29.4	29.4	29.4
Meter Temperature Tm (°F)	76.4	81.8	85.5	81.3
Measured Sample Volume Vm (ft ³)	71.36	62.93	73.46	69.25
Sample Volume (Vm St ft ³)	67.74	59.06	68.57	65.12
Sample Volume (Vm St m ³)	1.92	1.67	1.94	1.84
Total Weight of Sampled Gas (lbs) wet	5.15	4.49	5.20	4.95
Total Weight of Sampled Gas (lbs) dry	5.05	4.40	5.11	4.85
Gas Density Ps wet ("Hg)	0.07	0.07	0.07	0.07
Gas Density Ps dry ("Hg)	0.07	0.07	0.07	0.07
Condensate Volume (ft ³)	2.08	1.96	1.90	1.98
Nozzle Size (in ²)	0.00035	0.00035	0.00035	0.00
Impinger Gain (g)	29.0	30.3	25.8	28.4
Silica Gel Gain (g)	15.2	11.3	14.6	13.7

Lead Results

Sample Weight (ug)	2.60	2.43	2.72	2.58
Lead Concentration (lb/1000 lb (wet))	1.11E-06	1.19E-06	1.15E-06	1.15E-06
Lead Concentration (lb/1000 lb (dry))	1.14E-06	1.22E-06	1.17E-06	1.18E-06
Lead Concentration (mg/dscm (dry))	1.36E-03	1.45E-03	1.40E-03	1.40E-03
Lead Concentration (gr/dscf)	5.92E-07	6.35E-07	6.12E-07	6.13E-07
Lead Emission Rate (lb/hr)	1.98E-04	1.84E-04	2.07E-04	1.96E-04

Table 11: Emission Table - Lead Results - FGSYSTEMC - South

Company	Mueller Brass			
Source	South C			
Date	24-Jul-24	24-Jul-24	24-Jul-24	
Test Number	Test 1	Test 2	Test 3	Average
Start Time	8:46	11:08	13:32	-
End Time	10:29	12:46	15:09	-

Stack Information

Flow Rate (ft ³ /min) (Actual)	37,344	45,301	39,709	40,785
Flow (ft ³ /min) (Standard Wet)	33,623	40,954	35,749	36,775
Flow (ft ³ /min) (Standard Dry)	32,605	39,818	34,820	35,747
Flow (m ³ /min) (Standard Dry)	923	1,128	986	1,012

Percent Moisture (%)	3.0	2.8	2.6	2.8
Pressure Ps ("Hg)	29.27	29.27	29.27	29.27
Average Stack Temperature (T _s) (°F)	113.7	111.3	113.7	112.9
Molecular Weight of Stack Gas dry (M _d) (g/mole)	28.84	28.84	28.84	28.84
Molecular Weight of Stack Gas wet (M _s) (g/mole)	28.51	28.54	28.56	28.54
Stack Gas Specific Gravity (G _s) (kg/L)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction (%)	0.0	0.0	0.0	0.0
Average Stack Velocity (V _s) (ft/sec)	33.9	41.2	36.1	37.0
Cross Section Area of Stack (ft ²)	18.3	18.3	18.3	18.3
Percent Carbon Dioxide (%)	0.0	0.0	0.0	0.0
Percent Oxygen (%)	21.0	21.0	21.0	21.0
Percent Carbon Monoxide (%)	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location (%)	-	-	-	-

Meter Info

Isokinetic Variation I (%)	101.1	100.9	100.1	100.7
Meter Pressure Pm ("Hg)	29.4	29.5	29.4	29.4
Meter Temperature Tm (°F)	74.5	80.3	83.5	79.4
Measured Sample Volume Vm (ft ³)	68.72	84.51	73.80	75.68
Sample Volume (Vm St ft ³)	66.71	81.32	70.49	72.84
Sample Volume (Vm St m ³)	1.89	2.30	2.00	2.06
Total Weight of Sampled Gas (lbs) wet	5.07	6.17	5.34	5.53
Total Weight of Sampled Gas (lbs) dry	4.97	6.06	5.25	5.43
Gas Density Ps wet ("Hg)	0.07	0.07	0.07	0.07
Gas Density Ps dry ("Hg)	0.07	0.07	0.07	0.07
Condensate Volume (ft ³)	2.08	2.32	1.88	2.10
Nozzle Size (in ²)	0.00041	0.00041	0.00041	0.00
Impinger Gain (g)	31.5	35.9	28.7	32.0
Silica Gel Gain (g)	12.7	13.3	11.2	12.4

Lead Results

Sample Weight (ug)	1.82	2.09	1.97	1.96
Lead Concentration (lb/1000 lb (wet))	7.91E-07	7.47E-07	8.13E-07	7.84E-07
Lead Concentration (lb/1000 lb (dry))	8.07E-07	7.60E-07	8.27E-07	7.98E-07
Lead Concentration (mg/dscm (dry))	9.64E-04	9.08E-04	9.87E-04	9.53E-04
Lead Concentration (gr/dscf)	4.21E-07	3.97E-07	4.31E-07	4.16E-07
Lead Emission Rate (lb/hr)	1.18E-04	1.36E-04	1.29E-04	1.28E-04

