$PM_{10}/PM_{2.5}$ EMISSION FACTOR TESTING for the PULVERIZED MINERAL DIVISION of the NATIONAL STONE SAND AND GRAVEL ASSOCIATION

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AIR POLLUTION CONTROL SYSTEMS ENGINEERING

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1. SUMMARY

1.1 EMISSION FACTOR TEST RESULTS

The Pulverized Materials Division (PMD) of the National Stone, Sand, and Gravel Association (NSSGA) has retained Air Control Techniques, P.C. to accurately measure PM_{10} and $PM_{2.5}$ particulate matter emissions from a set of pulverized material processing systems. These tests were part of the NSSGA program initiated in 1991 to determine emission factors for the stone, sand, and gravel industries. Seven pulverized material processing systems at four plants were selected in order to provide a representative sample of the products produced and the processing equipment used by PMD-NSSGA member companies.

The results of the PMD-sponsored emission factor tests have been categorized into four major types of sources: (1) grinding, (2) classifying, (3) drying, and (4) storage. The measured emission factors for total filterable particulate matter, PM_{10} filterable particulate matter, and $PM_{2.5}$ filterable particulate matter are summarized in Table 1.

Table 1. Summary of Emission Factor Test Results

Emission Test Number	Type of Source	Total Filterable Particulate Matter, lbs./ton	PM_{10} Particulate Matter, lbs./ton	$PM_{2.5}$ Particulate Matter, lbs./ton
1	Grinding – Roller Mill	0.0029	0.0015	0.0008
2	Grinding – Raymond Mill	0.0205	0.0092	0.0016
3	Grinding – Horizontal Ball Mill	0.1514	0.0919	0.0338
4	Grinding – Vertical Ball Mill	1.5950	1.3808	0.6506
5	Classifier	0.0255	0.0104	0.0041
6	Flash Dryer	0.0306	0.0146	0.0083
7	Product Storage	0.0063	0.0016	0.0006

All of the particulate matter emissions measured during the study are characteristic of well operated and maintained sources controlled by fabric filters. The emission factors calculated based on the measured emissions are low.

PM_{10} filterable particulate matter is approximately 25% to 87% of the total filterable particulate matter for the total set of sources evaluated. $PM_{2.5}$ filterable particulate matter represents 9 to 41% of the total filterable particulate matter.

These data will be compiled with other previous emissions tests (total filterable particulate matter emissions) to prepare draft technical materials for future inclusion in EPA's AP-42 emission factor database. The draft AP-42 materials will be prepared and submitted to PMD in the near future.

1.2 PLANTS AND PROCESS EQUIPMENT SYSTEMS TESTED

The plants and process equipment systems included within the scope of this testing program were selected by PMD member companies. The four plants and seven systems listed in Table 2 represent a moderate-to-large fraction of the total pulverized materials industry in the U.S.

Table 2 Host Facilities, Products and Equipment Tested

Company Name	Town	State	Product Tested	Equipment Tested
Polar Minerals, Inc.	Wellsville	Ohio	Talc	Grinding (Roller Mill)
Specialty Minerals, Inc	North Adams	Massachusetts	Calcium Carbonate	Product Silo
Specialty Minerals, Inc	North Adams	Massachusetts	Calcium Carbonate	Classifier
Specialty Minerals, Inc	North Adams	Massachusetts	Calcium Carbonate	Grinding (Raymond Mill)
OMYA, Inc	Florence	Vermont	Calcium Carbonate	Flash Dryer
J. M. Huber Corporation	Quincy	Illinois	Limestone	Grinding (Horizontal Ball Mill)
J. M. Huber Corporation	Quincy	Illinois	Barite	Grinding (Vertical Ball Mill)

The emphasis in the testing program was placed on grinding systems because these are of central importance in the production of pulverized materials. The grinding equipment used in the pulverized material industry is quite different from the cone and impact crushers used in stone, sand, and gravel plants. The particle size ranges of products provided by PMD member companies range from less than 75 micrometer material (< 200 mesh) to products having mass mean diameters less than 5 micrometers in diameter. Conventional pulse jet and single compartment reverse air fabric filters control all grinding equipment used in the pulverized materials industry.

Other sources within the scope of this study included a classifier, a dryer, and a product storage silo. Classifiers separate minerals by size and return oversize material for additional grinding. Dryers prepare raw materials for grinding. Silos are used to store finely ground material prior to shipment.

The production levels common to the pulverized materials industry are considerably smaller than the levels in the stone, sand, and gravel industries. PMD member company sources tested as part of this study had processing equipment throughput rates ranging from 0.5 to 14 tons per hour. This is approximately 1/100 to 1/200th of the production levels in crushed stone, sand and gravel plants.

During each of the test programs, Air Control Techniques, P.C. obtained production rate data for each of the processes tested. Detailed process data were not obtained because the pulverized materials industry is highly competitive and process data are considered confidential. The tests were conducted when the equipment was operating near full capacity. During the field tests, the production rates were monitored by plant personnel in order to verify representative plant operations

1.3 EMISSION TESTING PROCEDURES

Air Control Techniques, P.C. used draft EPA reference method 201B (available at www.epa.gov/ttn/emc/) for the measurement of particulate matter in the $PM_{2.5}$ size range. This method has been fully reviewed by EPA and is presently the only recognized method for the measurement of $PM_{2.5}$. There are no alternative techniques under development at EPA. This test method is an extension of Method 201 for the measurement of PM_{10} and is based, in part, on EPA research conducted in the mid-1980s. The specific procedures used in draft Method 201B are based on the $PM_{10}/PM_{2.5}$ emission testing protocol developed by Air Control Techniques, P.C. for the Portland Cement Association (PCA) and published as PCA research publication 2081 (1996).

Method 201 B is a cascade cyclone technique. The Method 201B sampling system consists of the PM_{10} cyclone from Method 201A followed by a $PM_{2.5}$ cyclone. A 47millimeter (mm) filter is mounted after the $PM_{2.5}$ cyclone to collect particles equal to or smaller than 2.5 micrometers (aerodynamic diameter). Particulate matter obtained during sampling is divided into the following three size categories.

- Supercoarse particulate matter having aerodynamic diameters larger than 10 micrometers
- Coarse particulate matter having aerodynamic diameters larger than 2.5 micrometers and equal to or smaller than 10 micrometers
- Fine particulate matter having aerodynamic diameters equal to or smaller than 2.5 micrometers (commonly termed $PM_{2.5}$ particulate matter)

The capability of draft Method 201B to separate particulate matter in these three size categories is especially important considering the recent Supreme Court ruling in American Trucking versus EPA. As a result of that case, EPA is considering revising the National Ambient Air Quality Standards to independently regulate fine and coarse particulate matter. The emission factor data obtained by means of Method 201B are compatible with both EPA's prior regulatory approach and with the anticipated separate standards for fine and coarse particulate matter.

These data are being provided to PMD to support the development of an emission factor database concerning PM_{10} and $PM_{2.5}$ emissions for pulverized mineral plants. There are presently no PM_{10} and $PM_{2.5}$ emission factor data in U.S. EPA Publication AP-42 concerning these types of sources.

2. EMISSION TEST RESULTS

2.1 CALCIUM CARBONATE RAYMOND MILL PARTICULATE MATTER EMISSIONS

Air Control Techniques, P.C. tested a Raymond Mill baghouse stack at the Specialty Minerals, Inc. North Adams, Massachusetts plant on August 16, 2001. The Raymond mill is used to grind calcium carbonate to sizes less than 80 micrometers. A conventional pulse jet fabric filter is used for particulate matter control.

A sketch of the sampling location for the Raymond Mill is shown in Figure 1. A set of three ports was oriented vertically on the rectangular duct. The ports were located 25 inches upstream of the termination of the duct and more than 60 inches downstream of the closest flow disturbance. This port location satisfied U.S. EPA Method 1 siting requirements.

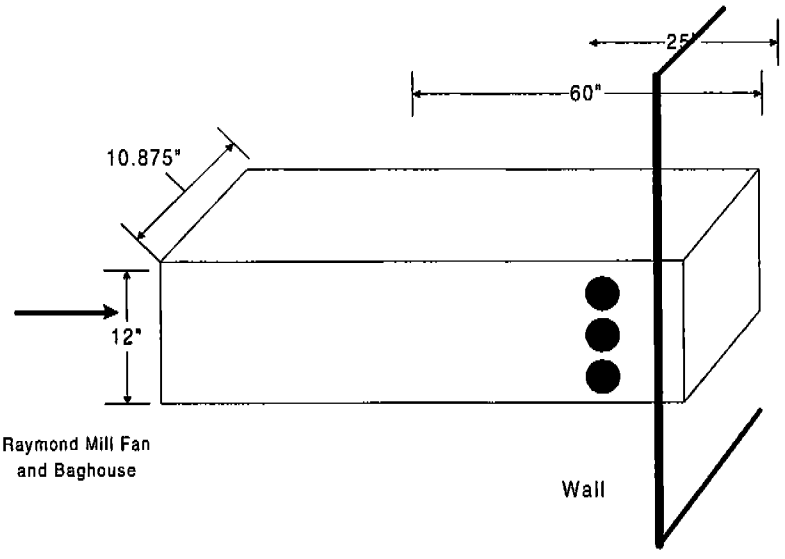


Figure 1. Calcium Carbonate Raymond Mill Stack Test Port Location

Provisions were made to produce a 3 by 4 sampling matrix to facilitate testing with the Method 201B dual cyclone assembly. The number and location of the sampling and traverse points were determined according to the procedures outlined in EPA Reference Method 1 based on 12 sampling points. The 10.875 inch by 12.5 inch square stack was divided into 12 equal areas with 4 sampling points per each of the three sample axes. A base time of 120 minutes was used for the Method 201B test runs. As required by Method 201B, each point was sampled for a different period of time (dwell time) calculated based on the stack gas velocity of that point.

Prior to sampling, a cyclonic flow check was performed on the calcium carbonate Raymond Mill stack location. The average flow angle measured in the stack was 1.9 degrees. In accordance with Section 2.5.1 of CFR 40 Part 60, special testing procedures to compensate for cyclonic flow are not required unless the average flow angle is in excess of 20 degrees. Therefore, standard testing procedures were used to complete the sampling. The particulate matter emissions measured at the calcium carbonate Raymond Mill are summarized in Table 3.

Table 3. Calcium Carbonate Raymond Mill Stack Emissions				
Parameter	SM3-M201B-1	SM2-M201B-2	SM3-M201B-3	Three Run Average
Test Date	8/16/01	8/16/01	8/16/01	N/A
Test Time	0800 – 1015	1021 – 1220	1226 – 1424	N/A
Total Filterable Particulate				
Pounds/Hour	0.04940	0.01856	0.01899	0.02898
Grains/DSCF	0.00361	0.00142	0.00157	0.00220
PM_{10} Particulate Emissions				
Pounds/hour	0.02386	0.01252	0.00795	0.01478
Grains/DSCF	0.00174	0.00096	0.00066	0.00112
PM_{10} Cyclone Cut Size, micrometers	10.52	10.81	10.74	10.69
$PM_{2.5}$ Particulate Emissions				
Pounds/hour	0.01047	0.00928	0.00662	0.00879
Grains/DSCF	0.00076	0.00071	0.00055	0.00067
$PM_{2.5}$ Cyclone Cut Size, micrometers	2.3	2.42	2.40	2.37
Flue Gas Flow, DSCFM	1,596	1,529	1,415	1,513
Flue Gas Flow, ACFM	1,909	1,840	1,739	1,829
Moisture, %	3.60	2.72	4.09	3.47
Stack Temperature, °F	136.4	145.6	149.6	143.9

As indicated in Table 3, all three categories of particulate matter emissions remained at consistently low levels during the three run tests. The total filterable particulate matter concentrations expressed as grains per DSCF are characteristics of well designed, operated, and maintained fabric filter controlled sources. Gas flow rates, moisture levels, and gas temperatures also remained very consistent throughout the test program.

The gas velocities in the exhaust stack averaged 2,016 feet per minute. While this average velocity is low compared to many other industrial sources, no problems were experienced in achieving the particle cut size (10 ± 1.0 micrometers and 2.5 ± 0.25 micrometer) requirements. All three of the tests were conducted in the required isokinetic range of 80% to 120%. Air Control Techniques, P.C. believes that the data summarized in Table 3 provide an accurate measurement of particulate matter emissions from the process tested.

2.2 TALC ROLLER MILL PARTICULATE MATTER EMISSIONS

Air Control Techniques, P.C. tested a talc roller mill baghouse stack at the Polar Minerals, Inc. Wellsville, Ohio Plant on July 7, 2001. Talc is hydrous magnesium silicate that is finely ground for use as a raw material ingredient in paper, rubber, textile, cosmetic, and paint industries. The production rates for the roller mill tested as part of this testing program was 5.67 tons per hour. The particle size range of the material produced by the roller mill was predominately less than 325 mesh. The roller mill was controlled by a conventional pulse jet fabric filter with a design air-to-cloth ratio less than 4 (ft^3/min per ft^2).

Figure 2 is a sketch of the talc roller mill stack location. The test ports were located 27 inches downstream of the fan discharge and more than ten duct diameters upstream of the end of the duct. The downstream separation distance of 27 inches was slightly smaller than required by Method 1; however, an evaluation of the point-to-point variations in velocity pressures indicated that the port location did not affect the testing results. There were no reasonable alternatives for the port location. Most of the duct section shown in Figure 2 was elevated and in an inaccessible location.

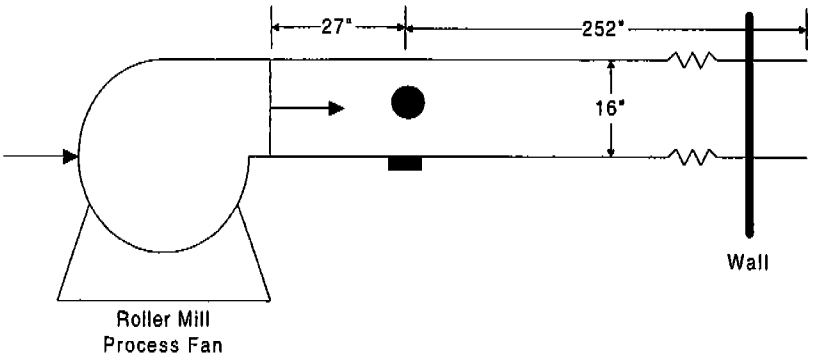


Figure 2. Talc Roller Mill Stack Test Port Location

Plant personnel installed two 3 inch diameter test ports 90° from one another to facilitate testing with the Method 201B dual cyclone assembly. The number and location of the sampling and traverse points were determined by Air Control Techniques, P.C. according to the procedures outlined in EPA Reference Method 1 based on 12 sampling points. The 16 inch diameter stack was divided into 12 equal areas with 6 sampling points on each of the 2 axes. A base time of 120 minutes was used for the Method 201B test runs. As required by Method 201B, each point was sampled for a different period of time (dwell time) calculated based on the stack gas velocity of that point.

Prior to sampling, a cyclonic flow check was performed on the talc roller mill stack location. The average flow angle measured in the stack was 1.6 degrees. In accordance with Section 2.5.1 of CFR 40 Part 60, special testing procedures to compensate for cyclonic flow are not required unless the average flow angle is in excess of 20 degrees; therefore, standard testing procedures were used to complete the sampling. The particulate emissions measured at the stack are summarized in Table 4.

Table 4. Talc Roller Mill Stack Emissions

Parameter	Test Run Designation			Three Run Average
	RM-M201B-1	RM-M201B-2	RM-M201B-3	
Test Date	7/17/01	7/17/01	7/17/01	N/A
Test Time	0911 – 1115	1317 – 1520	1549 – 1755	N/A
Total Filterable Particulate				
Pounds/Hour	0.13283	0.09770	0.11435	0.11496
Grains/DSCF	0.00343	0.00251	0.00272	0.00289
PM_{10} Particulate Emissions				
Pounds/hour	0.06772	0.04621	0.04368	0.05254
Grains/DSCF	0.00175	0.00119	0.00104	0.00133
PM_{10} Cyclone Cut Size, micrometers	10.70	10.92	10.35	10.66
$PM_{2.5}$ Particulate Emissions				
Pounds/hour	0.00912	0.00792	0.00899	0.00868
Grains/DSCF	0.00024	0.00020	0.00021	0.00022
$PM_{2.5}$ Cyclone Cut Size, micrometers	2.41	2.51	2.25	2.39
Flue Gas Flow, DSCFM	4,513	4,547	4,903	4,654
Flue Gas Flow, ACFM	5,715	5,844	5,956	5,838
Moisture, %	3.60	3.05	3.33	3.33
Stack Temperature, °F	174.0	187.0	149.9	170.3

All three of the test runs were very consistent. There were only minimal variations in the total filterable particulate matter concentrations, PM_{10} concentrations, $PM_{2.5}$ concentrations, gas flow rates, and gas moisture levels. All of the particulate matter emissions were quite low.

