

1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a compliance test program for Verso Corporation at the Escanaba Mill on the Recovery Furnace Outlet, Smelt Dissolving Tank Outlet, and Lime Kiln Stack on September 30 and October 1, 2020. This report summarizes the results of the test program and test methods used.

Test locations, test dates, and test parameter are summarized below.

TEST INFORMATION		
Test Locations	Test Dates	Test Parameters
Recovery Furnace Stack	September 30, 2020	Filterable Particulate Matter (FPM)
Smelt Dissolving Tank Outlet	September 30, 2020	
Lime Kiln Stack	October 1, 2020	

The purpose of this test program was to determine FPM compliance in accordance with the Michigan Department of Environment, Great Lakes and Energy (EGLE) issued Renewable Operating Permit (ROP) Number MI-ROP-A0884-2016 and the emission limits established under 40 CFR 63 Subpart MM – NESHAP for Chemical Recovery Combustion Sources at Kraft, Soda, Sulfite, and Stand-Alone Semichemical Pulp Mills summarized below. A complete summary of emission test results follows the narrative portion of this report.

TEST RESULTS				
Test Location	Test Date	Test Parameter	Emission Limit	Emission Rate
Recovery Furnace ¹	9/30/2020	FPM	0.044 grs/dscf @ 8% O ₂	0.0028 gr/dscf @ 8% O ₂
Smelt Dissolving Tank	9/30/2020	FPM	0.20 lb/TBLS	0.089 lb/TBLS
Lime Kiln Stack ²	10/1/2020	FPM	0.064 grs/dscf @ 10% O ₂	0.063 gr/dscf @ 10% O ₂

¹Four test runs were completed at the Recovery Furnace; however, only runs two through four were included in the average due to run one having probe temperatures higher than 273 °F for a substantial portion of the run. For runs two through four, a different sampling technique was utilized to ensure as few as possible probe temperature readings outside the 248 ± 25 °F window. Filter exit temperatures were monitored for the duration of these runs to ensure sample gas temperatures were within the 248 ± 25 °F window.

²Run one of the Lime Kiln had a post leak check of 0.028 cubic feet per minute (cfm). Because this value is above the allowable maximum leakage rate of 0.020 cfm listed in Method 5, the formula in section 12.3(a) of Method 5 was used to bias adjust the final volume for all subsequent emissions rate calculations.

Plant operating data as provided by Verso Corporation is included in Appendix A.

The identifications of individuals associated with the test program are summarized below.

TEST PERSONNEL INFORMATION		
Location	Address	Contact
Test Facility	Verso Corporation 7100 County Road 426 M.5 Rd Escanaba, MI 49829	Mr. Adam Becker Environmental Engineer (906) 233-2929 (phone) Adam.Becker@versoco.com
Testing Company Representative	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Richard J. Sollars II Senior Project Manager (630) 993-2100 (phone) rsollars@mp-mail.com

The test crew consisted of Messrs. N. Colangelo, R. Simon, J. Kukla, W. Petrovich, M. Sather, M. Friduss and R. Sollars of Mostardi Platt.

Lindsey Wells and Sydney Bruestle of EGLE were on site to observe testing.

2.0 TEST METHODOLOGY

Emissions testing were conducted following the methods specified in 40 CFR, Part 60, Appendix A. Schematics of the test section diagrams and sampling trains used are found in Appendix B and C, respectively. Calculation nomenclature and sample calculations are found in Appendix D. Sample analysis data are found in Appendix E. Copies of reference method data and field data sheets for each test run are included in Appendix F and G, respectively.

The following methodologies were used during the test program:

Method 1 Traverse Point Determination

Test measurement points were selected in accordance with Method 1. The characteristics of the measurement location are summarized below.