Table 12: Emission Table - Lead Results - FGSYSTEME

Company	Mueller Brass			
Source	FGSYSTEME			
Date	24-Jul-24	24-Jul-24	24-Jul-24	
Test Number	Test 1	Test 2	Test 3	Average
Start Time	6:55	9:07	11:13	-
End Time	8:34	10:42	12:50	-

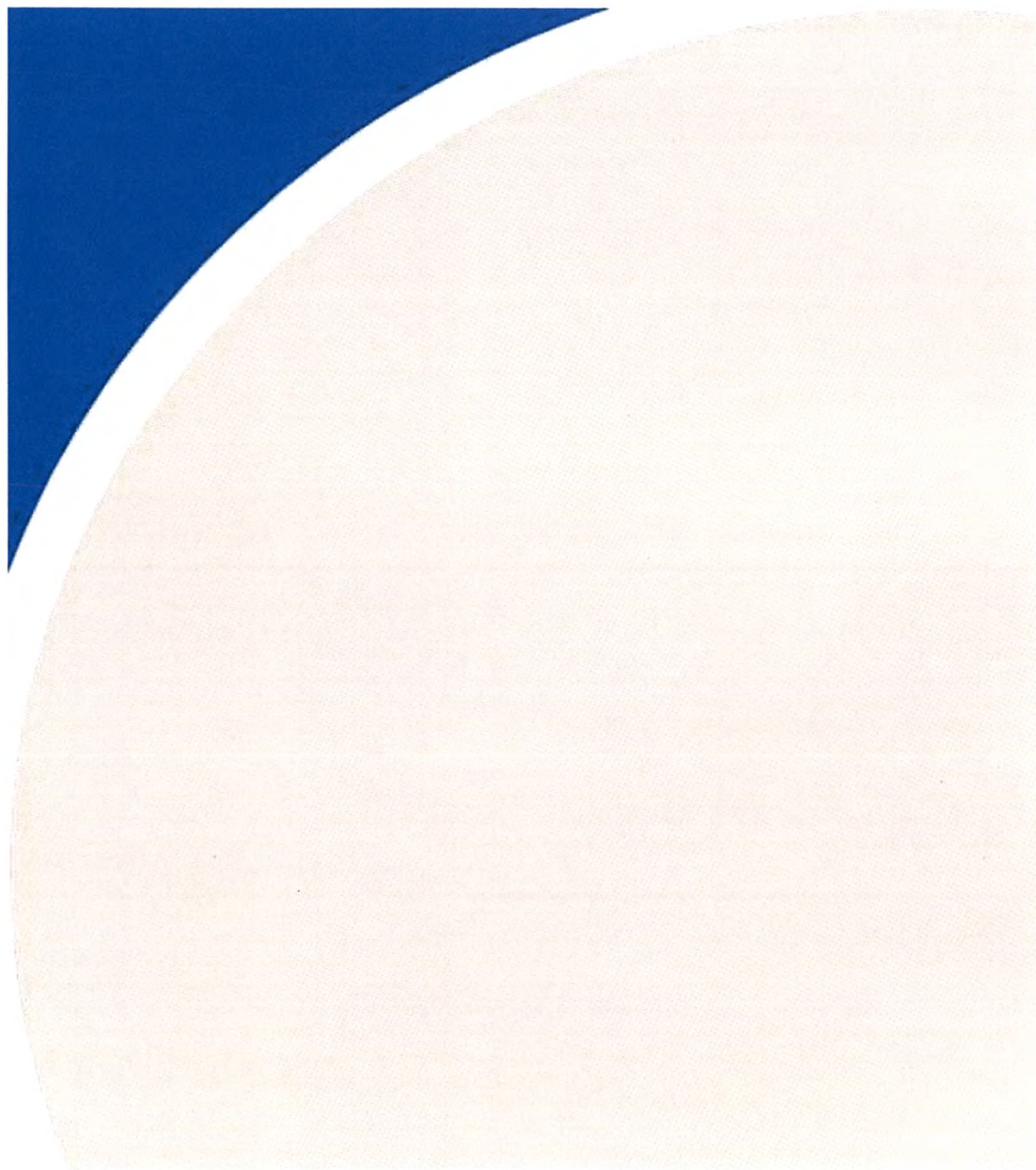
Stack Information				
Flow Rate (ft ³ /min) (Actual)	68,141	67,665	70,040	68,615
Flow (ft ³ /min) (Standard Wet)	62,639	60,264	62,998	61,967
Flow (ft ³ /min) (Standard Dry)	60,880	58,789	61,479	60,383
Flow (m ³ /min) (Standard Dry)	1,724	1,665	1,741	1,710