The Method 201B tests satisfied all applicable quality assurance requirements with the exception of Method 1 requirements for port location.

All of the Method 201B tests at the Wellsville plant achieved the particle cut size requirements (10 ± 1.0 micrometers and 2.5 ± 0.25 micrometer). All three of the tests were conducted in the required isokinetic range of 80% to 120%. Air Control Techniques, P.C. believes that the data summarized in Table 4 provide an accurate measurement of particulate matter emissions from the process tested.

2.3 LIMESTONE HORIZONTAL BALL MILL PARTICULATE MATTER EMISSIONS

Air Control Techniques, P.C. tested a horizontal ball mill baghouse stack at the J.M. Huber Corporation, Quincy, Illinois plant on September 5, 2001. A conventional grinding system is used to reduce mineral material to sizes less than 325 mesh. The ball mill is used for pulverizing limestone. The effluent gas stream from the ball mill is controlled by a pulse jet fabric filter having a design air-to-cloth ratio less than 4 (ft^3/min per ft^2).

The sampling location for this system was a set of test ports located on a horizontal duct on the fan discharge. As shown in Figure 3, the ports were located more than two duct diameters downstream of the fan discharge and more than two duct diameters upstream of the termination of the duct. This port location complies with U.S. EPA Method 1 guidelines. Air Control Techniques, P.C. used a 2 by 6 sampling matrix during testing with the Method 201B dual cyclone assembly. The number and location of the sampling and traverse points were determined according to the procedures outlined in EPA Reference Method 1. The 12 inch by 12-inch square stack was divided into 12 equal areas with 6 sampling points per sample axes. A base time of 120 minutes was used for the Method 201B test runs. As required by Method 201B, each point was sampled for a different period of time (dwell time) calculated based on the stack gas velocity of that point.

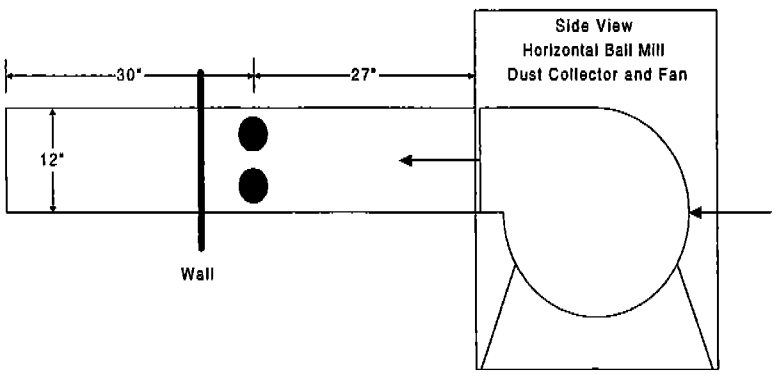


Figure 3. Limestone Horizontal Ball Mill Stack Test Port Location

Prior to sampling, a cyclonic flow check was performed on the horizontal ball mill stack location. The average flow angle measured in the stack was 1.7 degrees. In accordance with Section 2.5.1 of CFR 40 Part 60, special testing procedures to compensate for cyclonic flow are not required unless the average flow angle is in excess of 20 degrees; therefore, standard testing procedures were used to complete the sampling.

The particulate matter emissions and emission factors measured at the horizontal ball mill stack are summarized in Table 5.

Table 5. Limestone Horizontal Ball Mill Stack Emissions				
Parameter	JMH1-M201B-1	JMH1-M201B-2	JMH1-M201B-3	Three Run Average
Test Date	9/5/01	9/5/01	9/5/01	N/A
Test Time	0807 – 1037	1049 – 1254	1306 – 1508	N/A
Total Filterable Particulate				
Pounds/Hour	0.57874	0.58191	0.54862	0.56976
Grains/DSCF	0.01530	0.01534	0.01488	0.01517
PM_{10} Particulate Emissions				
Pounds/hour	0.35827	0.35139	0.32413	0.34459
Grains/DSCF	0.00947	0.00926	0.00879	0.00917
PM_{10} Cyclone Cut Size, micrometers	10.81	10.82	10.87	10.83
$PM_{2.5}$ Particulate Emissions				
Pounds/hour	0.12861	0.13208	0.11981	0.12683
Grains/DSCF	0.00340	0.00348	0.00325	0.00338
$PM_{2.5}$ Cyclone Cut Size, micrometers	2.42	2.43	2.46	2.44
Flue Gas Flow, DSCFM	4,414	4,425	4,302	4,380
Flue Gas Flow, ACFM	5,283	5,392	5,325	5,333
Moisture, %	1.91	2.12	2.35	2.13
Stack Temperature, °F	157.6	167.4	175.8	166.9

Air Control Techniques, P.C. experienced no problems in achieving the particle cut size requirements (10 ±1.0 micrometers and 2.5 ± 0.25 micrometer). All three of the tests were conducted in the required isokinetic range of 80% to 120%. Air Control Techniques, P.C. believes that the data summarized in Table 5 provide an accurate measurement of particulate matter emissions from the horizontal ball mill.

2.4 BARITE VERTICAL BALL MILL PARTICULATE MATTER EMISSIONS

Air Control Techniques, P.C. tested a vertical ball mill baghouse stack at the J.M. Huber Corporation, Quincy, Illinois Plant on September 6, 2001. This is a conventional grinding system used to reduce mineral material from a feed size of less than 10 micrometers to a product size with a mass median diameter in the range of 2 to 3 micrometers. This is the smallest sized product material included in the scope of this emission factor testing projects. PMD representatives need to determine if this type of process is representative of (1) the other three types of grinding operations included in this study and (2) other processes used in the pulverized materials industry. The ball mill is used for pulverizing barite, a mineral composed primarily of barium sulfate. The effluent gas stream from the ball mill is controlled by a pulse jet fabric filter having a design air-to-cloth ratio less than 4 (ft^3/min per ft^2).

A sketch of the test ports for this system is shown in Figure 4. The ports were located 196 inches downstream of the descending elbow from the fabric filter and more than 44 inches upstream of the elbow leading to the centrifugal fan for the system. This port location satisfies U.S. EPA Method 1 siting requirements.

Two 5 inch diameter test ports were installed 90 degrees from one another to facilitate testing with the Method 201B dual cyclone assembly. The number and location of the sampling and traverse points were determined according to the procedures outlined in EPA Reference Method 1 based on 12 sampling points. The 18 inch diameter stack was divided into 12 equal areas with 6 sampling points on each of the 2 axes. A base time of 120 minutes was used for the Method 201B test runs. Each point was sampled for a different period of time (dwell time) calculated based on the stack gas velocity of that point.

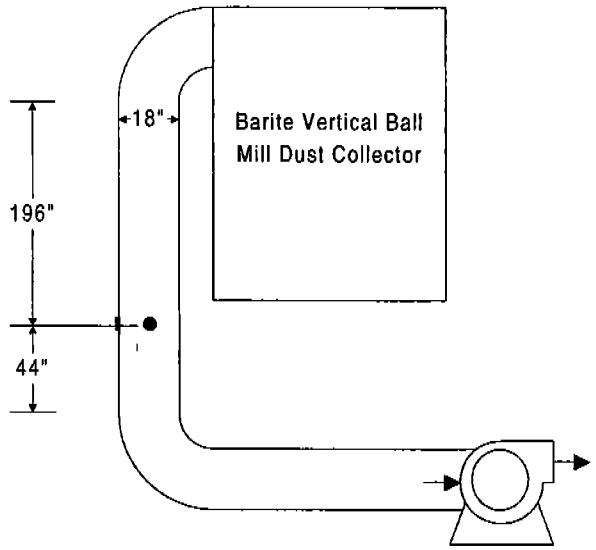


Figure 4. Barite Vertical Ball Mill Test Port Location

Prior to sampling, a cyclonic flow check was performed on the barite vertical ball mill stack location. The average flow angle measured in the stack was 2.0 degrees. In accordance with Section 2.5.1 of CFR 40 Part 60, special testing procedures to compensate for cyclonic flow are not required unless the average flow angle is in excess of 20 degrees; therefore, standard testing procedures were used to complete the sampling. The particulate matter emissions measured at the barite vertical ball mill are summarized in Table 6.

Table 6. Barite Vertical Ball Mill Stack Emissions

Parameter	JMH1-M201B-1	JMH1-M201B-2	JMH1-M201B-3	Three Run Average
Test Date	9/6/01	9/6/01	9/6/01	N/A
Test Time	0712 – 0928	0935 – 1135	1142 – 1351	N/A
Total Filterable Particulate				
Pounds/Hour	0.89702	0.74575	0.75011	079763
Grains/DSCF	0.02085	0.01789	0.01670	0.01848
PM_{10} Particulate Emissions				
Pounds/hour	0.77139	0.63921	0.66057	0.69039
Grains/DSCF	0.01793	0.01534	0.01471	0.01599
PM_{10} Cyclone Cut Size, micrometers	10.73	10.73	10.82	10.76
$PM_{2.5}$ Particulate Emissions				
Pounds/hour	0.32963	0.32111	0.32441	0.32505
Grains/DSCF	0.00766	0.00771	0.00722	0.00753
$PM_{2.5}$ Cyclone Cut Size, micrometers	2.41	2.41	2.45	2.42
Flue Gas Flow, DSCFM	5,020	4,862	5,239	5,040
Flue Gas Flow, ACFM	6,188	6,012	6,494	6,231
Moisture, %	2.57	2.51	2.32	2.47
Stack Temperature, °F	126.8	129.1	131.6	129.2

The total filterable particulate matter emissions from the vertical ball mill averaged 0.0167 grains/ACF. While this emission rate is characteristic of a properly operating fabric filter control system, the particulate matter emissions are well above those observed in other sources. Air Control Techniques, P.C. believes that the grinding source to grinding source differences could be due to (1) inherent bag cleaning difficulties associated with the extremely small product size or (2) non-ideal fabric filter operating conditions at the time of the emission factor tests. Air Control Techniques, P.C. has requested previously conducted total filterable particulate matter test results for this source to evaluate if the tests conducted on September 6, 2001 are representative of this facility. Air Control Techniques, P.C. has also requested additional emission tests from the other three grinding system tested to further evaluate the representativeness of these tests. The results of the comparisons with previous emission tests will be summarized in letter report to be submitted to PMD after these historical tests are received and reviewed.

2.5 CALCIUM CARBONATE CLASSIFIER PARTICULATE MATTER EMISSIONS

Air Control Techniques, P.C. tested the classifier system at Specialty Minerals, Inc. North Adams, Massachusetts plant on August 15, 2001. The calcium carbonate classifier tested as part of this emission factor compilation program was used to separate particulate matter in the 20 to 80 micrometer size range. The effluent gas stream was treated in a conventional pulse jet fabric filter with a design air-to-cloth ratio less than 4 (ft^3/min per ft^2).

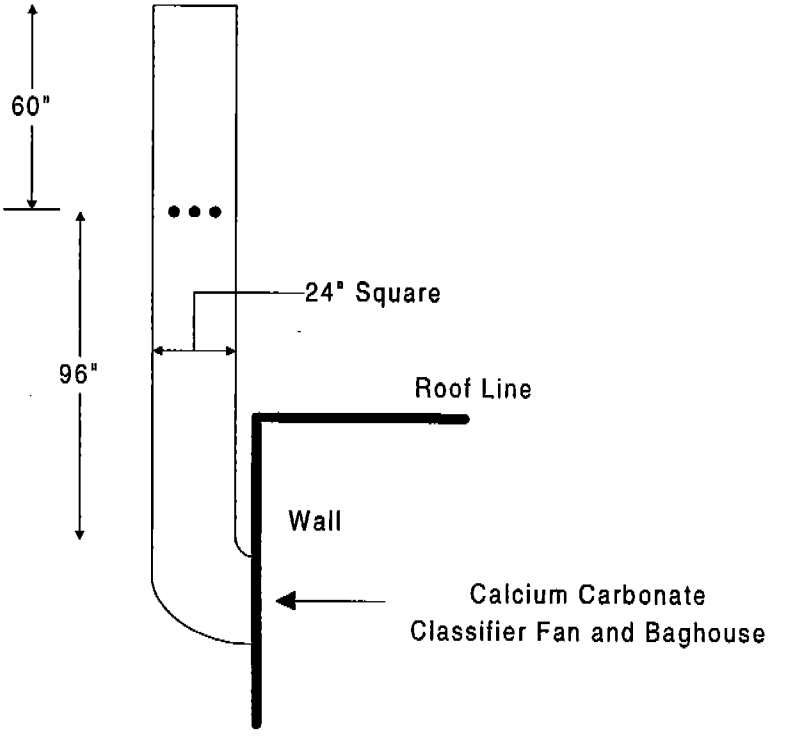


Figure 5. Calcium Carbonate Classifier Stack Test Port Location

The test port location shown in Figure 5 satisfies all U.S. EPA Method 1 siting requirements. Three 5 inch diameter test ports were installed in the square stack to facilitate testing with the Method 201B dual cyclone assembly. The number and location of the sampling and traverse points were determined according to the procedures outlined in EPA Reference Method 1 based on 12 sampling points. The 24 inch square stack was divided into 12 equal areas with 4 sampling points per sample port. A base

time of 120 minutes was used for the Method 201B test runs. As required by Method 201B, each point was sampled for a different period of time (dwell time) calculated based on the stack gas velocity of that point.

Prior to sampling, a cyclonic flow check was performed on the calcium carbonate classifier stack location. The average flow angle measured in the stack was 0.0 degrees. In accordance with Section 2.5.1 of CFR 40 Part 60, special testing procedures to compensate for cyclonic flow are not required unless the average flow angle is in excess of 20 degrees; therefore, standard testing procedures were used to complete the sampling. The particulate emissions measured at the calcium carbonate classifier are summarized in Table 7

Table 7. Calcium Carbonate Classifier Stack Emissions

Parameter	SM2-M201B-1	SM2-M201B-2	SM3-M201B-3	Three Run Average
Test Date	8/15/01	8/15/01	8/15/01	N/A
Test Time	1036 – 1242	1255 – 1445	1452 – 1658	N/A
Total Filterable Particulate				
Pounds/Hour	0.05857	0.03268	0.03025	0.04050
Grains/DSCF	0.00455	0.00294	0.00263	0.00337
PM_{10} Particulate Emissions				
Pounds/hour	0.02594	0.01462	0.01550	0.01868
Grains/DSCF	0.00201	0.00131	0.00135	0.00156
PM_{10} Cyclone Cut Size, micrometers	10.91	10.92	10.83	10.89
$PM_{2.5}$ Particulate Emissions				
Pounds/hour	0.00878	0.00688	0.00627	0.00731
Grains/DSCF	0.00068	0.00062	0.00054	0.00062
$PM_{2.5}$ Cyclone Cut Size, micrometers	2.41	2.44	2.41	2.42
Flue Gas Flow, DSCFM	1,502	1,297	1,343	1,381
Flue Gas Flow, ACFM	1,689	1,495	1,567	1,584
Moisture, %	1.02	1.22	1.14	1.13
Stack Temperature, °F	115.5	128.6	136.1	126.7

The measured emissions of total filterable particulate matter, PM_{10} particulate matter, and $PM_{2.5}$ particulate matter were very consistent and very low. These emissions are characteristic of a well designed, operated, and maintained fabric filter control system for a classifier.

All of the Method 201B tests at the North Adams plant achieved the particle cut size requirements (10 ± 1.0 micrometers and 2.5 ± 0.25 micrometer). All three of the tests were conducted in the required isokinetic range of 80% to 120%. Air Control Techniques, P.C. believes that the data summarized in Table 2-3 provide an accurate measurement of particulate matter emissions from the process tested.

2.6 CALCIUM CARBONATE FLASH DRYER PARTICULATE MATTER EMISSIONS

Air Control Techniques, P.C. tested a flash dryer baghouse stack at the OMYA, Inc. Florence, Vermont plant on August 17, 2001. The flash dryer is used to dry calcium carbonate feed material prior to grinding. The dryer is fired with No. 2 oil. The dryer throughput rates during the tests averaged approximately 11.08 tons per hour. The dryer was controlled by a conventional pulse jet fabric filter with a design air-to-cloth ratio less than 4 (ft^3/min per ft^2).

This source had the highest gas flow rate of the set of seven sources tested as part of this emission factor compilation program. At an average flow rate of 20,524 ACFM, this source had gas flows that were larger than the combined flows from the other six sources tested. The moisture levels and the gas temperatures were also considerably higher than the other sources tested.