TEST POINT INFORMATION							
Location	Stack Diameter (Feet)	Stack Area (Square Feet)	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points	Run Times (minutes)
Recovery Furnace	13.0	132.732	>0.5	>2.0	FPM	24	60
Smelt Dissolving Tank	4	12.566	2.6	2.7	FPM	24	60
Lime Kiln Stack	4.667	17.104	21.4	10.7	FPM	12	60

Method 2 Volumetric Flowrate Determination

Gas velocity was measured following USEPA Method 2, 40CFR60, Appendix A, for purposes of calculating stack gas volumetric flow rate. An S-type Pitot tube, 0-10 inch differential pressure gauge, and K-type thermocouple and temperature readout were used to determine gas velocity at each sample point. For the Smelt Dissolving Tank location, oxygen and carbon dioxide concentrations were utilized per section 8.6 of USEPA Method 2 – “for processes emitting essentially air, an analysis need not be conducted; use a dry molecular weight of 29.0.”.

All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H. All locations have passed the null point pitot check and the results are appended in the report.

Method 3A Oxygen (O₂)/Carbon Dioxide (CO₂) Determination

Stack gas molecular weight was determined in accordance with Method 3A, 40 CFR, Part 60, Appendix A at all test locations. ECOM analyzers were used to determine stack gas oxygen and carbon dioxide content and, by difference, nitrogen content. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H and gas cylinder certifications are presented in Appendix I.

Method 5 Filterable Particulate Matter (FPM) Determination

Stack gas FPM concentrations and emission rates were determined in accordance with USEPA Method 5, 40CFR60, Appendix A at all test locations. An Environmental Supply Company, Inc. sampling train was used to sample stack gas at an isokinetic rate, as specified in the Method. Particulate matter in the sample probe was recovered using a deionized water wash. The probe wash and filter catch were analyzed by Mostardi Platt in accordance with the Method in the Elmhurst, Illinois laboratory. Sample analysis data are found in Appendix E. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H.

3.0 TEST RESULTS SUMMARIES

Client: Verso Corporation
Facility: Escanaba Mill
Test Location: Recovery Furnace Stack
Test Method: 5

	Source Condition	Normal	Normal	Normal	Normal
	Date	9/30/20	9/30/20	9/30/20	9/30/20
	Start Time	8:40	11:16	13:11	15:05
	End Time	9:50	12:41	14:34	16:24
	Run 1	Run 2	Run 3	Run 4	Average
Stack Conditions					
Average Gas Temperature, °F	467.1	459.8	471.4	462.1	464.4
Flue Gas Moisture, percent by volume	27.2%	27.9%	26.4%	26.1%	26.8%
Average Flue Pressure, in. Hg	28.54	28.54	28.54	28.54	28.54
Gas Sample Volume, dscf	42.611	43.502	43.772	43.597	43.624
Average Gas Velocity, ft/sec	51.243	51.878	54.271	53.424	53.191
Gas Volumetric Flow Rate, acfm	408,099	413,153	432,210	425,464	423,609
Gas Volumetric Flow Rate, dscfm	161,316	163,040	172,010	171,826	168,959
Gas Volumetric Flow Rate, scfm	221,728	226,253	233,736	232,416	230,802
Average %CO ₂ by volume, dry basis	15.1	15.5	13.9	14.9	14.8
Average %O ₂ by volume, dry basis	4.6	3.7	5.5	4.2	4.5
Isokinetic Variance	104.0	105.1	100.2	99.9	101.7
Filterable Particulate Matter (Method 5)					
grams collected	0.00758	0.00619	0.01844	0.00465	0.00976
grains/acf	0.0011	0.0009	0.0026	0.0007	0.0014
grains/dscf	0.0027	0.0022	0.0065	0.0016	0.0034
grains/dscf @ 8% O ₂	0.0021	0.0017	0.0054	0.0012	0.0028

*Run 1 excluded from the average due to high probe temperatures and no filter exit temperature monitoring.