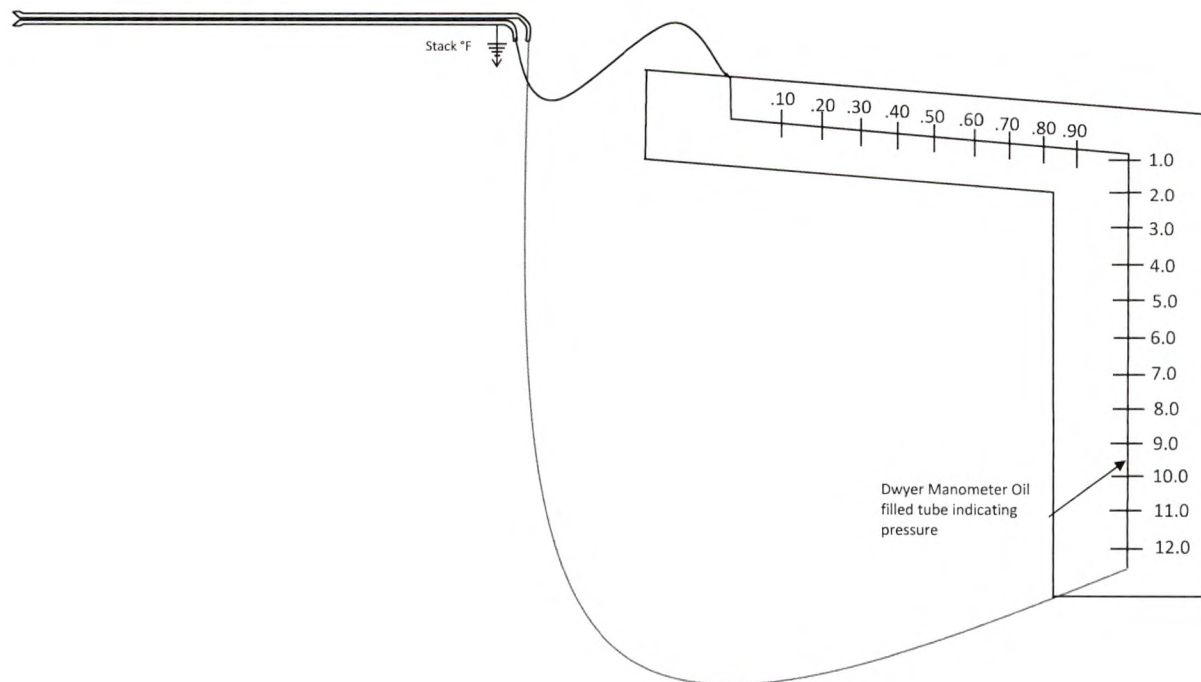
Percent Moisture (%)	2.8	2.4	2.4	2.6
Pressure Ps ("Hg)	29.30	29.30	29.30	29.30
Average Stack Temperature (T _s) (°F)	102.4	120.5	114.8	112.6
Molecular Weight of Stack Gas dry (M _d) (g/mole)	28.84	28.84	28.84	28.84
Molecular Weight of Stack Gas wet (M _s) (g/mole)	28.54	28.57	28.58	28.56
Stack Gas Specific Gravity (G _s) (kg/L)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction (%)	0.0	0.0	0.0	0.0
Average Stack Velocity (V _s) (ft/sec)	49.3	48.9	50.7	49.6
Cross Section Area of Stack (ft ²)	23.0	23.0	23.0	23.0
Percent Carbon Dioxide (%)	0.0	0.0	0.0	0.0
Percent Oxygen (%)	21.0	21.0	21.0	21.0
Percent Carbon Monoxide (%)	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location (%)	-	-	-	-

Meter Info				
Isokinetic Variation I (%)	101.0	100.2	100.6	100.6
Meter Pressure Pm ("Hg)	29.5	29.5	29.5	29.5
Meter Temperature Tm (°F)	73.7	75.6	78.0	75.8
Measured Sample Volume Vm (ft ³)	71.71	69.02	72.73	71.15
Sample Volume (Vm St ft ³)	76.05	72.90	76.52	75.15
Sample Volume (Vm St m ³)	2.15	2.06	2.17	2.13
Total Weight of Sampled Gas (lbs) wet	5.77	5.52	5.79	5.69
Total Weight of Sampled Gas (lbs) dry	5.67	5.43	5.70	5.60
Gas Density Ps wet ("Hg)	0.07	0.07	0.07	0.07
Gas Density Ps dry ("Hg)	0.07	0.07	0.07	0.07
Condensate Volume (ft ³)	2.20	1.83	1.89	1.97
Nozzle Size (in ²)	0.00032	0.00032	0.00032	0.00
Impinger Gain (g)	26.6	25.1	26.1	25.9
Silica Gel Gain (g)	20.0	13.7	14.0	15.9

Lead Results				
Sample Weight (ug)	1.41	1.54	1.92	1.62
Lead Concentration (lb/1000 lb (wet))	5.39E-07	6.15E-07	7.31E-07	6.28E-07
Lead Concentration (lb/1000 lb (dry))	5.48E-07	6.25E-07	7.42E-07	6.38E-07
Lead Concentration (mg/dscm (dry))	6.55E-04	7.46E-04	8.86E-04	7.62E-04
Lead Concentration (gr/dscf)	2.86E-07	3.26E-07	3.87E-07	3.33E-07
Lead Emission Rate (lb/hr)	1.50E-04	1.65E-04	2.05E-04	1.73E-04

FIGURES





USEPA Method 2
Mueller Industries, LLC
Mueller Brass
Port Huron, Michigan

Project #2405025

Figure No. 1

Date: July 23 to 24, 2024





Figure No. #2: USEPA Method 3 Schematic (Fyrite)