The test ports for the flash dryer are located in a stack discharging the effluent gas stream from a baghouse and a centrifugal fan. The location of the test ports shown in Figure 6 fully satisfied all Method 1 requirements. There were two 4 inch diameter test ports located 90 degrees° from one another to facilitate testing. The 30 inch diameter stack was divided into 12 equal areas with 6 sampling points on each of the 2 axes. A base time of 120 minutes was used for the Method 201B test runs. As required by Method 201B, each point was sampled for a different period of time (dwell time) calculated based on the stack gas velocity at that point.

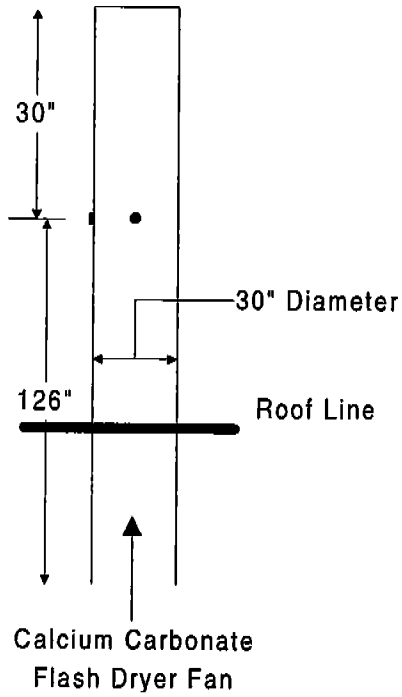


Figure 6. Calcium Carbonate Flash Dryer Stack Test Port Location

Prior to sampling, a cyclonic flow check was performed. The average flow angle measured in the stack was 4.2 degrees, well with the 20 degree limited specified in Section 2.5.1 of CFR 40 Part 60; therefore, standard testing procedures were used to complete the sampling. The particulate matter emissions measured at the calcium carbonate flash dryer are summarized in Table 8.

The particulate matter emissions measured in all three runs at this facility were consistently low. The outlet grain loadings of less than 0.005 grains per ACF observed in these tests are representative of well designed, operated, and maintained fabric filter control systems.

Air Control Techniques, P.C. experienced no problems in achieving the particle cut size requirements (10 ± 1.0 micrometers and 2.5 ± 0.25 micrometer). All three of the tests were conducted in the required isokinetic range of 80% to 120%. Air Control Techniques, P.C. believes that the data summarized in Table 7 provide an accurate measurement of particulate matter emissions from the flash dryer.

Table 8. Calcium Carbonate Flash Dryer Stack Emissions				
Parameter	OI-M201B-1	OI-M201B-1	OI-M201B-1	Three Run Average[1]
Test Date	8/17/01	8/17/01	8/17/01	N/A
Test Time	0908 – 1118	1131 - 1332	1340 – 1543	N/A
Total Filterable Particulate				
Pounds/Hour	0.25635	0.35963	0.40309	0.33969
Grains/DSCF	0.00272	0.00384	0.00425	0.00360
PM_{10} Particulate Emissions				
Pounds/hour	0.15604	0.15734	0.17168	0.16169
Grains/DSCF	0.00165	0.00168	0.00181	0.00171
PM_{10} Cyclone Cut Size, micrometers	10.04	10.15	10.17	10.12
$PM_{2.5}$ Particulate Emissions				
Pounds/hour	0.07802	0.09740	0.10077	0.09206
Grains/DSCF	0.00083	0.00104	0.00106	0.00098
$PM_{2.5}$ Cyclone Cut Size, micrometers	2.33	2.37	2.38	2.36
Flue Gas Flow, DSCFM	11,015	10,925	11,069	11,003
Flue Gas Flow, ACFM	20,579	20,395	20,598	20,524
Moisture, %	21.91	22.07	21.86	21.95
Stack Temperature, °F	296.5	294.3	293.9	294.9

2.7 CALCIUM CARBONATE PRODUCT SILO PARTICULATE MATTER EMISSIONS

Air Control Techniques, P.C. tested a product silo baghouse stack at the Specialty Minerals, Inc. North Adams, Massachusetts plant on August 14, 2001. The product is a finely ground calcium carbonate (limestone) with a mass median diameter less than approximately 50 micrometers. Particulate matter is emitted from the silo due to displaced air movement during product loading and unloading from the silo. The emissions are controlled by a small displaced air fabric filter system.

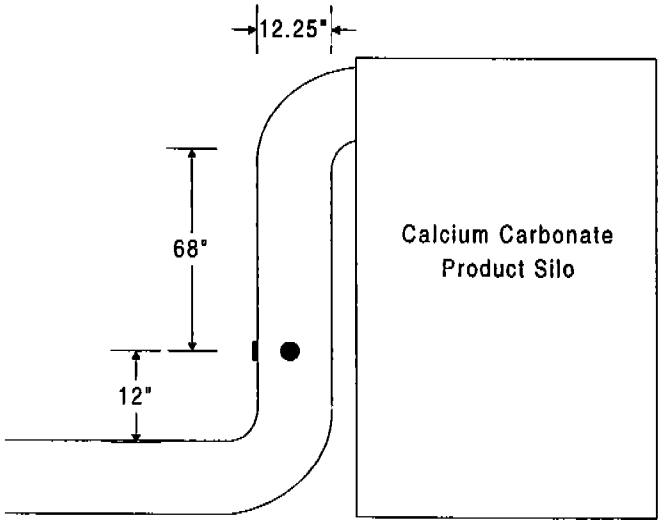


Figure 7. Calcium Carbonate Product Silo Stack Test Port Location

As indicated in Figure 7, the test port was approximately 1 diameter upstream of an elbow. Due to the close proximity of a flow disturbance, this location does not satisfy Method 1 guidelines. An inspection of the ductwork indicated that there were no reasonable alternatives to this location. The velocity pressure data indicated that the disturbance did not significantly affect the test results.

Two 4 inch diameter test ports were installed 90 degrees° from one another to facilitate testing with the Method 201B dual cyclone assembly. The number and location of the sampling and traverse points were determined according to the procedures outlined in EPA Reference Method 1 based on 12 sampling points. The relatively small 12.25 inch diameter stack was divided into 12 equal areas with 6 sampling points on each of the 2 axes. A base time of 120 minutes was used for the Method 201B test runs. Each point was sampled for a different period of time (dwell time) calculated based on the stack gas velocity of that point.

Prior to sampling, a cyclonic flow check was performed on the calcium carbonate product silo stack location. The average flow angle measured in the stack was 1.0 degrees. In accordance with Section 2.5.1 of CFR 40 Part 60, special testing procedures to compensate for cyclonic flow are not required unless the average flow angle is in excess of 20 degrees; therefore, standard testing procedures were used to complete the sampling. The particulate emissions measured at the calcium carbonate product silo are summarized in Table 9.

Table 9. Calcium Carbonate Product Silo Stack Emissions

Parameter	SM1-M201B-1	SM1-M201B-2	SM1-M201B-3	Three Run Average
Test Date	8/14/01	8/14/01	8/14/01	N/A
Test Time	0835 – 1031	1045 - 1246	1258 – 1617	N/A
Total Filterable Particulate				
Pounds/Hour	0.00395	0.01080	0.02242	0.01239
Grains/DSCF	0.00096	0.00270	0.00533	0.00300
PM_{10} Particulate Emissions				
Pounds/hour	0.00289	0.00449	0.00203	0.00313
Grains/DSCF	0.00070	0.00112	0.00048	0.00077
PM_{10} Cyclone Cut Size, micrometers	10.93	10.90	10.81	10.88
$PM_{2.5}$ Particulate Emissions				
Pounds/hour	0.00091	0.00112	0.00149	0.00117
Grains/DSCF	0.00022	0.00028	0.00035	0.00028
$PM_{2.5}$ Cyclone Cut Size, micrometers	2.38	2.38	2.35	2.37
Flue Gas Flow, DSCFM	482	466	491	480
Flue Gas Flow, ACFM	516	505	531	517
Moisture, %	1.54	1.80	1.80	1.71
Stack Temperature, °F	81.8	87.5	86.7	85.3

As with most product storage silos, the gas flow rates from the silo are very low. The gas velocities in the 12.5 inch diameter stack were extremely low, 627 to 649 feet per second. This velocity range is well below the values typical of most air pollution control systems. These low velocities are also below the normal velocities encountered in PM_{10} testing using Method 201A and in $PM_{10}/PM_{2.5}$ testing using Method 201B. Despite these very challenging velocity conditions, Air Control Techniques, P.C. was able to satisfy the Method 201B cut size requirements. The isokinetic conditions were intentionally set above the 120% levels in order to achieve the cut size requirements.

All of the particulate matter emissions measured from this source are extremely low and are characteristic of a very well controlled source. While there are some run-to-run variations, these differences are insignificant considering the extremely low levels observed in all three test runs.

All of the Method 201B tests at the North Adams Plant achieved the particle cut size requirements (10 ± 1.0 micrometers and 2.5 ± 0.25 micrometer). Air Control Techniques, P.C. believes that the data summarized in Table 9 provide an accurate measurement of particulate matter emissions from the process tested.

The duration of run #3 at the North Adams product silo was longer than the normal two hour testing period. This extended testing time was due to a process interruption.

2.8 PRODUCTION DATA

The appendix to of this report contains production data from the processes tested. These data were supplied by plant personnel. A summary of the production data is presented in Table 10 to demonstrate that the emission tests were conducted under representative operating conditions, and that the production data were used in the calculation of emission factors.

Table 10. Host Facilities Production and Material Data

Company Name	Run #	Production Rate, Tons/Hour	Product Tested	Equipment Tested
Specialty Minerals, Inc.	SM3-M201B-1	8.23	Calcium Carbonate	Grinding (Raymond Mill)
	SM3-M201B-2	14.00		
	SM3-M201B-3	14.00		
Polar Minerals, Inc.	RM-M201B-1	6.52	Talc	Grinding (Roller Mill)
	RM-M201B-2	5.66		
	RM-M201B-3	4.80		
J. M. Huber Corporation	JMH1-M201B-1,2,3	3.75	Limestone	Grinding (Horizontal Ball Mill)
J. M. Huber Corporation	JMH2-M201B-1,2,3	0.5	Barite	Grinding (Vertical Ball Mill)
Specialty Minerals, Inc	SM2-M201B-1,2,3	1.80	Calcium Carbonate	Classifier
OMYA, Inc	OI-M201B-1	11.08	Calcium Carbonate	Flash Dryer
	OI-M201B-1	11.06		
	OI-M201B-1	11.11		
Specialty Minerals, Inc	SM1-M201B-1,2,3	1.96	Calcium Carbonate	Product Silo

2.9 EMISSION FACTOR RESULTS

Emission factors for the various sources tested have been calculated based on the emissions data in Sections 2-1 to 2-7 and the production rates in Section 2-8. These emission factors have been presented in units of pounds of particulate matter per ton of product. This is consistent with the emission factor format for mineral product industries included in EPA's AP-42 database (Section 11.19). The total filterable particulate emission factors for the seven sources tested are summarized in Figure 8.

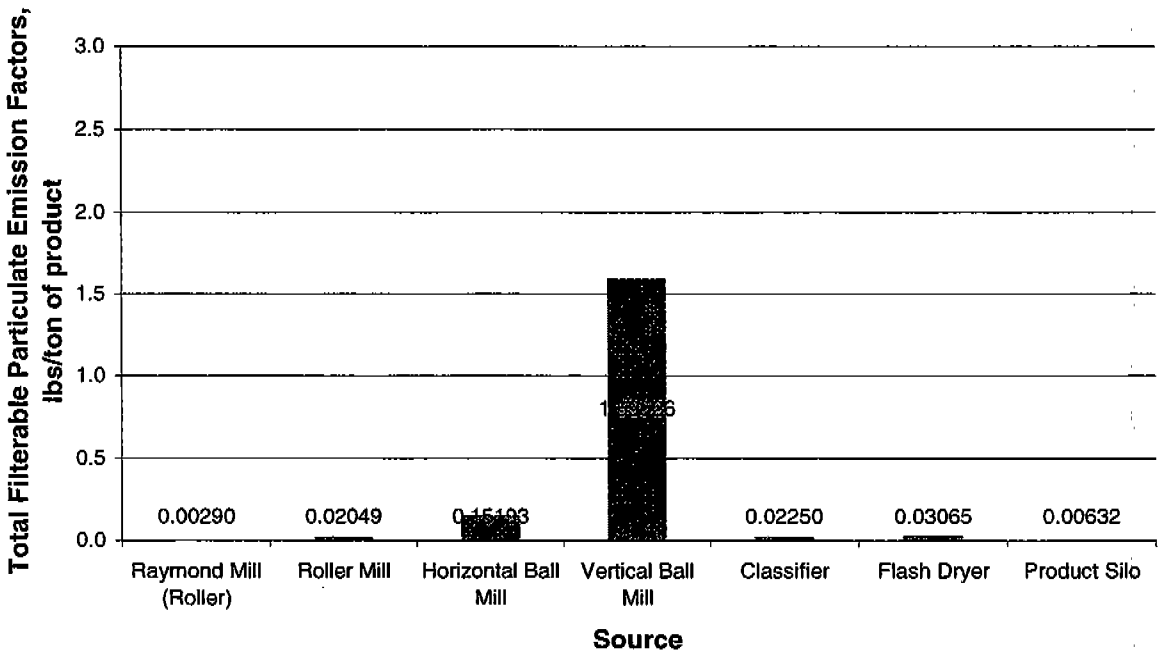


Figure 8. Total Filterable Particulate Emission Factors

The PM_{10} and $PM_{2.5}$ emission factors for these seven sources are summarized in Figures 9 and 10. It is apparent from the similarity of these two charts that the PM_{10} and $PM_{2.5}$ emission factors are very similar. The PM_{10} measured during the test program that was in the $PM_{2.5}$ size fraction ranges from 17% to 55% with an average of 41%. This is illustrated in Figure 11, which provides a comparison of these two data sets.

The $PM_{2.5}$ particulate matter comprised 8% to 41% with an average of 22% of the total filterable particulate matter as measured using Method 201B. The differences between these two categories of particulate matter are shown in Figure 12.

The PM_{10} particulate matter comprised 25% to 87% with an average of 52% of the total filterable particulate matter as measured using Method 201B. The differences between these two categories of particulate matter are shown in Figure 13.