Client: Verso Corporation
Facility: Escanaba Mill
Test Location: Smelt Dissolving Tank
Test Method: 5

	Source Condition	Normal	Normal	Normal	
	Date	9/30/20	9/30/20	9/30/20	
	Start Time	8:40	11:00	13:05	
	End Time	10:07	14:29	14:12	
		Run 1	Run 2	Run 3	Average
Stack Conditions					
Average Gas Temperature, °F		167.7	171.3	172.8	170.6
Flue Gas Moisture, percent by volume		37.4%	38.9%	42.0%	39.4%
Average Flue Pressure, in. Hg		29.07	29.07	29.07	29.07
Gas Sample Volume, dscf		75.677	49.866	48.228	57.924
Average Gas Velocity, ft/sec		31.763	49.381	50.284	43.809
Gas Volumetric Flow Rate, acfm		23,949	37,232	37,913	33,031
Gas Volumetric Flow Rate, dscfm		12,253	18,495	17,836	16,195
Gas Volumetric Flow Rate, scfm		19,571	30,255	30,733	26,853
Average %CO ₂ by volume, dry basis		0.0	0.0	0.0	0.0
Average %O ₂ by volume, dry basis		20.9	20.9	20.9	20.9
Isokinetic Variance		98.8	104.4	104.7	102.6
Black Liquor Solids, ton/hr		78.1	78.2	78.2	78.2
Filterable Particulate Matter (Method 5)					
grams collected		0.14011	0.18161	0.18334	0.16835
grains/acf		0.0146	0.0279	0.0276	0.0234
grains/dscf		0.0286	0.0562	0.0587	0.0478
lb/hr		3.000	8.908	8.968	6.959
lb/ton BLS		0.038	0.114	0.115	0.089

Client: Verso Corporation
Facility: Escanaba Mill
Test Location: Lime Kiln Stack
Test Method: 5

	Source Condition	Normal	Normal	Normal
	Date	10/1/20	10/1/20	10/1/20
	Start Time	8:10	10:30	12:10
	End Time	9:35	11:43	13:17
	Run 1	Run 2	Run 3	Average
Stack Conditions				
Average Gas Temperature, °F	161.3	162.8	163.8	162.6
Flue Gas Moisture, percent by volume	34.2%	35.5%	36.3%	35.3%
Average Flue Pressure, in. Hg	29.08	29.08	29.08	29.08
Gas Sample Volume, dscf	50.315	41.694	40.465	44.158
Average Gas Velocity, ft/sec	24.820	27.751	27.092	26.554
Gas Volumetric Flow Rate, acfm	25,508	28,520	27,843	27,290
Gas Volumetric Flow Rate, dscfm	13,866	15,158	14,592	14,539
Gas Volumetric Flow Rate, scfm	21,073	23,501	22,907	22,494
Average %CO ₂ by volume, dry basis	18.5	18.6	17.9	18.3
Average %O ₂ by volume, dry basis	5.6	5.3	5.3	5.4
Isokinetic Variance	98.6	102.4	103.3	101.4
Filterable Particulate Matter (Method 5)				
grams collected	0.26608	0.25892	0.23689	0.25396
grains/acf	0.0444	0.0509	0.0473	0.0475
grains/dscf	0.0816	0.0958	0.0903	0.0892
grains/dscf @ 10% O ₂	0.058	0.067	0.063	0.063

Run 1 sample volumes were calculated based on the procedures in Section 8.4.3 and calculations in section 12.3(a) of USEPA Method 5

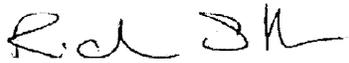
4.0 CERTIFICATION

MOSTARDI PLATT is pleased to have been of service to Verso Corporation. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