USEPA Method 3

Mueller Industries, LLC

Mueller Brass

Port Huron, MI

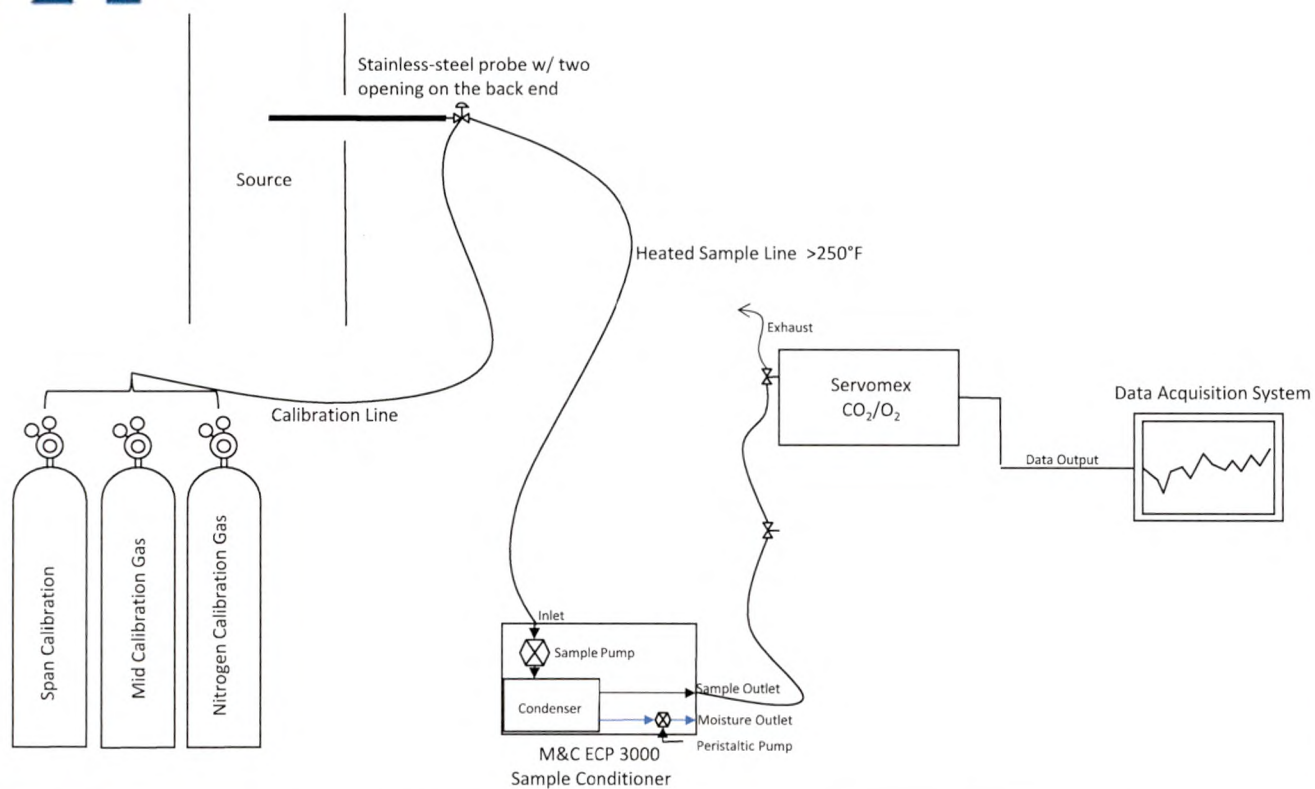
Project #2405025

Date: July 23 to 24, 2024





Figure No. 3: USEPA Method 3A Schematic



USEPA Method 3A

Mueller Industries, LLC

Chip Dryer

Port Huron, MI