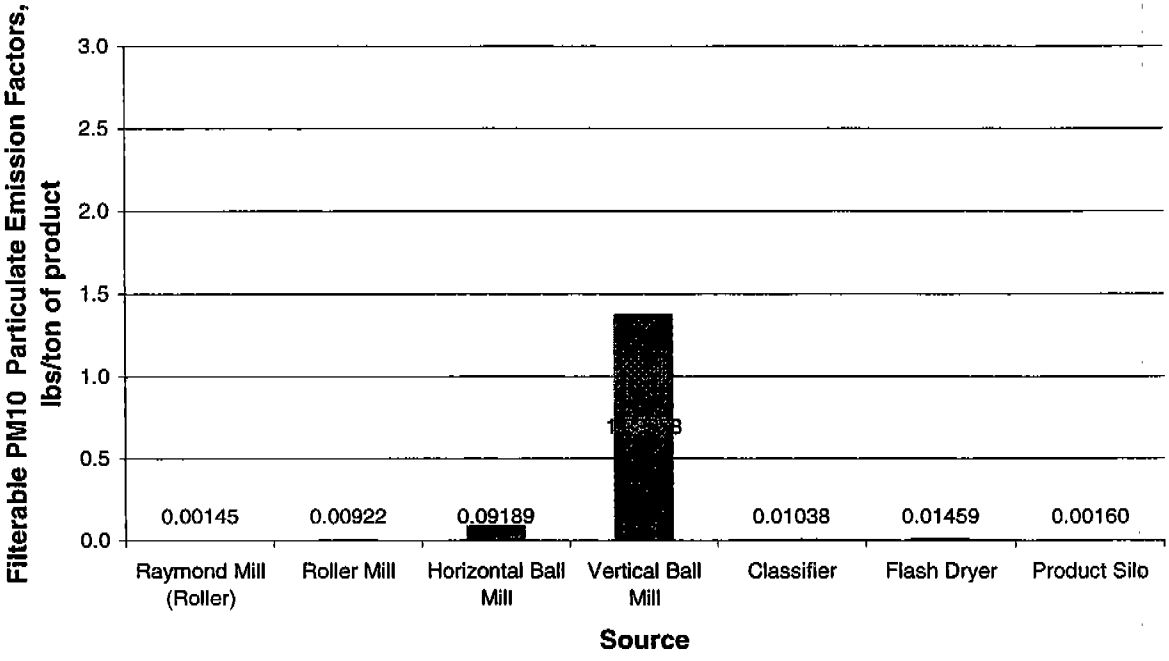


Figure 9. Filterable PM_{10} Emission Factors

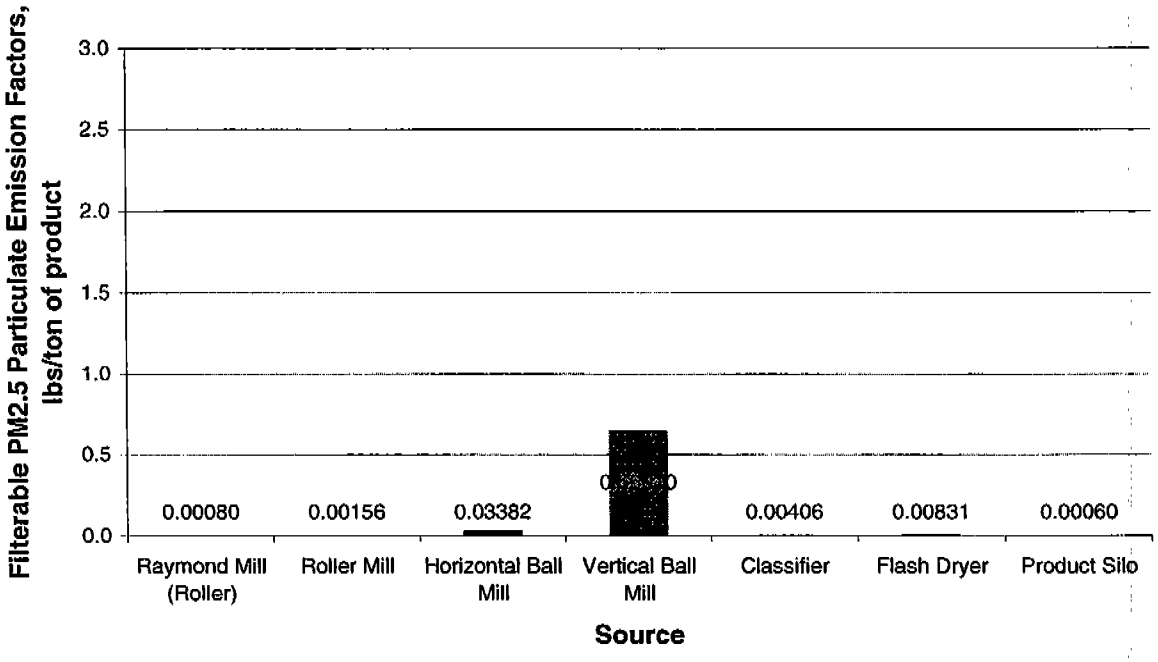


Figure 10. Filterable $PM_{2.5}$ Emission Factors

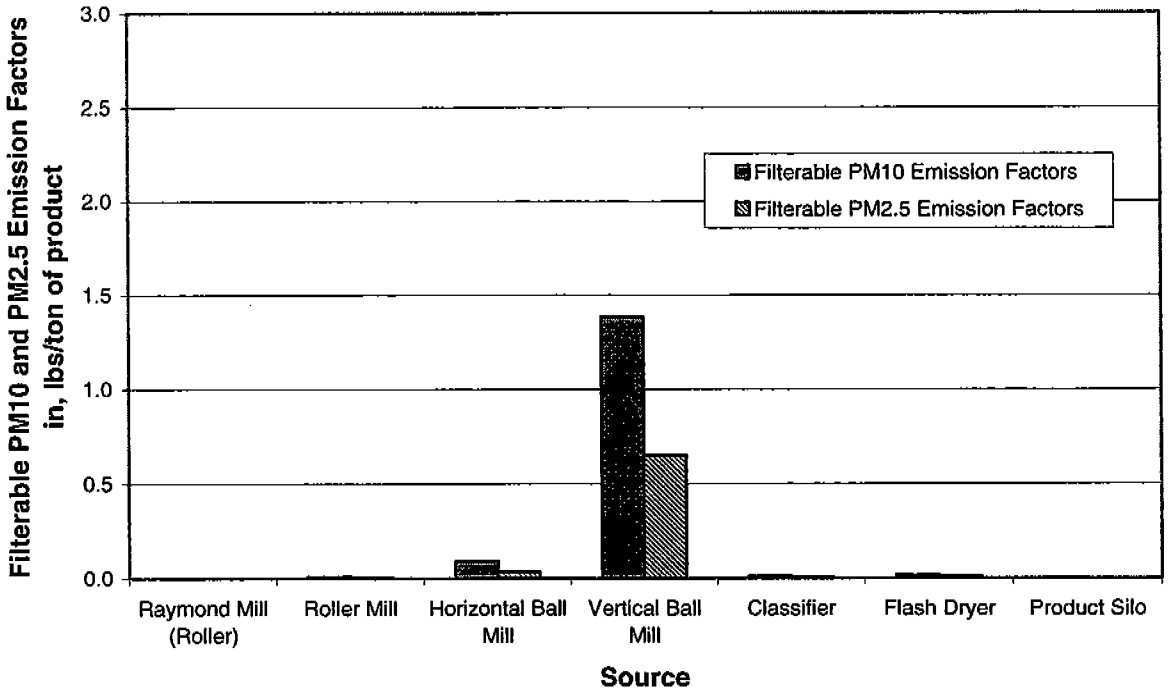


Figure 11. Comparison of Filterable $PM_{2.5}$ and PM_{10} Emission Factors

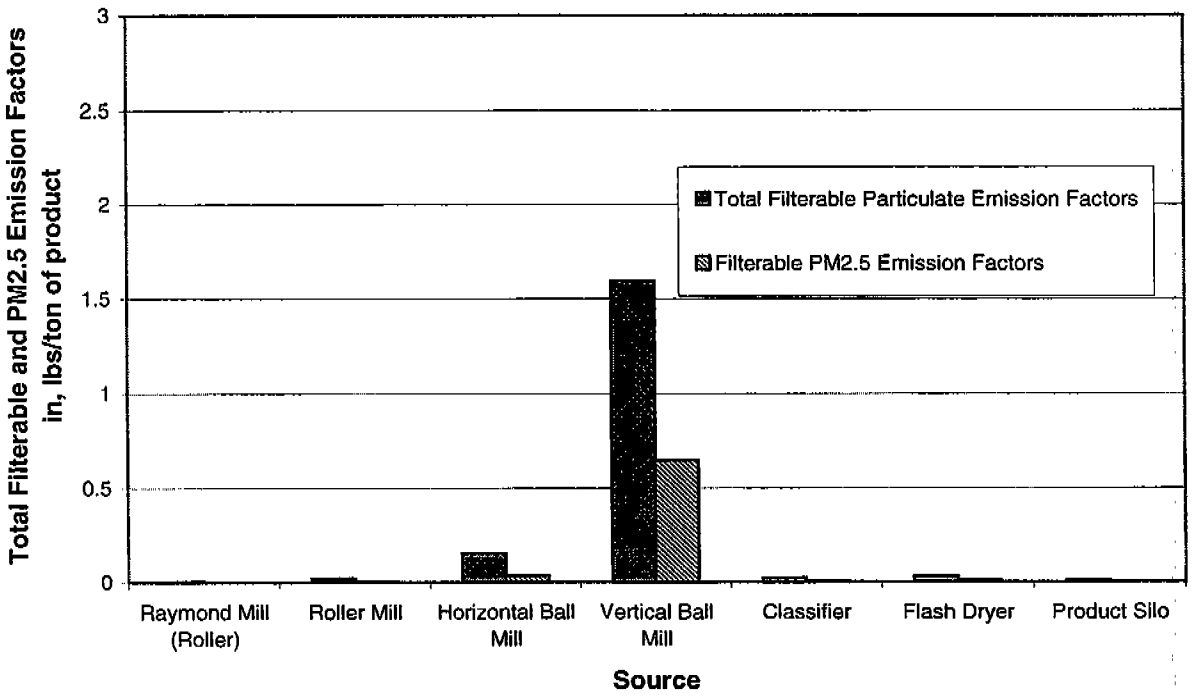


Figure 12. Comparison of Total Filterable Particulate and $PM_{2.5}$ Particulate Emission Factors

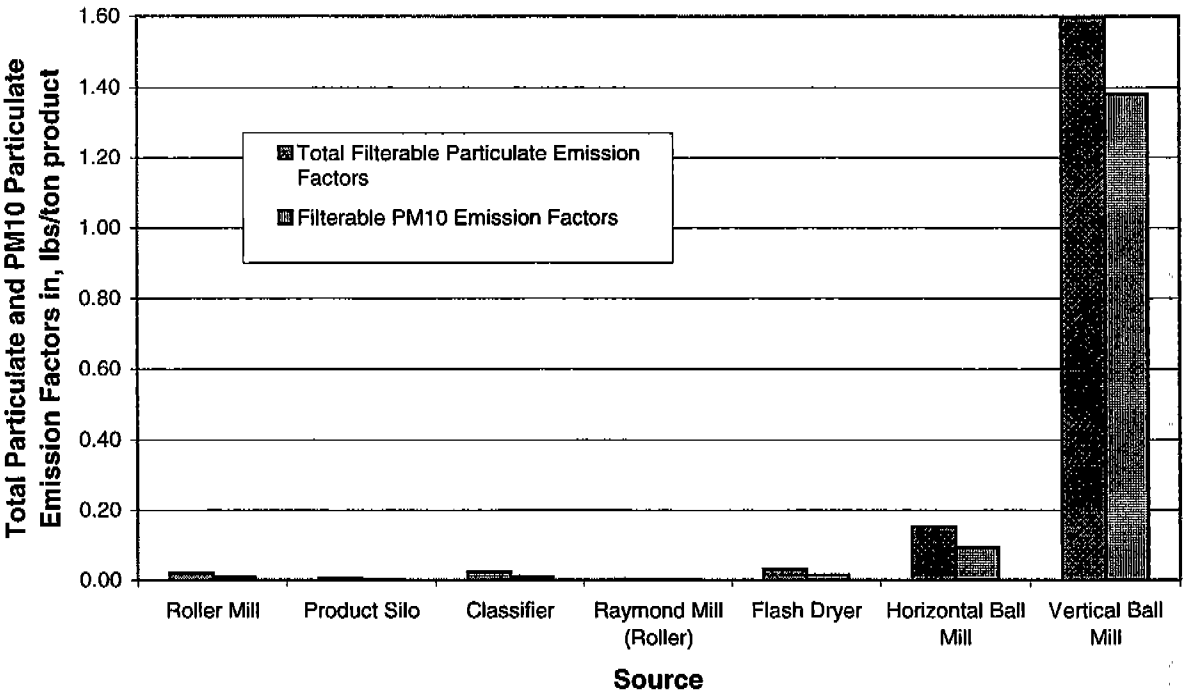


Figure 13 Comparison of Total Filterable Particulate and PM_{10} Particulate Emission Factors

3. SAMPLING AND ANALYTICAL PROCEDURES

3.1 $PM_{10}/PM_{2.5}$ PARTICULATE EMISSIONS

The sampling system consisted of the PM_{10} cyclone from Method 201A followed by the $PM_{2.5}$ cyclone from a five stage cascade cyclone train. A 47mm filter was mounted after the $PM_{2.5}$ cyclone. The sampling train was identical to Method 201A except that the $PM_{2.5}$ cyclone was inserted between the PM_{10} cyclone and the filter. Both cyclones and the filter were coupled closely together so that the entire sampling head shown in Figure 14 could be operated in-situ.

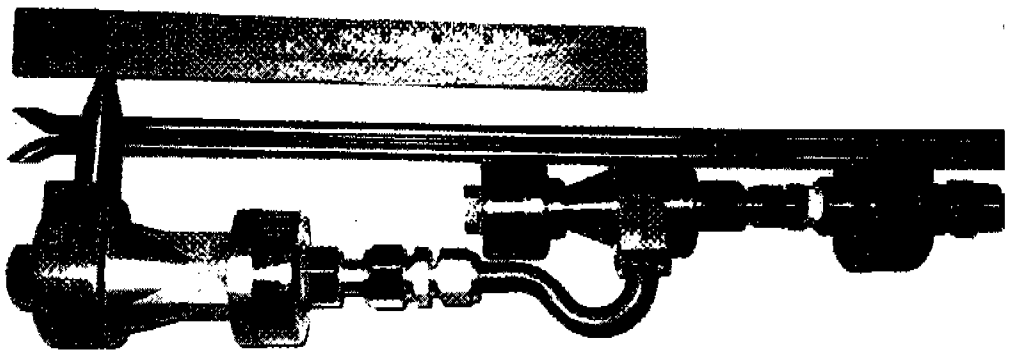


Figure 14. Method 201B Sampling Head

As with Method 201A, Method 201B is a constant sampling rate (CSR) technique. It is critical to maintain the actual sample gas flow rate in each of the cyclones at a rate that provides the desirable particle collection efficiencies. Ideally, cyclone I must collect particles that have a D_{50} (particle size collected with 50% efficiency) between 9.0 and 11.0 micrometers in order to be consistent with Method 201A. Cyclone IV (the second cyclone in Figure 1) should optimally have a cut diameter between 2.25 and 2.75 micrometers. Using the cyclone performance curves, Air Control Techniques, P.C. has calculated the sampling rates necessary to simultaneously satisfy the cyclone I and cyclone IV D_{50} ranges. The area between the two solid lines in Figure 15 demonstrates that this range is reasonably large for sources operating at elevated gas temperatures; however at ambient or near ambient temperature, the range is quit small. Furthermore, it is important to maintain the sampling velocities in the nozzle at a rate between 80% and 120% of the isokinetic velocity.

Two hour sampling times were used to ensure that catch weights of both the PM_{10} and $PM_{2.5}$ cyclones could be analyzed gravimetrically. These sampling times were considerably longer than the one-hour runs typically used in EPA Methods 5 and 17 for the measurement of total filterable particulate matter. These long sampling times were needed due to the relatively low particulate matter concentrations in the $PM_{2.5}$ size range.

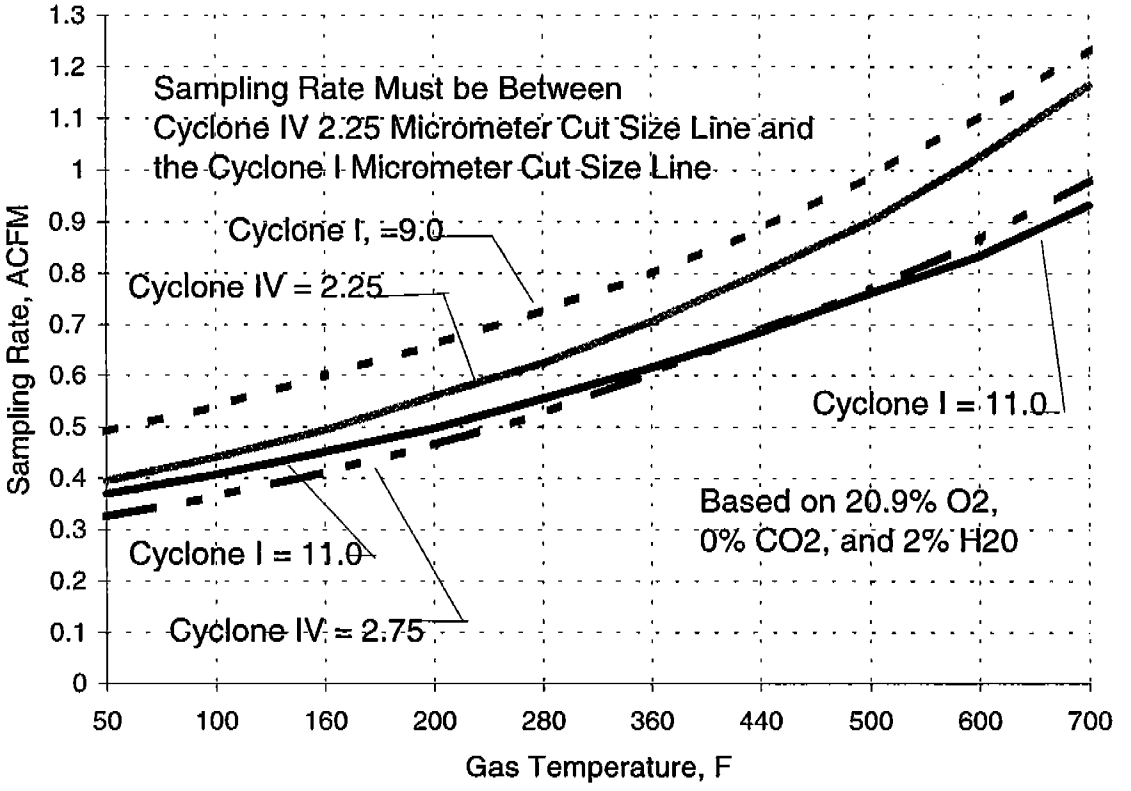


Figure 15. Sampling Rate Requirements of Method 201B

Air Control Techniques, P.C. used Method 201B to determine the $PM_{10}/PM_{2.5}$ particulate matter emissions from all seven sources included in the scope of this testing program. Method 201B and Method 4were conducted on all of the seven sources in accordance with all applicable EPA sampling and quality assurance requirements. The tests consisted of a set of three runs each per test location.