CERTIFICATION

As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

MOSTARDI PLATT



Richard J. Sollars II

Program Manager



Scott W. Banach

Quality Assurance

APPENDICES

Appendix A - Plant Operating Data

No. 10 Recovery Furnace Operating Parameters																	
Particulate Matter Testing																	
Date & Time	BLS Production Rate	Steam Flow	Opacity	East SIR #1	East SIR #2	East T/R #3	East T/R #4	East T/R #5	East T/R #6	West SIR #1	West SIR #2	West T/R #3	West T/R #4	West T/R #5	West T/R #6	Secondary Fan	Horsepower
	MMlbs/day	KPPH	%	KV	hp												
Run 1	Start 9/30/2020 8:40 Stop 9/30/2020 10:50	3.75	473	1.82	62.45	59.11	53.16	52.03	49.06	53.38	63.76	56.14	51.34	51.14	38.72	33.32	598
Run 2	Start 9/30/2020 11:16 Stop 9/30/2020 12:41	3.75	478	0.03	62.90	58.40	53.72	51.56	49.33	50.00	64.16	63.70	52.99	50.81	49.52	40.82	597
Run 3	Start 9/30/2020 13:11 Stop 9/30/2020 14:34	3.75	471	0.03	62.25	57.50	53.46	52.84	49.57	50.00	63.62	62.99	54.09	50.34	50.08	40.97	598
Run 4	Start 9/30/2020 15:05 Stop 9/30/2020 16:24	3.75	460	0.02	63.14	56.47	53.42	51.59	49.81	50.53	63.48	63.26	53.29	50.87	50.64	41.00	599

**Smelt Dissolving Tank Operating Parameters
PM Testing**

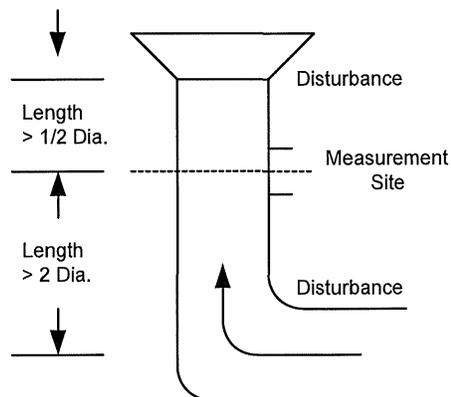
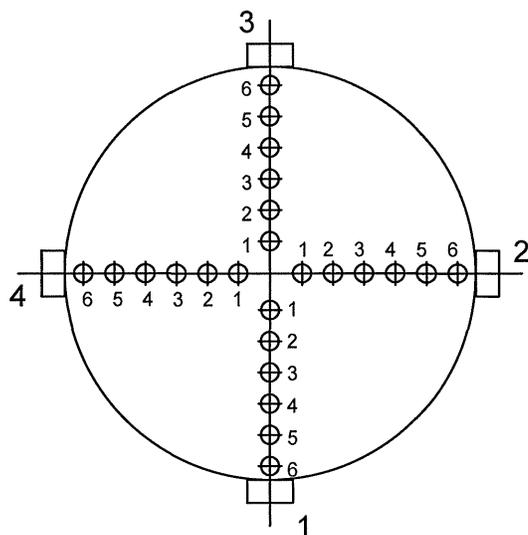
	Date & Time	BLS Production Rate MMlbs/day	Steam Flow KPPH	Opacity %	East duct Scrubber Flow gpm	West Duct Scrubber Flow gpm	Scrubber Fan Nozzle Flow gpm	Total Scrubber Flow gpm	Fan Amperage amps	Fan Status
Run 1	Start 9/30/2020 8:40 Stop 9/30/2020 10:07	3.75	471	2	15	16	63	94	125	Run
Run 2	Start 9/30/2020 11:00 Stop 9/30/2020 12:22	3.75	480	0	15	15	59	89	120	Run
Run 3	Start 9/30/2020 13:05 Stop 9/30/2020 14:12	3.75	472	0	15	15	58	88	120	Run

Lime Kiln Operating Parameters

	Date & Time	CaO Production (tons/day)	CaO Production (tons/hr)	Scrubber dP (Inches)	Scrubber Flow (GPM)	Stack O2 (%)	Natural Gas (cfm)	ID Fan Amps	Mud to Filter (GPM)	Density
Run 1	Start 10/1/2020 8:10 Stop 10/1/2020 9:35	212	8.8	13.6	575	5.1	1026	328	300	23.0
Run 2	Start 10/1/2020 10:30 Stop 10/1/2020 11:43	213	8.9	14.0	575	5.0	1024	329	300	23.0
Run 3	Start 10/1/2020 12:10 Stop 10/1/2020 13:17	214	8.9	14.5	575	5.1	1024	331	300	23.0