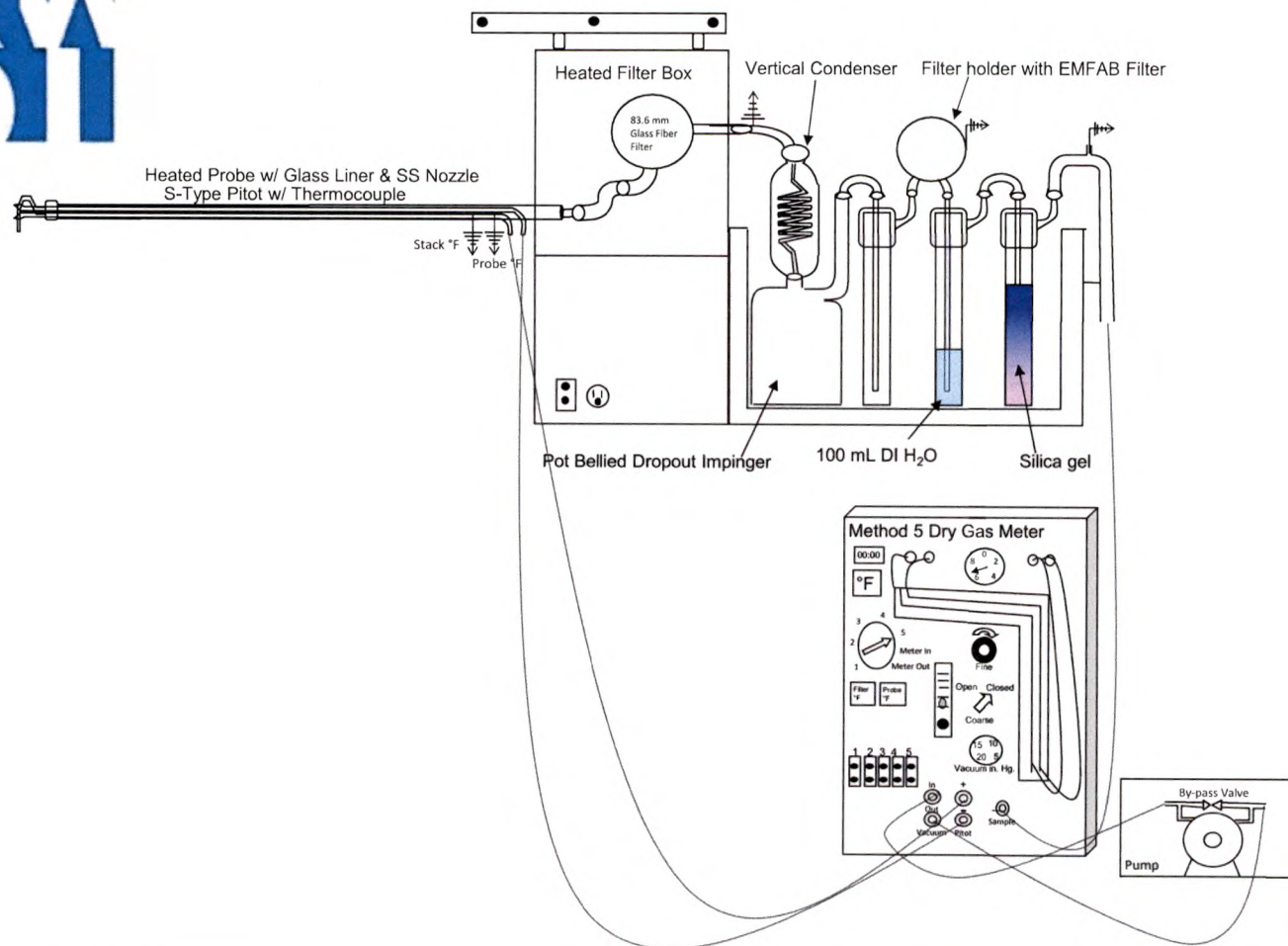
Project# 2405025

Date: July 23, 2024





Figure No. #4 USEPA Method 5/202 Schematic



USEPA Method 5/202

Mueller Industries, LLC

Mueller Brass

Port Huron, Michigan

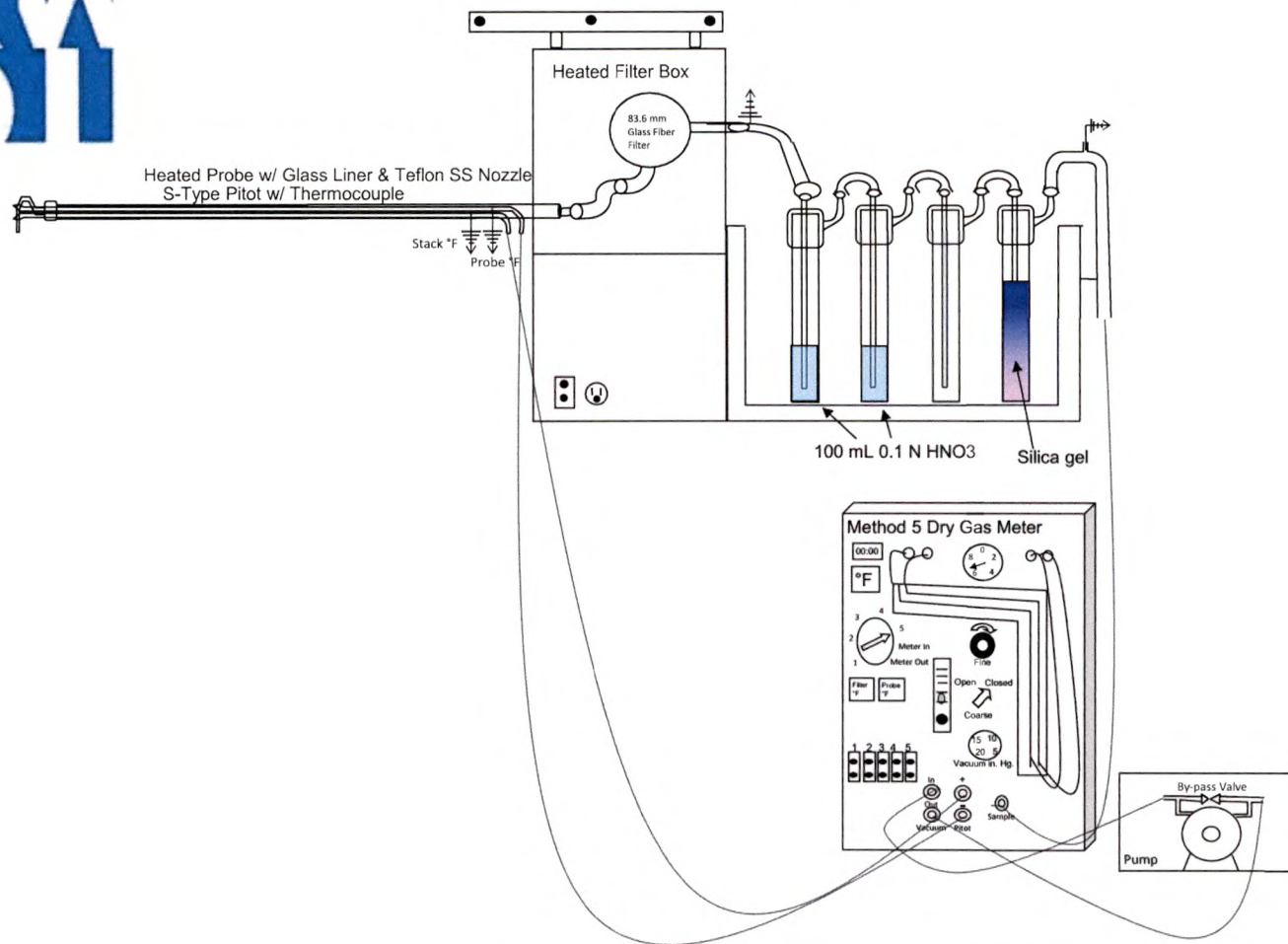
Project #2405025

Date: July 23, 2024