Sample Collection. Samples were withdrawn isokinetically (100% ±20%) from the source using a Method 201B sampling train. The sampling train consisted of a nozzle and the dual cyclone configuration followed by a 47mm filter holder (as seen in Figure 14), a stainless steel lined probe with an S Type Pitot tube attached, four chilled impingers, and a metering console. The particulate sample was collected on a glass fiber filter supported by a stainless steel frit.

The combined Method 201B and Method 4 sample train contained 100 ml of ml of deionized, distilled (DI) water in the first two impingers, the third was empty, and the fourth contained preweighed silica gel.

Sample Recovery. The combined cyclone sampling head was recovered using a nylon brush and ultra-pure acetone rinse. The particulate was divided into four separate sample jars.

Sample Jar #1: Particulate Matter > 10 micrometers
- Solids and acetone rinse from cyclone I cup
- Acetone rinse of nozzle
- Acetone rinse of cyclone I

Sample Jar #2: Particulate Matter ≤ 10 micrometers and > 2.5 micrometers
- Cyclone I turnaround cup (above inner downcomer line)
- Brushed and acetone rinsed solids from downcomer line
- Solids from cyclone IV cup
- Acetone rinse of cyclone IV

Sample Jar #3: Particulate Matter ≤ 2.5 micrometers
- Brushed and acetone rinsed solids from downcomer line
- Acetone rinse from front half of filter holder

Sample Jar #4, Particulate Matter ≤ 2.5 micrometers
- Filter

The total filterable particulate matter is the sum of all the particulate matter recovered from the combined cyclone sampling assembly. PM_{10} particulate matter is all of the solids recovered from sample jars #2, #3, and #4. $PM_{2.5}$ particulate matter is determined based on the quantity of solids recovered from sample jars #3 and #4. An acetone blank was analyzed and subtracted from the particulate catch weights using the volume of acetone rinse used for each sample jar.

The DI water reagent was returned to the original 1000 ml glass jar and weighed. The weight was recorded on the label, and the liquid level was marked. The silica gel was returned to the original tared container and weighed. The weight was recorded on the label. The volume of water vapor condensed in the impingers and the volume of water vapor collected in the silica gel were summed and entered into moisture content calculations.

Sample Analyses. EPA Method 5 analytical procedures were used to analyze the filter and three front half acetone rinses for particulate matter.

3.2 GENERAL U.S. EPA REFERENCE TEST METHODS

3.2.1 Sampling Point Determination - EPA Method 1

The number and location of the sampling and traverse points used in the Method 201B tests were determined according to the procedures outlined in U.S. EPA Reference Method 1, based on 12 sampling points. Sampling points located less than 1.0 inch from the stack wall were relocated to 1.0 inch from the wall as required by the method. This was important to avoid biasing the results due to dislodging and capturing wall deposits by the sampling probe.

3.2.2 Flue Gas Velocity and Volumetric Flow Rate - EPA Method 2

The flue gas velocity and volumetric flow rate during the Method 201B tests were determined according to the procedures outlined in U.S. EPA Reference Method 2. Velocity measurements were made using S-Type pitot tubes conforming to the geometric specifications outlined in Method 2. Accordingly, each pitot was assigned a coefficient of 0.84. Velocity pressures were measured with

fluid manometers. An electronic micro-manometer was used on the classifier stack due to extremely low flue gas velocities of 7 feet per second. Effluent gas temperatures were measured with chromel-alumel thermocouples equipped with digital readouts. A cyclonic flow check was performed prior to the Method 201B tests at each sampling location.

3.2.3 Flue Gas Composition and Molecular Weight - EPA Method 3

Flue gas analyses and calculation of flue gas dry molecular weight were performed in accordance with EPA Method 3. Multi-point, integrated sampling was used to obtain a flue gas sample concurrent with isokinetic testing. A stainless steel probe was affixed to the isokinetic sampling probe for this purpose. A squeeze aspirator was used to draw a sample. Moisture was removed from the sample gas by means of a knockout jar located prior to the aspirator. Oxygen and carbon dioxide were determined using a Fyrite® apparatus.

3.2.4 Flue Gas Moisture Content - EPA Method 4

The flue gas moisture contents during the Method 201B tests were determined in conjunction with each sample train according to the sampling and analytical procedures outlined in EPA Method 4. The impingers were connected in series and contained reagents as listed in the method descriptions in section 3.2.1 of this report. The impingers were contained in an ice bath to assure condensation of the flue gas stream moisture. Any moisture that was not condensed in the impingers was captured in the silica gel; therefore all moisture could be weighed and entered into moisture content calculations.

4. QUALITY ASSURANCE AND QUALITY CONTROL

4.1 QA/QC SUMMARY

All of the tests were conducted using QA/QC procedures established by the EPA and Air Control Techniques, P.C. for Method 201B. Complete records concerning the QA/QC procedures were prepared during the tests. Problems encountered before a test run were identified and corrected prior to sampling. Problems at the conclusion of a test run were identified and brought to the attention of the plant project manager, and a determination of the acceptability of the run was made.

4.1.1 Leak Checks

Pretest and posttest leak checks were conducted on each sampling train used in all Method 201B tests. The observed leak rates were below 0.02 actual cubic feet per minute and, therefore, were acceptable. Posttest leak checks were completed with the dual cyclone removed. This is a standard Method 201A procedure to ensure that the particles in the cyclone catch cups are not re-entrained into subsequent stages.

4.1.2 S-Type Pitot Tube Calibration

All S-Type pitot tubes used in this project conformed to EPA guidelines concerning construction and geometry. Pitot tubes were inspected prior to use. The specified guidelines were met; therefore, a pitot tube coefficient of 0.84 was used. Information pertaining to S-type pitot tubes is presented in detail in Section 3.1.1 of EPA Publication No. 600/4-77-027b. Only S-type pitot tubes meeting the required EPA specifications were used in this project.

4.1.3 Sample Nozzle Calibration

Stainless steel nozzles were used for isokinetic sampling. All nozzles were thoroughly cleaned, visually inspected, and calibrated on-site prior to sampling according to the procedures outlined in Section 3.4.2 of EPA Publication No. 600/4-77-027b.

4.1.4 Temperature Monitor Calibration

The thermocouples used in this project were calibrated using the procedures described in Section 3.4.2 of EPA Publication No. 600/4-77-027b. Each temperature sensor was calibrated at a minimum of 3 points over the anticipated range of use against an NIST-traceable mercury in glass thermometer.

4.1.5 Dry Gas Meter Calibration

All dry gas meters were fully calibrated prior to shipment to the plant to determine the volume correction factor prior to field use. Upon arrival at the plant, a ten minute pre-calibration was performed to verify the full calibration correction factor. The calibration procedure is documented in Section 3.3.2 of EPA Publication No. 600/4-77-237b.

4.1.6 Moisture Scale Calibration

The scales used in the recovery laboratory to determine flue gas moisture content were calibrated using a standard set of weights.

4.1.7 Particulate Sampling Using Method 201B

Standard operating procedures described in Draft Method 201B were followed. Prior to conducting the test, the sampling trains were tested to confirm proper operation and to determine the sampling nozzles needed to achieve isokinetic sampling conditions. The gas flow velocities at the sampling locations were measured using EPA Method 2. An S-type pitot tube was used for these velocity measurements. The S-type pitot tube was visually inspected before each run. Each leg of the pitot tube was leak checked before and after each run. Proper orientation of the S-type pitot tube was maintained throughout each measurement. Checks for cyclonic flow were completed at each sampling location before the start of the first test run.

4.2 QA/QC CHECKS FOR DATA REDUCTION, VALIDATION, AND REPORTING

Daily quality audits were conducted using data quality indicators that require the review of the recording and transfer of raw data, calculations, and documentation of testing procedures. All data and calculations for air flow rates and isokinetic sampling rates were recorded manually and then transferred to a portable computer. The calculations were verified by independent, manual checks. Any suspect data or outliers were noted and identified with respect to the nature of the problem and potential effect on data quality.

4.2.1 Quality Assurance Results

Some of the twenty one Method 201B test runs did not fully satisfy the quality assurance requirements specified by Method 201B. These quality assurance requirements and the results of the test runs are summarized in Table 11. Each of the deviations from the quality assurance requirements is summarized below.

4.2.2 Calcium Carbonate Classifier (Runs SM2-M201B-1, 2, and 3)

The calcium carbonate classifier stack has extremely low gas velocities of 6 to 7 feet per second. These velocities are well below typical stack velocities of 30 to 90 feet per second. These velocities are also well below the gas velocity range considered during the development of Method 201B.

Commercially available air emission testing equipment, including the equipment used in this test program, is not designed for these very low velocities. Specifically, sampling nozzles that fit the Cyclone 1 sampling head are not appropriate for this condition. Based on pretest discussions with National Stone, Sand & Gravel personnel, Air Control Techniques, P.C. adjusted the sampling conditions to optimize the D_{50} values in both cyclones. This approach maximized the accuracy of the particle size cuts achieved by the cyclones. Air Control Techniques, P.C. believes that the reported data are the most accurate data that could be obtained at these very low velocities.

4.2.3 Sample Recovery and Custody

All filter samples and impinger samples were recovered by Air Control Techniques personnel using standard EPA procedures. Sample recovery was performed in mobile laboratories located at each of the plants. All sampling equipment was sealed to prevent contamination during transport to and from the laboratory.

All chemicals used for sampling train preparation and sample recovery were American Chemical Society ACS, High Performance Liquid Chromatography (HPLC) or pesticide grade. Reagent water met or exceeded the American Society for Testing Materials (ASTM) specifications for Type I reagent water.

The samples recovered from each of the reference method tests are listed below.

Method 201B

- Sample Jar #1, Particulate Matter > 10 micrometers
- Sample Jar #2, Particulate Matter ≤ 10 micrometers and > 2.5 micrometers
- Sample Jar #3, Particulate Matter ≤ 2.5 micrometers
- Sample Jar #4, Filter Particulate Matter ≤ 2.5 micrometers
- Acetone blank (1 per acetone lot)
- Silica gel (impinger 4 for moisture determination)

Table 11. Method 201B Quality Assurance Results

Parameter	Cyclonic flow, degrees	Condenser exit temp., °F	Isokinetics, %	Pre-leak check, DSCFM	Post-leak check, DSCFM	Cut Diameters (D_{50}) µm	
Requirement	<20°	<68	80 – 120	<0.02	<0.02	≥2.25 - D50 - ≤2.75	≥9.0 - D50 - ≤11
RM-M201B-1	1.6	<68	103.1	<0.02	<0.02	2.41	10.70
RM-M201B-2	1.6	<68	96.3	<0.02	<0.02	2.51	10.92
RM-M201B-3	1.6	<68	99.6	<0.02	<0.02	2.25	10.35
SM1-M201B-1	1.0	<68	97.8	<0.02	<0.02	2.38	10.93
SM1-M201B-2	1.0	<68	104.2	<0.02	<0.02	2.38	10.90
SM1-M201B-3	1.0	<68	97.2	<0.02	<0.02	2.35	10.81
SM2-M201B-1	0.0	<68	**121.8**	<0.02	<0.02	2.41	10.91
SM2-M201B-2	0.0	<68	**141.3**	<0.02	<0.02	2.44	10.92
SM2-M201B-3	0.0	<68	**137.6**	<0.02	<0.02	2.41	10.83
SM3-M201B-1	1.9	<68	93.0	<0.02	<0.02	2.30	10.52
SM3-M201B-2	1.9	<68	92.0	<0.02	<0.02	2.42	10.81
SM3-M201B-3	1.9	<68	101.4	<0.02	<0.02	2.40	10.74
OI-M201B-1	4.2	<68	86.8	<0.02	<0.02	2.33	10.04
OI-M201B-2	4.2	<68	83.3	<0.02	<0.02	2.37	10.15
OI-M201B-3	4.2	<68	84.7	<0.02	<0.02	2.38	10.17
JMH1-M201B-1	1.7	<68	95.4	<0.02	<0.02	2.42	10.81
JMH1-M201B-2	1.7	<68	90.6	<0.02	<0.02	2.43	10.82
JMH1-M201B-3	1.7	<68	96.7	<0.02	<0.02	2.46	10.87
JMH2-M201B-1	2.0	<68	88.4	<0.02	<0.02	2.41	10.73
JMH2-M201B-2	2.0	<68	93.5	<0.02	<0.02	2.41	10.73
JMH2-M201B-3	2.0	<68	83.9	<0.02	<0.02	2.45	10.82

All of the samples were labeled immediately after recovery. The samples were packed in boxes and sealed. A chain of custody record and sample log was maintained during the emissions study. The sample boxes were shipped by Air Control Techniques to Cary, N.C. The samples were picked up by Resolution Analytics along with the appropriate chain of custody record forms.

APPENDIX A

Resolution Analytics, Inc.,
Analytical Reports

RESOLUTION ANALYTICS, INC.
Specialists in High Performance Liquid Chromatography

2733 LEE AVENUE SANFORD, NC 27330 (919) 774-5557

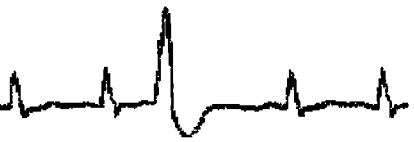
ANALYTICAL REPORT

- $PM_{2.5}$ PARTICULATE
  (EPA METHOD 201B)

CLIENT: ACT

RFA#: 642

RESOLUTION ANALYTICS, INC.
Specialists in High Performance Liquid Chromatography



REPORT SUMMARY

RFA#: 642

SAMPLE ID	*Particulate ≤ 2.5 µm*	*Particulate 2.5µm - 10µm*	*Particulate >10µm*	*Total Filterable Particulate*
ACETONE BLANK		0.2 mgs(100 mls)		
RM-M201B-1	0.7 mgs	4.5 mgs	5.0 mgs	10.2 mgs
RM-M201B-2	0.6 mgs	2.9 mgs	3.9 mgs	7.4 mgs
RM-M201B-3	0.7 mgs	2.7 mgs	5.5 mgs	8.9 mgs

Analytical Narrative

RFA # 642

Client/Plant Name: ACT

Date Rec'd in lab: 7/26/01

Analyst: CLT

Date of Analysis: 7/31/01

Analysis Method: EPA Method 201B

Analyte(s): PM <2.5micron

Sample Matrix & Components:

Dry Filters, Acetone Rinses (Precutter/Cyclone and Front½ rinses weighed separately), Acetone Blank

Summary of Sample Prep:

The acetone rinses and pre-tared filters were transferred to pre-tared teflon "baggies" in a low humidity environment. The acetone rinses were evaporated overnight, then desiccated for 24 hours, after which time they were weighed daily every six hours until consecutive weights agreed within ±0.5 mgs. The filters were oven dried at 105°C for 2 hours and weighed immediately afterwards. All weights were recorded to the nearest 0.1 mg and include filterable particulate catch only. The total catch reported for each run is a sum of the filter and rinse catches. The acetone blank catch has been subtracted out of sample rinse catches in proportion with their respective volumes.

Summary of Instrumentation:

Denver model A-250 analytical balance

Analytical Detection Limit(s): 0.5 mgs

Miscellaneous Comments Regarding Sample Analysis: (Note unusual catch weights, interferences, odd sample behavior, and steps taken to confirm unusual results. Also note any deviations from standard analytical procedures, together with justification and possible affect on results. Specify samples when applicable.)

No modifications to EPA Method 5 analytical procedure were made.

See Data Sheets for individual sample descriptions.