Appendix B - Test Section Diagrams

EQUAL AREA TRAVERSE FOR ROUND DUCTS



Job: Verso Corporation
 Escanaba Mill
 Escanaba, Michigan

Date: September 30, 2020

Test Location: Recovery Furnace

Stack Diameter: 13.0 Feet

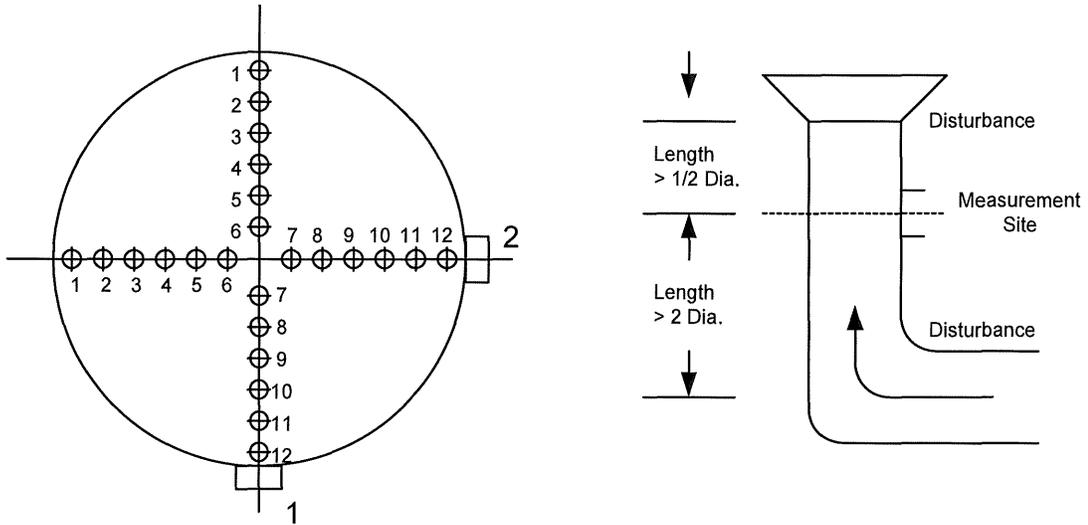
Stack Area: 132.732 Square Feet

No. Points Across Diameter: 12

No. of Ports: 4

Port Length: 19.0 Inches

EQUAL AREA TRAVERSE FOR ROUND DUCTS



Job: Verso Corporation
Escanaba Mill
Escanaba, Michigan

Date: September 30, 2020

Test Location: Smelt Dissolving Tank

Stack Diameter: 4.0 Feet

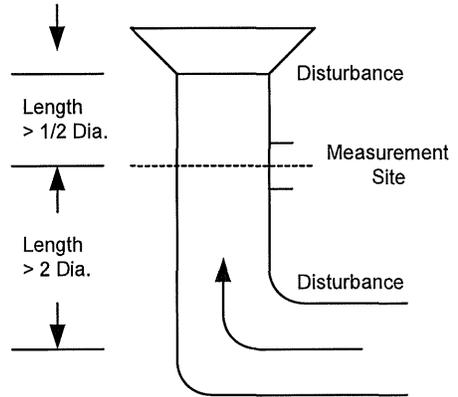
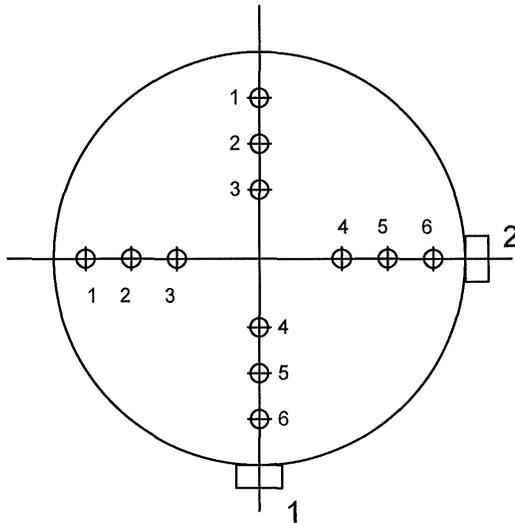
Stack Area: 12.566 Square Feet