Figure No. #5: USEPA Method 12



USEPA Method 12

Mueller Industries, LLC

Mueller Brass

Port Huron, Michigan

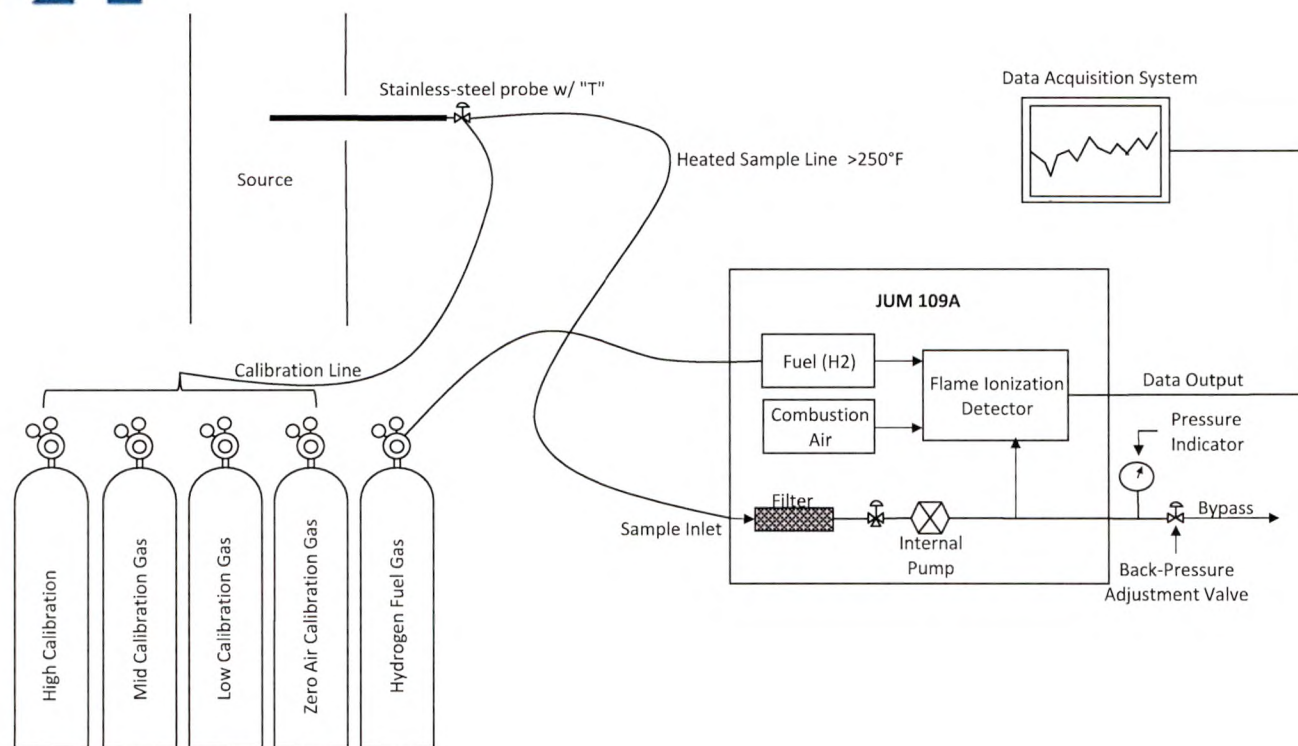
Project #2405025

Date: July 24, 2024





Figure No. #6: USEPA Method 25A Schematic



USEPA Method 25A