Confirmation of Data Review:

QA Officer Signature J. Bruce Nemet Date 7/31/01

(J. Bruce Nemet, Lab QA Officer)

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT		PFA #: 842	
Method: M2.5		Filename: ACT	
Date Received: 7/26/01	Page 1 of 4	File Pathway:	C:\JOBS\842\ACT.WK1
Run Number	RM-M201B-1		

Sample I.D.	Date	Init		Filter # 388 (< = 2.5 µg)	Date		Rinse # 547 (<= 10µg > 2.5µm)
	07/31	CLT		3.4732			
	07/30	CLT	@	3.4731	07/31		3.7800
Baggie Tare Wt., g.				3.3598	07/30	@	3.7799
Filter Tare Wt., g.		SF47-232		0.1131	(110	ml)	3.7752
SAMPLE WT., g.				0.0002			0.0047

Sample I.D.	Date	Init		Filter Rinse # 8 (< = 2.5 µg)	Date		Nozzle Rinse # 1184 (>10 ug)
	07/31	CLT	@	3.5266	07/31	@	3.8007
	07/30	CLT		3.5267	07/30		3.8008
Tare Wt., g.		(80	ml)	3.5259	(90	ml)	3.7955
SAMPLE WT., g.				0.0007			0.0052

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	0.2		
Filter Rinse Catch (<=2.5µm) , mg.	0.5	0.7	0.2
Rinse Catch (<=10µm >2.5µm) , mg.	4.5	4.7	0.2
Nozzle Rinse Catch (> 10µm) , mg.	5.0	5.2	0.2
TOTAL FILTERABLE PARTICULATE, mg.	10.2		

Blank Beeker #	28
Final wt., mg.	3.4378
Tare wt., mg.	3.4376
Residue, mg.	0.2
Volume, ml.	100
Density, mg/ml	785.0
Conc., mg/mg	2.548E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		<=10µm > 2.5µm	<= 2.5 µm	> 10 µm
Run ID	In Stack Filter	Rinse	Filter Rinse	Nozzle Rinse
Color:	CLEAR	WHITE	WHITE	WHITE
Texture:	N/A	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	N/A	LOW	LOW	LOW

Miscellaneous Notes & Comments:

Legend: @ = Final Weight
F = Filter
R = Rinse

Printing Date. 31-Jul-2001 Printing Time 09:41 AM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT		RFA #: [illegible]	
Method: M 2.5		Filename: ACT	
Date Received:	Page 2 of 4	File Pathway:	C:\JOBS\[illegible]\ACT[illegible]
Run Number:	RM-M201B-2		

Sample I.D.

	Date	Init		Filter # 1237 (< = 2.5 µg)	Date		Rinse # 2036 (<= 10µg > 2.5µm)
	07/31	CLT	@	3.6498			
	07/30	CLT		3.6499	07/31	@	3.3159
Baggie Tare Wt., g.				3.5362	07/30	@	3.3159
Filter Tare Wt., g.		SF7-233		0.1134	(90	ml)	3.3128
SAMPLE WT., g.				0.0003			0.0031

Sample I.D.

	Date	Init		Filter Rinse # 396 (< = 2.5 µg)	Date		Nozzle Rinse # 215 (>10 µg)
	07/31	CLT		3.2909	07/31		3.5895
	07/30	CLT	@	3.2907	07/30	@	3.5892
Tare Wt., g.	(	50	ml)	3.2903	(90	ml)	3.5851
SAMPLE WT., g.				0.0004			0.0041

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm), mg.	0.3		
Filter Rinse Catch (<=2.5µm), mg.	0.3	0.4	0.1
Rinse Catch (<=10µm >2.5µm), mg.	2.9	3.1	0.2
Nozzle Rinse Catch (> 10µm), mg.	3.9	4.1	0.2
TOTAL FILTERABLE PARTICULATE, mg.	7.4		

Blank Beaker #	28
Final wt., mg.	3.4378
Tare wt., mg.	3.4376
Residue, mg.	0.2
Volume, ml.	100
Density, mg/ml	785.0
Conc., mg/mg	2.548E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		> 10 µm	<=10µm > 2.5µm	<= 2.5 µm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	CLEAR	WHITE	WHITE	WHITE
Texture:	N/A	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	N/A	LOW	LOW	LOW

Miscellaneous Notes & Comments:

Legend: @ = Final Weight
F = Filter
R = Rinse

Printing Date: 31-Jul-2001 Printing Time: 09:41 AM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT		EPA #	842
Method: M 2.5		Filename:	ACT
Date Received:	Page 3 of 4	File Pathway:	C:\JOBS\842\ACT.WB[illegible]
Run Number	RM-M201B-3		

Sample I.D.

	Date	Init		Filter # 867 (< = 2.5 µg)		Date		Rinse # 105 (<= 10µg > 2.5µm)
	07/31	CLT		3.4504				
	07/30	CLT	@	3.4502		07/31		3.5237
Baggie Tare Wt., g.				3.3371		07/30	@	3.5236
Filter Tare Wt., g.		SF47-234		0.1129	(	80	ml)	3.5207
SAMPLE WT., g.				0.0002				0.0029

Sample I.D.

	Date	Init		Filter Rinse # 748 (< = 2.5 µg)		Date		Nozzle Rinse # 839 (>10 ug)
	07/31	CLT		3.1063		07/31	@	3.2989
	07/30	CLT	@	3.1062		07/30	@	3.2989
Tare Wt., g.	(	50	ml)	3.1056	(	70	ml)	3.2933
SAMPLE WT., g.				0.0006				0.0056

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	0.2		
Filter Rinse Catch (<=2.5µm) , mg.	0.5	0.6	0.1
Rinse Catch (<=10µm >2.5µm) , mg.	2.7	2.9	0.2
Nozzle Rinse Catch (> 10µm) , mg.	5.5	5.6	0.1
TOTAL FILTERABLE PARTICULATE, mg.	8.9		

Blank Beaker #	28
Final wt., mg.	3.4378
Tare wt., mg.	3.4376
Residue, mg.	0.2
Volume, ml.	100
Density, mg/ml	785.0
Conc., mg/mg	2.548E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		> 10 µm	<=10µm > 2.5µm	<= 2.5 µm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	CLEAR	WHITE	WHITE	WHITE
Texture:	N/A	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	N/A	LOW	LOW	LOW

Miscellaneous Notes & Comments:

Legend:	@ = Final Weight
	F = Filter
	R = Rinse

Printing Date. 31-Jul-2001 Printing Time 09:41 AM

REAGENT BLANK LABORATORY RESULTS

Plant Name: ACT | RFA #: [illegible]
Method: M2.5 | Filename: ACT
Date Received: | Page 4 of 4 | File Pathway: [illegible]

Run Number: | Analysis: Blank

Container # 28

	Date	Init		
	07/31	CLT	@	3.4378
	07/30	CLT		3.4379
Tare Wt., g.		(100	ml)	3.4376
SAMPLE WT., g.				0.0002

Printing Date 31-Jul-2001 Printing Time 09:41 AM

Particulate Worksheet

Client ACT #642 Rel. Humidity 42%

Analyst CLT Date 7-27-01

	Filter	>10 microns Acetone Rinse	≤10 microns >2.5 Nozzle Cyclone	≤ 2.5 MeCl2 Rinse	DI H2O Impinger

RUN#	Cont. #	Filter #	Filter Tare	Cont. #	Vol. (mls)	Cont. #	Vol. (mls)	Cont. #	Vol. (mls)	Cont. #	Vol. (mls)
RM-M201B-1	386	SF47-232	.1131	1164	90	547	110	8	80		
2	1237	SF47-233	.1134	215	90	2036	90	396	50		
3	867	SF47-234	.1129	839	70	105	80	748	50		
BLANK				28	100						

RESOLUTION ANALYTICS, INC.
Specialists in High Performance Liquid Chromatography

2733 LEE AVENUE SANFORD, NC 27330 (919) 774-5557

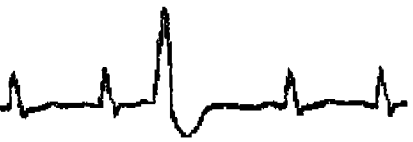
ANALYTICAL REPORT

- $PM_{2.5}$ PARTICULATE
  (EPA METHOD 201B)

CLIENT: ACT

RFA#: [redacted]

RESOLUTION ANALYTICS, INC.
Specialists in High Performance Liquid Chromatography



REPORT SUMMARY

RFA#: 642

SAMPLE ID	*Particulate ≤ 2.5 µm*	*Particulate 2.5µm - 10µm*	*Particulate > 10µm*	*Total Filterable Particulate*
ACETONE BLANK		0.3 mgs(120 mls)		
SM1-M201B-1	0.6 mgs	1.3 mgs	0.7 mgs	2.6 mgs
SM1-M201B-2	0.8 mgs	2.4 mgs	4.5 mgs	7.7 mgs
SM1-M201B-3	1.1 mgs	0.4 mgs	15.1 mgs	16.6 mgs
SM2-M201B-1	2.1 mgs	4.1 mgs	7.8 mgs	14.0 mgs
SM2-M201B-2	1.6 mgs	1.8 mgs	4.2 mgs	7.6 mgs
SM2-M201B-3	1.7 mgs	2.5 mgs	4.0 mgs	8.2 mgs
SM3-M201B-1	2.5 mgs	3.2 mgs	6.1 mgs	11.8 mgs
SM3-M201B-2	2.0 mgs	0.7 mgs	1.3 mgs	4.0 mgs
SM3-M201B-3	1.5 mgs	0.3 mgs	2.5 mgs	4.3 mgs
OI-M201B-1	2.1 mgs	2.1 mgs	2.7 mgs	6.9 mgs
OI-M201B-2	2.6 mgs	1.6 mgs	5.4 mgs	9.6 mgs
OI-M201B-3	2.7 mgs	1.9 mgs	6.2 mgs	10.8 mgs

Analytical Narrative

RFA # 642

Client/Plant Name: ACT

Date Rec'd in lab: 8/20/2001

Analyst: CLT

Date of Analysis: 9/7/2001

Analysis Method: EPA Method 201B

Analyte(s): PM <2.5micron

Sample Matrix & Components:

Dry Filters, Acetone Rinses (Precutter/Cyclone and Front½ rinses weighed separately), Acetone Blank

Summary of Sample Prep:

The acetone rinses and pre-tared filters were transferred to pre-tared teflon "baggies" in a low humidity environment. The acetone rinses were evaporated overnight, then desiccated for 24 hours, after which time they were weighed daily every six hours until consecutive weights agreed within ±0.5 mgs. The filters were oven dried at 105°C for 2 hours and weighed immediately afterwards. All weights were recorded to the nearest 0.1 mg and include filterable particulate catch only. The total catch reported for each run is a sum of the filter and rinse catches. The acetone blank catch has been subtracted out of sample rinse catches in proportion with their respective volumes.

Summary of Instrumentation:

Denver model A-250 analytical balance

Analytical Detection Limit(s): 0.5 mgs

Miscellaneous Comments Regarding Sample Analysis: (Note unusual catch weights, interferences, odd sample behavior, and steps taken to confirm unusual results. Also note any deviations from standard analytical procedures, together with justification and possible affect on results. Specify samples when applicable.)

No modifications to EPA Method 5 analytical procedure were made.

See Data Sheets for individual sample descriptions.

Confirmation of Data Review:

QA Officer Signature J. Bruce Nemet Date 9/07/01

(J. Bruce Nemet, Lab QA Officer)

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT
Method: MM5
Date Received: 8/29/2001
Page 1 of
Run Number: SM1-M5H/B-1

Sample I.D.			Filter # 965 (<= 2.5 µg)			Rinse # 773 (<= 10µg > 2.5µm)
	Date	Init		Date		
	09/03	CLT	3.4408	09/04	@	3.3004
Beggie Tare Wt., g.			3.3267	09/03		3.3006
Filter Tare Wt., g.		SF47 312	0.1137	(70	ml)	3.2989
SAMPLE WT., g.			0.0004			0.0015

Sample I.D.			Filter Rinse # 5 (<= 2.5 µg)			Nozzle Rinse # 717 (>10 ug)
	Date	Init		Date		
	09/04	CLT	3.9413	09/04	@	3.3871
	09/03	CLT @	3.9412	09/03		3.3872
Tare Wt., g.		(40 ml)	3.9409	(60	ml)	3.3862
SAMPLE WT., g.			0.0003			0.0009

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	0.4		
Filter Rinse Catch (<=2.5µm) , mg.	0.2	0.3	0.1
Rinse Catch (<=10µm >2.5µm) , mg.	1.3	1.5	0.2
Nozzle Rinse Catch (> 10µm) , mg.	0.7	0.9	0.2
TOTAL FILTERABLE PARTICULATE, mg.	2.6		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:	In Stack Filter	<=10µm > 2.5µm Rinse	<= 2.5 µm Filter Rinse	> 10 µm Nozzle Rinse
Run ID				
Color:	CLEAR	BIEGE	CLEAR	BIEGE
Texture:	N/A	FINE SOOT	N/A	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	N/A	LOW	N/A	LOW

Miscellaneous Notes & Comments:

Legend: B = Final Weight
F = Filter
R = Rinse

Printing Date: 06-Sep-2001 Printing Time: 08:48 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT RFA#: [illegible]
Method: M201B Filename: ACT
Date Received: [illegible] Page 2 of 13 File/Pathway: [illegible]

Run Number: SM1 M201B-2

Sample I.D.

	Date	Init	Filter # 769 (< = 2.5 µg)	Date			Rinse # 451 (<= 10µg > 2.5µm)
	09/03	CLT	3.4435	09/04			3.2485
Baggie Tare Wt., g.			3.3294	09/03	@		3.2484
Filter Tare Wt., g.		SF47 314	0.1134	(80		ml)	3.2458
SAMPLE WT., g.			0.0007				0.0026

Sample I.D.

	Date	Init		Filter Rinse # 453 (< = 2.5 µg)	Date			Nozzle Rinse # 504 (>10 ug)
	09/04	CLT	@	3.2083	09/04	@		3.7650
	09/03	CLT		3.2085	09/03			3.7654
Tare Wt., g.	(	40	ml)	3.2081	(50		ml)	3.7604
SAMPLE WT., g.				0.0002				0.0046

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm), mg.	0.7		
Filter Rinse Catch (<=2.5µm), mg.	0.1	0.2	0.1
Rinse Catch (<=10µm >2.5µm), mg.	2.4	2.6	0.2
Nozzle Rinse Catch (> 10µm), mg.	4.5	4.6	0.1
TOTAL FILTERABLE PARTICULATE, mg.	7.7		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		> 10 µm	<=10µm > 2.5µm	<= 2.5 µm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	BIEGE	BIEGE	BIEGE	CLEAR
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	N/A
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	LOW	LOW	LOW	N/A

Miscellaneous Notes & Comments:

Legend: @ = Flask Weight
F = Filter
R = Rinse

Printing Date. 06-Sep-2001 Printing Time 09:48 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT		RPA #	042
Method: M202B		Filename:	ACT
Date Received: 8/24/2001	Page 3 of 3	File Pathway:	C:\LOTUS\FAST\ACT\
Run Number:	3M1-M202B-3		

Sample I.D.			Filter # 1041 (< = 2.5 µg)			Rinse # 1277 (<= 10µg > 2.5µm)
	Date	Init		Date		
	09/03	CLT	4.1285	09/04	@	3.3747
Beggie Tare Wt., g.			4.0151	09/03		3.3749
Filter Tare Wt., g.		SF47 313	0.1126	(60	ml)	3.3741
SAMPLE WT., g.			0.0008			0.0006

Sample I.D.			Filter Rinse # 724 (< = 2.5 µg)			Nozzle Rinse # 1272 (>10 ug)
	Date	Init		Date		
	09/04	CLT @	3.4155	09/04	@	3.3949
	09/03	CLT	3.4156	09/03		3.3951
Tare Wt., g.		(30 ml)	3.4151	(100	ml)	3.3795
SAMPLE WT., g.			0.0004			0.0154

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	0.8		
Filter Rinse Catch (<=2.5µm) , mg.	0.3	0.4	0.1
Rinse Catch (<=10µm >2.5µm) , mg.	0.4	0.6	0.2
Nozzle Rinse Catch (> 10µm) , mg.	15.1	15.4	0.3
TOTAL FILTERABLE PARTICULATE, mg.	16.6		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:	In Stack Filter	> 10 µm Nozzle Rinse	<=10µm > 2.5µm Rinse	<= 2.5 µm Filter Rinse
Run ID				
Color:	BIEGE	BIEGE	BIEGE	CLEAR
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	N/A
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	LOW	MED	LOW	N/A

Miscellaneous Notes & Comments:

Legend: F = Final Weight; I = Filter; R = Rinse

Printing Date: 06-Sep-2001 Printing Time: 09:50 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name:	ACT	RFA #:	642
Method:	M201B	Filename:	ACT
Date Received:	[illegible]/2001	Page 1 of 33	File Pathway: [illegible]
Run Number:	SM2-M201B-1		

Sample I.D.