No. Points Across Diameter: 12

No. of Ports: 2

Port Length: 4.0 Inches

EQUAL AREA TRAVERSE FOR ROUND DUCTS



Job: Verso Corporation
Escanaba Mill
Escanaba, Michigan

Date: October 1, 2020

Test Location: Lime Kiln Stack

Duct Diameter: 4.67 Feet

Duct Area: 17.129 Square Feet

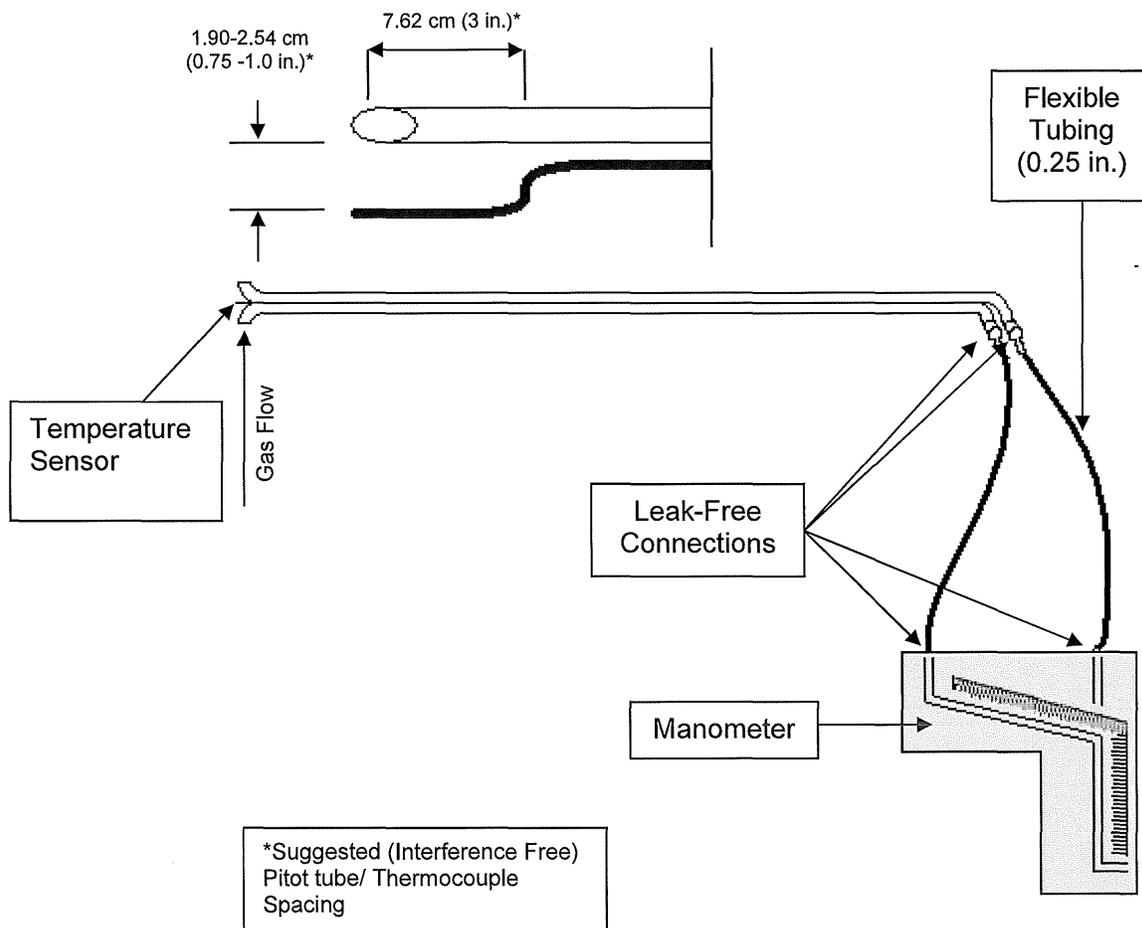
No. Points Across Diameter: 6