Mueller Industries, LLC

Mueller Brass

Port Huron, Michigan

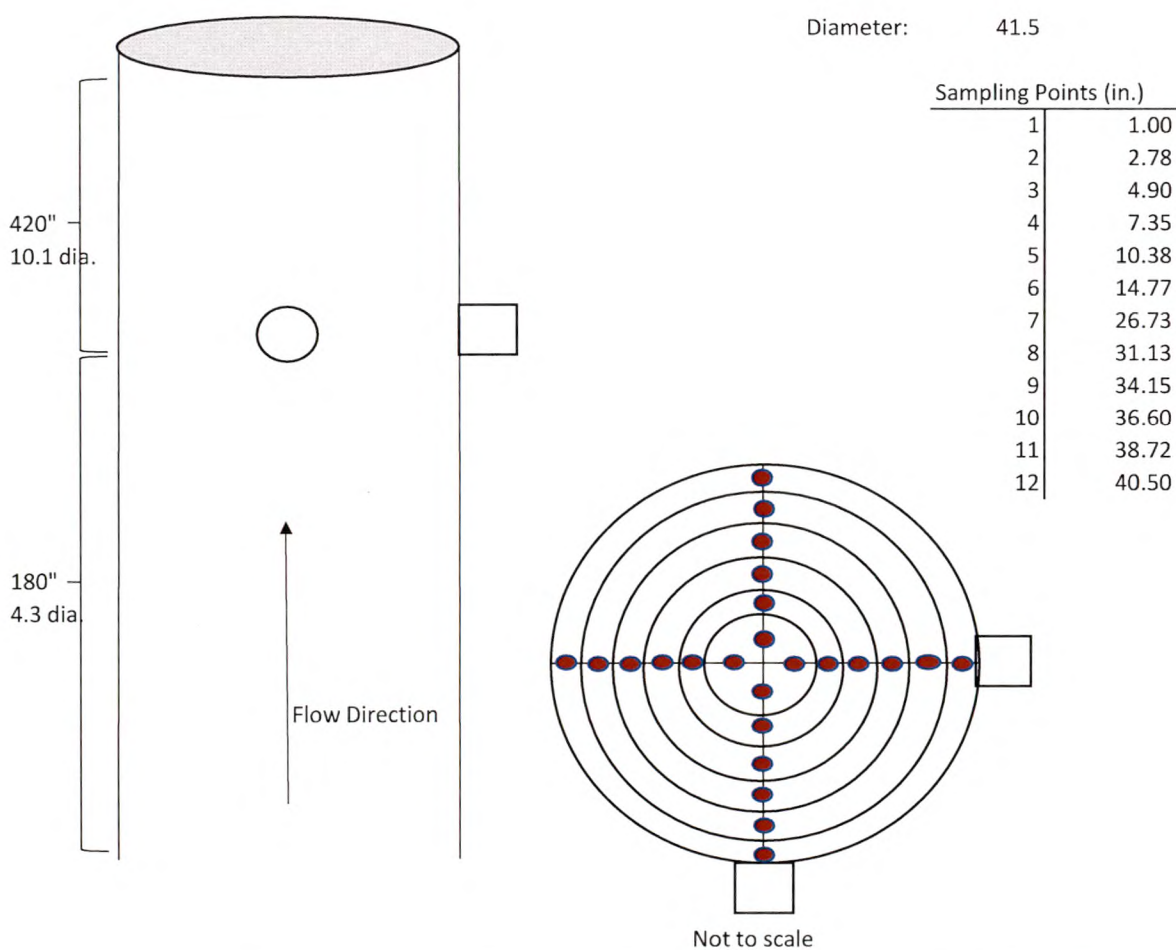
Project #2405025

Date: July 23, 2024





Figure No. #7 EUCHIPDRYER



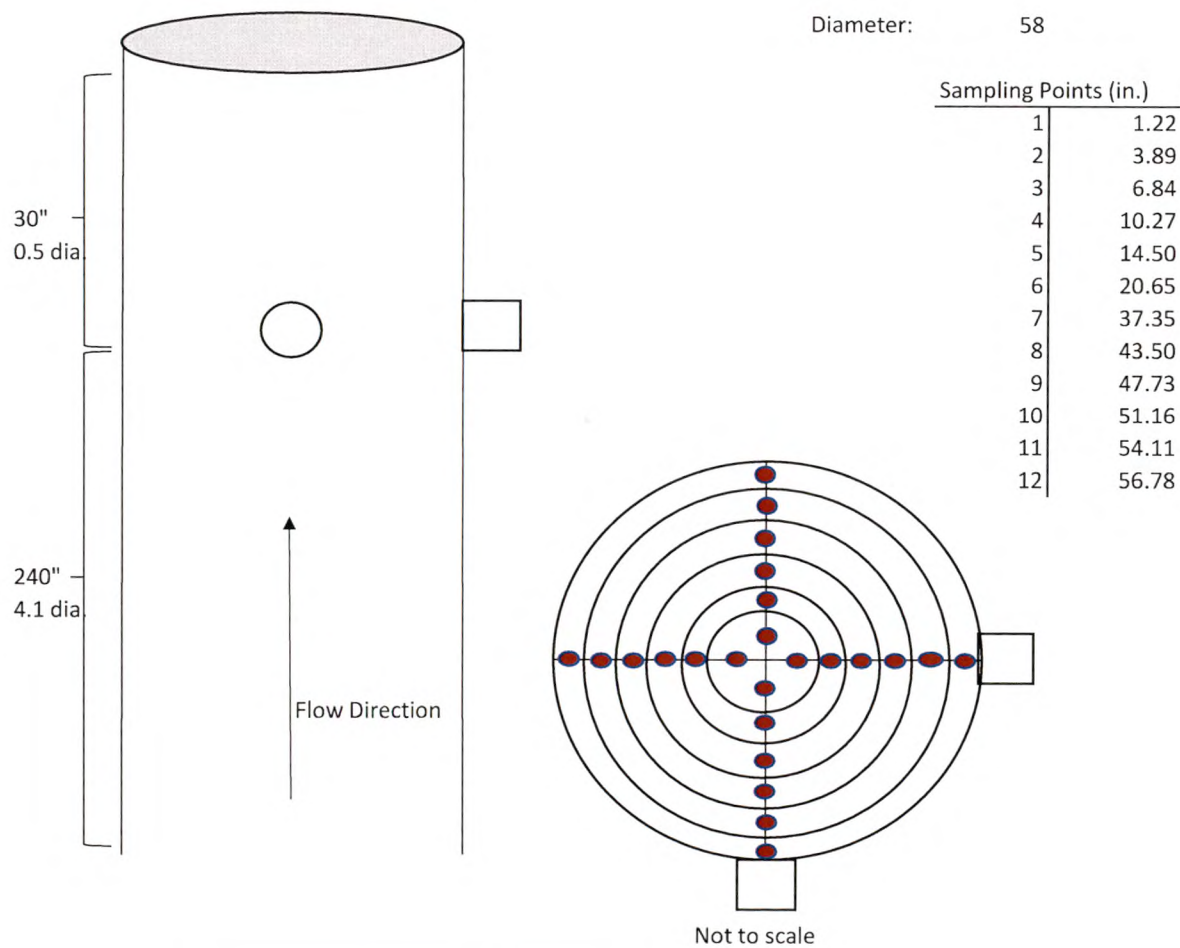
EUCHIPDRYER
Mueller Industries, LLC
Mueller Brass
Port Huron, Michigan