	Date	Init	Filter # 365 (<= 2.5 µg)	Date		Rinse # 1181 (<= 10µg > 2.5µm)
	09/03	CLT	3.5430	09/04	@	3.3994
Baggie Tare Wt., g.			3.4282	09/03		3.3998
Filter Tare Wt., g.		SF47 315	0.1132	(70	ml)	3.3951
SAMPLE WT., g.			0.0016			0.0043

Sample I.D.

	Date	Init		Filter Rinse # 537 (<= 2.5 µg)	Date		Nozzle Rinse # 369 (>10 ug)
	09/04	CLT		3.4859	09/04	@	3.4856
	09/03	CLT	@	3.4858	09/03		3.4857
Tare Wt., g.	(	40	ml)	3.4852	(60	ml)	3.4776
SAMPLE WT., g.				0.0006			0.0080

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm), mg.	1.6		
Filter Rinse Catch (<=2.5µm), mg.	0.5	0.6	0.1
Rinse Catch (<=10µm >2.5µm), mg.	4.1	4.3	0.2
Nozzle Rinse Catch (> 10µm), mg.	7.8	8.0	0.2
TOTAL FILTERABLE PARTICULATE, mg.	14.0		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		> 10 µm	<=10µm > 2.5µm	<= 2.5 µm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	BIEGE	BIEGE	BIEGE	BIEGE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	LOW	MED	LOW	LOW

Miscellaneous Notes & Comments:

Legend: @ = Final Weight
F = Filter
R = Rinse

Printing Date. 08-Sep-2001 Printing Time. 08.50 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT | RCS #: 844
Method: M201B | Filename: ACT
Date Received: 9/7/2001 | Page 5 of 13 | File Pathway: C:\QUESTAR\ACT\WE
Run Number: 3N2-M201B-2

Sample I.D.			Filter # 1189 (< = 2.5 µg)		Rinse # 1266 (<= 10µg > 2.5µm)
	Date	Init		Date	
	09/03	CLT	3.4488	09/04 @	3.2241
Baggie Tare Wt., g.			3.3326	09/03	3.2242
Filter Tare Wt., g.		SF47 316	0.1146	(70 ml)	3.2221
SAMPLE WT., g.			0.0016		0.0020

Sample I.D.			Filter Rinse # 1104 (< = 2.5 µg)		Nozzle Rinse # 1308 (>10 ug)
	Date	Init		Date	
	09/04	CLT @	3.4675	09/04 @	3.3495
	09/03	CLT	3.4676	09/03	3.3496
Tare Wt., g.		(30 ml)	3.4674	(70 ml)	3.3451
SAMPLE WT., g.			0.0001		0.0044

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	1.6		
Filter Rinse Catch (<=2.5µm) , mg.	0.0	0.1	0.1
Rinse Catch (<=10µm >2.5µm) , mg.	1.8	2.0	0.2
Nozzle Rinse Catch (> 10µm) , mg.	4.2	4.4	0.2
TOTAL FILTERABLE PARTICULATE, mg.	7.6		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:	> 10 µm	<=10µm > 2.5µm	<= 2.5 µm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	BIEGE	BIEGE	BIEGE	CLEAR
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	N/A
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	LOW	LOW	LOW	N/A

Miscellaneous Notes & Comments:

Legend: W = Final Weight
F = Filter
R = Rinse

Printing Date: 06-Sep-2001 Printing Time: 08:50 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT		RFA #	942
Method: M201B		Filename:	ACT
Date Retrieved: 8/30/2001	Page # of: 23	File Pathway:	S:\M201B\942\ACT.WK1
Run Number:	942-M201B-5		

Sample I.D.			Filter # 1273 (<= 2.5 µg)			Rinse # 651 (<= 10µg > 2.5µm)
	Date	Init		Date		
	09/03	CLT	3.3334	09/04	@	3.4393
Baggie Tare Wt., g.			3.2182	09/03		3.4394
Filter Tare Wt., g.		SF47 317	0.1139	(80	ml)	3.4366
SAMPLE WT., g.			0.0013			0.0027

Sample I.D.			Filter Rinse # 1114 (<= 2.5 µg)			Nozzle Rinse # 1191 (>10 ug)
	Date	Init		Date		
	09/04	CLT	3.2580	09/04	@	3.1491
	09/03	CLT @	3.2579	09/03		3.1493
Tare Wt., g.		(40 ml)	3.2574	(60	ml)	3.1449
SAMPLE WT., g.			0.0005			0.0042

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	1.3		
Filter Rinse Catch (<=2.5µm) , mg.	0.4	0.5	0.1
Rinse Catch (<=10µm >2.5µm) , mg.	2.5	2.7	0.2
Nozzle Rinse Catch (> 10µm) , mg.	4.0	4.2	0.2
TOTAL FILTERABLE PARTICULATE, mg.	8.2		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:	In Stack Filter	> 10 µm Nozzle Rinse	<=10µm > 2.5µm Rinse	<= 2.5 µm Filter Rinse
Run ID				
Color:	BIEGE	BIEGE	BIEGE	BIEGE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	LOW	LOW	LOW	LOW

Miscellaneous Notes & Comments:

Legend: B = Final Weight; F = Filter; R = Rinse

Printing Date: 06-Sep-2001 Printing Time: 08:50 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Final Weigh: ACT
Method: M29/8
Date Received: 8/29/2001
Page 2 of 11
RFA #: 642
Filename: ACT
Run Number: SM2-M29/8-1

Sample I.D.			Filter # 670 (< = 2.5 µg)		Rinse # 119 (<= 10µg > 2.5µm)
	Date	Init		Date	
	09/03	CLT	3.5721	09/04 @	3.8739
Baggie Tare Wt., g.			3.4567	09/03	3.8740
Filter Tare Wt., g.		SF47 318	0.1138	(70 ml)	3.8705
SAMPLE WT., g.			0.0016		0.0034

Sample I.D.			Filter Rinse # 645 (< = 2.5 µg)		Nozzle Rinse # 1260 (>10 ug)
	Date	Init		Date	
	09/04	CLT	3.6651	09/04 @	3.2700
	09/03	CLT @	3.6650	09/03	3.2702
Tare Wt., g.		(40 ml)	3.6640	(60 ml)	3.2637
SAMPLE WT., g.			0.0010		0.0063

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	1.6		
Filter Rinse Catch (<=2.5µm) , mg.	0.9	1.0	0.1
Rinse Catch (<=10µm >2.5µm) , mg.	3.2	3.4	0.2
Nozzle Rinse Catch (> 10µm) , mg.	6.1	6.3	0.2
TOTAL FILTERABLE PARTICULATE, mg.	11.8		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection	In Stack Filter	> 10 µm Nozzle Rinse	<=10µm > 2.5µm Rinse	<= 2.5 µm Filter Rinse
Run ID				
Color:	BIEGE	BIEGE	BIEGE	BIEGE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	LOW	LOW	LOW	LOW

Legend: FW = Final Weight; F = Filter; R = Rinse

Miscellaneous Notes & Comments:

Printing Date: 06-Sep-2001 Printing Time: 08:50 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT			RFA #: 643
Method: M201B			Filename: ACT
Date Received: 8/20/2001	Page # of	43	File Pathway: C:\JOBS\643\ACT.WB1
Run Number:	SMS-M201B-2		

Sample I.D.

	Date	Init	Filter # 936 (< = 2.5 µg)	Date			Rinse # 600 (<= 10µg > 2.5µm)
	09/03	CLT	3.4702	09/04	@		3.6098
Baggie Tare Wt., g.			3.3554	09/03			3.6100
Filter Tare Wt., g.		SF47 319	0.1136	(80	ml)		3.6089
SAMPLE WT., g.			0.0012				0.0009

Sample I.D.

	Date	Init			Filter Rinse # 1234 (< = 2.5 µg)	Date		Nozzle Rinse # 349 (>10 ug)
	09/04	CLT	@		3.5351	09/04	@	3.2714
	09/03	CLT			3.5352	09/03	@	3.2714
Tare Wt., g.	(	30	ml)		3.5342	(70	ml)	3.2699
SAMPLE WT., g.					0.0009			0.0015

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm), mg.	1.2		
Filter Rinse Catch (<=2.5µm), mg.	0.8	0.9	0.1
Rinse Catch (<=10µm >2.5µm), mg.	0.7	0.9	0.2
Nozzle Rinse Catch (> 10µm), mg.	1.3	1.5	0.2
TOTAL FILTERABLE PARTICULATE, mg.	4.0		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	- 785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		> 10 µm	<=10µm > 2.5µm	<= 2.5 µm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	BIEGE	BIEGE	BIEGE	BIEGE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	LOW	LOW	LOW	LOW

Miscellaneous Notes & Comments:

Legend:	@ = Final Weight
	F = Filter
	R = Rinse

Printing Date: 06-Sep-2001 **Printing Time:** 06:50 PM

2.5 μm / 10 μm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name:	ACT	RFR#:	643
Method:	M201B	Filename:	ACT
Date Received:	8/20/2001	Page 9 of 19	File Pathway: C:\JOBS\...\ACT.WB1
Run Number:	SM5-M201B-3		

Sample I.D.

	Date	Init	Filter # 664 (< = 2.5 μg)	Date		Rinse # 543 (<= 10μg > 2.5μm)
	09/03	CLT	3.9033	09/04	@	3.5894
Baggie Tare Wt., g.			3.7893	09/03		3.5895
Filter Tare Wt., g.		SF47 320	0.1135	(70	ml)	3.5889
SAMPLE WT., g.			0.0005			0.0005

Sample I.D.

	Date	Init		Filter Rinse # 937 (< = 2.5 μg)	Date		Nozzle Rinse # 851 (>10 ug)
	09/04	CLT	@	3.2621	09/04	@	3.8161
	09/03	CLT		3.2623	09/03		3.8162
Tare Wt., g.	(30	ml)		3.2610	(60	ml)	3.8134
SAMPLE WT., g.				0.0011			0.0027

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5μm) , mg.	0.5		
Filter Rinse Catch (<=2.5μm) , mg.	1.0	1.1	0.1
Rinse Catch (<=10μm >2.5μm) , mg.	0.3	0.5	0.2
Nozzle Rinse Catch (> 10μm) , mg.	2.5	2.7	0.2
TOTAL FILTERABLE PARTICULATE, mg.	4.3		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		> 10 μm	<=10μm > 2.5μm	<= 2.5 μm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	CLEAR	BIEGE	BIEGE	BIEGE
Texture:	N/A	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	N/A	LOW	LOW	LOW

Miscellaneous Notes & Comments:

Legend: FW = Final Weight
F = Filter
R = Rinse

Printing Date: 06-Sep-2001 Printing Time: 06:50 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name:	ACT			RFA #:	643
Method:	M201B			Filename:	ACT
Date Received:	8/20/2001	Page 10 of	13	File Pathway:	C:\...\ACT.WB1
Run Number:		GI-M201B-1			

Sample I.D.

	Date	Init	Filter # 978 (< = 2.5 µg)	Date		Rinse # 2029 (<= 10µg > 2.5µm)
	09/03	CLT	3.3933	09/04		3.3601
Baggie Tare Wt., g.			3.2775	09/03	@	3.3600
Filter Tare Wt., g.		SF47 321	0.1143	(70	ml)	3.3577
SAMPLE WT., g.			0.0015			0.0023

Sample I.D.

	Date	Init		Filter Rinse # 284 (< = 2.5 µg)	Date		Nozzle Rinse # 110 (>10 ug)
	09/04	CLT	@	3.4579	09/04	@	3.5970
	09/03	CLT		3.4580	09/03		3.5971
Tare Wt., g.	(30	ml)		3.4572	(60	ml)	3.5941
SAMPLE WT., g.				0.0007			0.0029

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm), mg.	1.5		
Filter Rinse Catch (<=2.5µm), mg.	0.6	0.7	0.1
Rinse Catch (<=10µm >2.5µm), mg.	2.1	2.3	0.2
Nozzle Rinse Catch (> 10µm), mg.	2.7	2.9	0.2
TOTAL FILTERABLE PARTICULATE, mg.	6.9		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		> 10 µm	<=10µm > 2.5µm	<= 2.5 µm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	BIEGE	BIEGE	BIEGE	BIEGE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	LOW	LOW	LOW	LOW

Miscellaneous Notes & Comments:

Legend:	B = Final Weight
	F = Filter
	R = Rinse

Printing Date: 06-Sep-2001 Printing Time: [illegible] PM

2.5 μm / 10 μm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT			RFA #: [illegible]
Method: M201B			Filename: ACT
Date Received: [illegible]	Page [illegible] of	[illegible]	File Pathway: [illegible]
Run Number:	[illegible]		

Sample I.D.	Date	Init	Filter # 2040 (< = 2.5 μg)	Date			Rinse # 588 (<= 10μg > 2.5μm)
	09/03	CLT	3.3387	09/04			3.4902
Baggie Tare Wt., g.			3.2224	09/03	@		3.4900
Filter Tare Wt., g.		SF47 322	0.1143	(60	ml)		3.4882
SAMPLE WT., g.			0.0020				0.0018

Sample I.D.	Date	Init			Filter Rinse # 688 (< = 2.5 μg)	Date			Nozzle Rinse # 382 (>10 ug)
	09/04	CLT	@		3.6384	09/04	@		3.2441
	09/03	CLT			3.6385	09/03			3.2442
Tare Wt., g.		(40	ml)		3.6377	(70	ml)		3.2385
SAMPLE WT., g.					0.0007				0.0056

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5μm) , mg.	2.0		
Filter Rinse Catch (<=2.5μm) , mg.	0.6	0.7	0.1
Rinse Catch (<=10μm >2.5μm) , mg.	1.6	1.8	0.2
Nozzle Rinse Catch (> 10μm) , mg.	5.4	5.6	0.2
TOTAL FILTERABLE PARTICULATE, mg.	9.6		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		> 10 μm	<=10μm > 2.5μm	<= 2.5 μm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	BIEGE	BIEGE	BIEGE	BIEGE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	LOW	LOW	LOW	LOW

Miscellaneous Notes & Comments:

Legend: @ = Final Weight
F = Filter
R = Rinse

Printing Date: 08-Sep-2001 Printing Time: 08:50 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name:	ACT	RFA #:	642
Method:	M201B	Filename:	ACT
Date Received:	8/20/2001	Page 12 of 13	File Pathway: C:\JOBS\642\ACT.WB\
Run Number	CI-M201B-2		

Sample I.D.

Filter # 376 (< = 2.5 µg)

	Date	Init	Filter # 376 (< = 2.5 µg)
	09/03	CLT	3.2009
Baggie Tare Wt., g.			3.0843
Filter Tare Wt., g.		SF47 323	0.1144
SAMPLE WT., g.			0.0022

Rinse # 616 (<= 10µg > 2.5µm)

Date		Rinse # 616
09/04	@	3.8524
09/03		3.8527
(50 ml)		3.8504
		0.0020

Sample I.D.