No. of Ports: 2

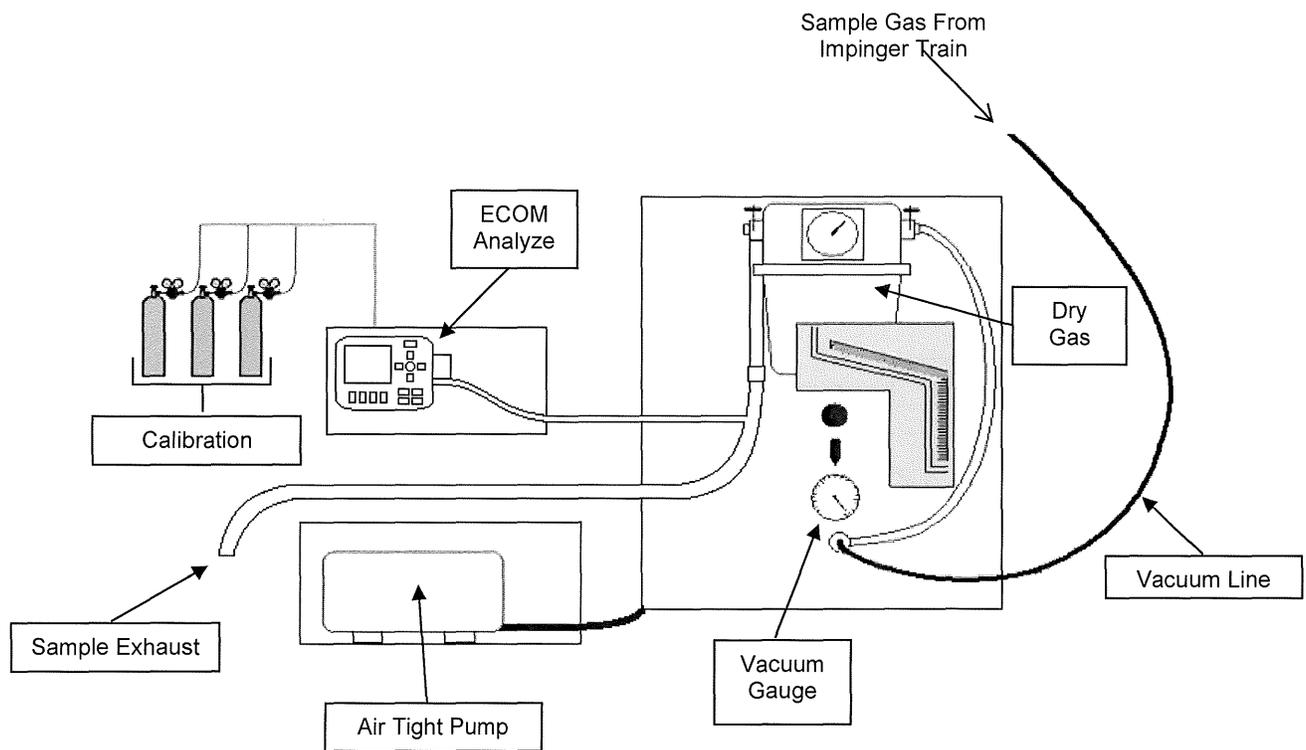
Port Length: 7.0 Inches

Appendix C - Sample Train Diagrams

USEPA Method 2 – Type S Pitot Tube Manometer Assembly



USEPA Method 3A - Integrated Oxygen/Carbon Dioxide Sample Train Diagram Utilizing ECOM To Measure from Sample Exhaust



USEPA Method 5- Particulate Matter Sample Train Diagram