Date:
July 23 to 24, 2024

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Figure No. #8 FGSYSTEMC - North



FGSYSTEMC - North
Mueller Industries, LLC
Mueller Brass
Port Huron, Michigan

Date:
July 23 to 24, 2024

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Figure No. #9 FGSYSTEMC - South

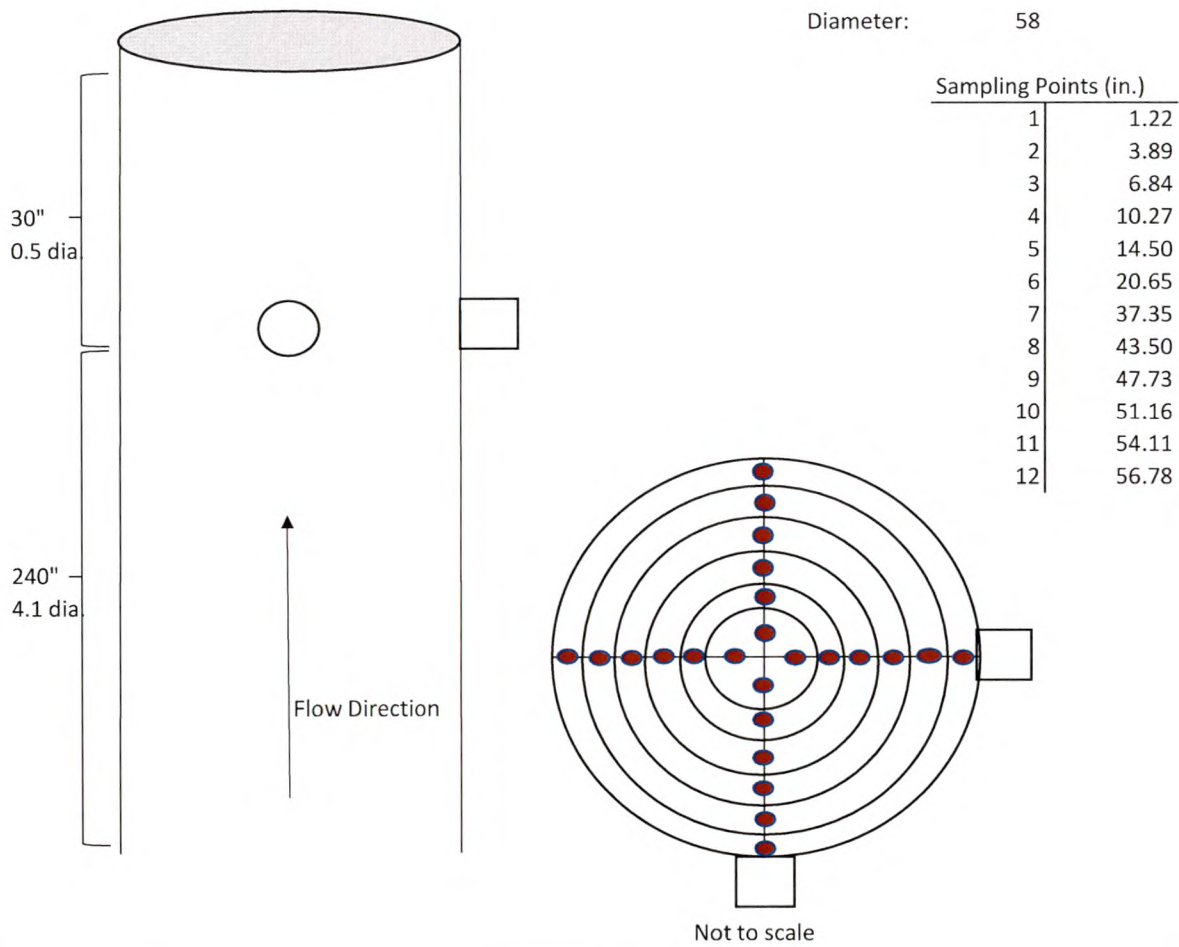




Figure No. #10 FGSYSTEME