Filter Rinse # 1231 (< = 2.5 µg)

	Date	Init		Filter Rinse # 1231
	09/04	CLT		3.5586
	09/03	CLT	@	3.5584
Tare Wt., g.	(50 ml)			3.5578
SAMPLE WT., g.				0.0006

Nozzle Rinse # 1304 (>10 µg)

Date		Nozzle Rinse # 1304
09/04	@	3.3498
09/03		3.3504
(80 ml)		3.3434
		0.0064

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	2.2		
Filter Rinse Catch (<=2.5µm) , mg.	0.5	0.6	0.1
Rinse Catch (<=10µm >2.5µm) , mg.	1.9	2.0	0.1
Nozzle Rinse Catch (> 10µm) , mg.	6.2	6.4	0.2
TOTAL FILTERABLE PARTICULATE, mg.	10.8		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection	> 10 µm	<=10µm > 2.5µm	<= 2.5 µm	
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	BIEGE	BIEGE	BIEGE	BIEGE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	LOW	LOW	LOW	LOW

Miscellaneous Notes & Comments:

Legend: @ = Final Weight
F = Filter
R = Rinse

Printing Date: 06-Sep-2001 Printing Time: 08:50 PM

REAGENT BLANK LABORATORY RESULTS

Plant Name: ACT			RFA #:	[illegible]
Method: M201B			Filename:	ACT
Date Received: [illegible]	Page 13 of 13	File Pathway:	[illegible]	
Run Number:	ACETONE BLANK RINSE			

	Date	Init		142
Container #				142
	09/04	CLT	@	3.5295
	09/03	CLT		3.5299
Tare Wt., g.		(120	ml)	3.5292
SAMPLE WT., g.				0.0003

Printing Date: 08-Sep-2001 Printing Time: 08:50 PM

Particulate Worksheet

Client ACT # 642 Rel. Humidity 48%

Analyst CLT Date 8-21-01

		Filter		Acetone Rinse >10		Nozzle Cyclone ≤ 10 > 2.5		MeCl2 Rinse ≤ 2.5		DI H2O Impinger	
	RUN#	Cont. #	Filter #	Filter Tare	Cont. #	Vol. (mls)	Cont. #	Vol. (mls)	Cont. #	Vol. (mls)	Cont. #	Vol. (mls)
	SM1-M201B-1	965	SF47 312	.1137	717	60	773	70	5	40		
	2	769	SF47 314	~~.1136~~ .1134	504	50	451	80	453	40		
	3	1041	SF47313	.1126	1272	100	1277	60	724	30		
	SM2-M201B-1	365	SF47315	.1132	369	60	1181	70	537	40		
	2	1189	SF47316	.1146	1308	70	1266	70	1104	30		
CT	3	1273	SF47317	.1139	1191	60	651	80	1114	40		
CO												
I	[redacted]-M201B-1	978	SF47321	.1143	110	60	2029	70	284	30		
	2	2040	SF47322	.1143	382	70	588	60	688	40		
	3	376	SF47323	.1144	1304	80	616	50	1231	50		
3	[redacted]-M201B-1	670	SF47318	.1138	1260	60	119	70	645	40		
	2	936	SF47319	.1136	349	70	600	80	1234	30		
	3	664	SF47320	.1135	543	60	851	70	937	30		
	BLANK				142	120						

RESOLUTION ANALYTICS, INC.
Specialists in High Performance Liquid Chromatography

2733 LEE AVENUE SANFORD, NC 27330 (919) 774-5557

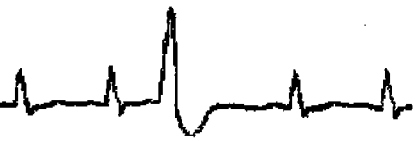
ANALYTICAL REPORT

- $PM_{2.5}$ PARTICULATE
  (EPA METHOD 201B)

CLIENT: ACT

RFA#: 642

RESOLUTION ANALYTICS, INC.
Specialists in High Performance Liquid Chromatography



REPORT SUMMARY

RFA#: 642

SAMPLE ID	Particulate ≤ 2.5 µm	Particulate 2.5µm - 10µm	Particulate > 10µm	Total Filterable Particulate
ACETONE BLANK		0.3 mgs(120 mls)		
JMH1-M201B-1	11.2 mgs	20.0 mgs	19.2 mgs	50.4 mgs
JMH1-M201B-2	10.6 mgs	17.6 mgs	18.5 mgs	46.7 mgs
JMH1-M201B-3	9.5 mgs	16.2 mgs	17.8 mgs	43.5 mgs
JMH2-M201B-1	24.4 mgs	32.7 mgs	9.3 mgs	66.4 mgs
JMH2-M201B-2	21.4 mgs	21.2 mgs	7.1 mgs	49.7 mgs
JMH2-M201B-3	22.1 mgs	22.9 mgs	6.1 mgs	51.1 mgs

Analytical Narrative

RFA # 642

Client/Plant Name: ACT

Date Rec'd in lab: 9/07/01

Analyst: CLT

Date of Analysis: 9/12/01

Analysis Method: EPA Method 201B

Analyte(s): PM <2.5micron

Sample Matrix & Components:

Dry Filters, Acetone Rinses (Precutter/Cyclone and Front½ rinses weighed separately), Acetone Blank

Summary of Sample Prep:

The acetone rinses and pre-tared filters were transferred to pre-tared teflon "baggies" in a low humidity environment. The acetone rinses were evaporated overnight, then desiccated for 24 hours, after which time they were weighed daily every six hours until consecutive weights agreed within ±0.5 mgs. The filters were oven dried at 105°C for 2 hours and weighed immediately afterwards. All weights were recorded to the nearest 0.1 mg and include filterable particulate catch only. The total catch reported for each run is a sum of the filter and rinse catches. The acetone blank catch has been subtracted out of sample rinse catches in proportion with their respective volumes.

Summary of Instrumentation:

Denver model A-250 analytical balance

Analytical Detection Limit(s): 0.5 mgs

Miscellaneous Comments Regarding Sample Analysis: (Note unusual catch weights, interferences, odd sample behavior, and steps taken to confirm unusual results. Also note any deviations from standard analytical procedures, together with justification and possible affect on results. Specify samples when applicable.)

No modifications to EPA Method 5 analytical procedure were made.

See Data Sheets for individual sample descriptions.

Confirmation of Data Review:

QA Officer Signature J. Bruce Nemet Date 9/12/01

(J. Bruce Nemet, Lab QA Officer)

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT			RFA # [illegible]
Method: M201B			Filename: ACT
Date Received: [illegible]	Page 1 of 7	File Pathway:	[illegible]
Run Number	[illegible]		

Sample I.D.

	Date	Init	Filter # 900 (< = 2.5 µg)	Date			Rinse # 558 (<= 10µg > 2.5µm)
	09/12	CLT	3.4899	09/12	@		3.6378
Baggie Tare Wt., g.			3.3668	09/11			3.6381
Filter Tare Wt., g.		SF47 324	0.1124	(100	ml)		3.6175
SAMPLE WT., g.			0.0107				0.0203

Sample I.D.

	Date	Init		Filter Rinse # 707 (< = 2.5 µg)	Date		Nozzle Rinse # 377 (>10 ug)
	09/12	CLT	@	3.1969	09/12	@	3.2890
	09/11	CLT		3.1970	09/11		3.2891
Tare Wt., g.	(	50	ml)	3.1963	(90	ml)	3.2696
SAMPLE WT., g.				0.0006			0.0194

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	10.7		
Filter Rinse Catch (<=2.5µm) , mg.	0.5	0.6	0.1
Rinse Catch (<=10µm >2.5µm) , mg.	20.0	20.3	0.3
Nozzle Rinse Catch (> 10µm) , mg.	19.2	19.4	0.2
TOTAL FILTERABLE PARTICULATE, mg.	50.4		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.165E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		<=10µm > 2.5µm	<= 2.5 µm	> 10 µm
Run ID	In Stack Filter	Rinse	Filter Rinse	Nozzle Rinse
Color:	WHITE	WHITE	WHITE	WHITE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	MED	MED	LOW	MED

Miscellaneous Notes & Comments:

Legend:	@ = Final Weight
	F = Filter
	R = Rinse

Printing Date 12-Sep-2001 Printing Time. 02:46 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT
Method: M201B
Date Received:
Page 5 of
File Pathway:
RFA #: 940
Filename: ACT
Run Number: M5H-M201B-2

Sample I.D.			Filter # 1 (< = 2.5 µg)		Rinse # 1096 (<= 10µg > 2.5µm)
	Date	Init		Date	
	09/12	CLT	3.3418	09/12 @	3.6909
Beggie Tare Wt., g.			3.2185	09/11	3.6909
Filter Tare Wt., g.		SF47 325	0.1135	(60 ml)	3.6730
SAMPLE WT., g.			0.0098		0.0178

Sample I.D.			Filter Rinse # 103 (< = 2.5 µg)		Nozzle Rinse # 2079 (>10 ug)
	Date	Init		Date	
	09/12	CLT @	3.7090	09/12	3.5411
	09/11	CLT	3.7091	09/11 @	3.5409
Tare Wt., g.		(40 ml)	3.7081	(90 ml)	3.5222
SAMPLE WT., g.			0.0009		0.0187

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	9.8		
Filter Rinse Catch (<=2.5µm) , mg.	0.8	0.9	0.1
Rinse Catch (<=10µm >2.5µm) , mg.	17.6	17.8	0.2
Nozzle Rinse Catch (> 10µm) , mg.	18.5	18.7	0.2
TOTAL FILTERABLE PARTICULATE, mg.	46.7		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		> 10 µm	<=10µm > 2.5µm	<= 2.5 µm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	WHITE	WHITE	WHITE	WHITE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	MED	MED	LOW	MED

Miscellaneous Notes & Comments:

Legend: (B) = Final Weight for Blank, (F) = Final Weight for Filter

Printing Date: 12-Sep-2001 Printing Time: 02:48 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name:	ACT	EPA #:	842
Method:	M201B	Filename:	ACT
Date Received:	Page 3 of 7	File Pathway:	[illegible]
Run Number:	3M11-M201B-3		

Sample I.D.

	Date	Init	Filter # 997 (< = 2.5 µg)	Date			Rinse # 2097 (<= 10µg > 2.5µm)
	09/12	CLT	3.4683	09/12	@		3.5256
Baggie Tare Wt., g.			3.3463	09/11			3.5257
Filter Tare Wt., g.		SF46 326	0.1131	(100	ml)		3.5091
SAMPLE WT., g.			0.0089				0.0165

Sample I.D.

	Date	Init			Filter Rinse # 2032 (< = 2.5 µg)	Date			Nozzle Rinse # 2077 (> 10 ug)
	09/12	CLT	@		3.1284	09/12	@		3.3301
	09/11	CLT			3.1289	09/11	@		3.3301
Tare Wt., g.		(40	ml)		3.1277	(80	ml)		3.3121
SAMPLE WT., g.					0.0007				0.0180

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm), mg.	8.9		
Filter Rinse Catch (<=2.5µm), mg.	0.6	0.7	0.1
Rinse Catch (<=10µm >2.5µm), mg.	16.2	16.5	0.3
Nozzle Rinse Catch (> 10µm), mg.	17.8	18.0	0.2
TOTAL FILTERABLE PARTICULATE, mg.	43.5		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		> 10 µm	<=10µm > 2.5µm	<= 2.5 µm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	WHITE	WHITE	WHITE	WHITE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	MED	MED	LOW	MED

Miscellaneous Notes & Comments:

Legend: @ = Final Weight
F = Filter
R = Rinse

Printing Date: 12-Sep-2001 Printing Time: 02:48 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT — PTA #: 642
Method: M202B — Fabricator: ACT
Date Received: — Page 1 of — File Pathway: C:\LOGS\642\OUT.WB1
Run Number: JMH-2-M202B-1

Sample I.D.			Filter # 699 (< = 2.5 µg)			Rinse # 1163 (<= 10µg > 2.5µm)
	Date	Init		Date		
	09/12	CLT	3.1453	09/12	@	3.3734
Baggie Tare Wt., g.			3.0055	09/11		3.3737
Filter Tare Wt., g.		SF47 328	0.1157	(100	ml)	3.3404
SAMPLE WT., g.			0.0241			0.0330

Sample I.D.			Filter Rinse # 466 (< = 2.5 µg)			Nozzle Rinse # 1295 (>10 ug)
	Date	Init		Date		
	09/12	CLT @	3.3534	09/12		3.0679
	09/11	CLT @	3.3534	09/11	@	3.0678
Tare Wt., g.		(40 ml)	3.3530	(100	ml)	3.0582
SAMPLE WT., g.			0.0004			0.0096

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	24.1		
Filter Rinse Catch (<=2.5µm) , mg.	0.3	0.4	0.1
Rinse Catch (<=10µm >2.5µm) , mg.	32.7	33.0	0.3
Nozzle Rinse Catch (> 10µm) , mg.	9.3	9.6	0.3
TOTAL FILTERABLE PARTICULATE, mg.	66.4		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 ←
Upper Limit, mg/mg	1.000E-05

Visual Inspection:	In Stack Filter	> 10 µm Nozzle Rinse	<=10µm > 2.5µm Rinse	<= 2.5 µm Filter Rinse
Run ID				
Color:	WHITE	WHITE	WHITE	WHITE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	MED	MED	LOW	MED

Miscellaneous Notes & Comments:

Legend: @ = Final Weight; I = Filter; R = Rinse

Printing Date: 12-Sep-2001 Printing Time: 02:48 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT			RFA #: [illegible]
Method: M201B			Filename: ACT
Date Received:	Page 5 of 7		File Pathway: [illegible]
Run Number:	JMH2-M201B-2		

Sample I.D.

	Date	Init	Filter # 1198 (< = 2.5 µg)	Date		Rinse # 2066 (<= 10µg > 2.5µm)
	09/12	CLT	3.5760	09/12	@	3.6184
Baggie Tare Wt., g.			3.4397	09/11		3.6188
Filter Tare Wt., g.		SF47 328	0.1151	(110	ml)	3.5969
SAMPLE WT., g.			0.0212			0.0215

Sample I.D.

	Date	Init		Filter Rinse # 771 (< = 2.5 µg)	Date		Nozzle Rinse # 1167 (>10 ug)
	09/12	CLT		3.4016	09/12		3.1683
	09/11	CLT	@	3.4014	09/11	@	3.1682
Tare Wt., g.	(	30	ml)	3.4011	(100	ml)	3.1608
SAMPLE WT., g.				0.0003			0.0074

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm), mg.	21.2		
Filter Rinse Catch (<=2.5µm), mg.	0.2	0.3	0.1
Rinse Catch (<=10µm >2.5µm), mg.	21.2	21.5	0.3
Nozzle Rinse Catch (> 10µm), mg.	7.1	7.4	0.3
TOTAL FILTERABLE PARTICULATE, mg.	49.7		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:		> 10 µm	<=10µm > 2.5µm	<= 2.5 µm
Run ID	In Stack Filter	Nozzle Rinse	Rinse	Filter Rinse
Color:	WHITE	WHITE	WHITE	WHITE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	MED	MED	LOW	MED

Miscellaneous Notes & Comments:

Legend: Fx = Final Weight; F = Filter; R = Rinse

Printing Date: 12-Sep-2001 Printing Time: 02:48 PM

2.5 µm / 10 µm PARTICULATE SAMPLING LABORATORY RESULTS

Plant Name: ACT		RFA #:	748
Method: M201A		Filename:	ACT
Date Received:	Page 6 of 7	File Pathway:	G:\FOSSIL\748\ACT.WB4
Run Number:	Mar12-M201B-2		

Sample I.D.		Filter # 2019 (< = 2.5 µg)		Rinse # 1283 (<= 10µg > 2.5µm)
	Date / Init		Date	
	09/12 CLT	3.4265	09/12 @	3.2435
Baggie Tare Wt., g.		3.2913	09/11	3.2437
Filter Tare Wt., g.	SF47 329	0.1137	(90 ml)	3.2204
SAMPLE WT., g.		0.0215		0.0231

Sample I.D.		Filter Rinse # 2010 (< = 2.5 µg)		Nozzle Rinse # 566 (>10 ug)
	Date / Init		Date	
	09/12 CLT @	3.3050	09/12 @	3.4847
	09/11 CLT	3.3051	09/11	3.4848
Tare Wt., g.	(40 ml)	3.3043	(80 ml)	3.4784
SAMPLE WT., g.		0.0007		0.0063

	Final Wt	Pre-Wt	Blank Res.
Filter Catch (<=2.5µm) , mg.	21.5		
Filter Rinse Catch (<=2.5µm) , mg.	0.6	0.7	0.1
Rinse Catch (<=10µm >2.5µm) , mg.	22.9	23.1	0.2
Nozzle Rinse Catch (> 10µm) , mg.	6.1	6.3	0.2
TOTAL FILTERABLE PARTICULATE, mg.	51.1		

Blank Beaker #	142
Final wt., mg.	3.5295
Tare wt., mg.	3.5292
Residue, mg.	0.3
Volume, ml.	120
Density, mg/ml	785.0
Conc., mg/mg	3.185E-06 <--
Upper Limit, mg/mg	1.000E-05

Visual Inspection:	In Stack Filter	> 10 µm Nozzle Rinse	<=10µm > 2.5µm Rinse	<= 2.5 µm Filter Rinse
Run ID				
Color:	WHITE	WHITE	WHITE	WHITE
Texture:	FINE SOOT	FINE SOOT	FINE SOOT	FINE SOOT
Foreign Matter:	N/A	N/A	N/A	N/A
Relative Comp:	MED	MED	LOW	MED

Miscellaneous Notes & Comments:

Legend: FW = Final Weight
F = Filter
R = Rinse

Printing Date: 12-Sep-2001 Printing Time: 02:48 PM

REAGENT BLANK LABORATORY RESULTS

Plant Name: ACT						RFA #	640
Method: 9071B						Chemist	ACT
Date Received:		Page	1	of	1	File Pathway	C:\LOGS\EXTRACT.MDB
Run Number:	ACETONE BLANK						

Container #				142
	Date	Init		
	09/04	CLT	@	3.5295
	09/03	CLT		3.5299
Tare Wt., g.		(120	ml)	3.5292
SAMPLE WT., g.				0.0003

Printing Date: 12-Sep-2001 Printing Time: 02:48 PM

Particulate Worksheet

Client: ACT #642 Rel. Humidity: 47%

Analyst: CLT Date: 9-8-01

	Filter			Acetone Rinse 710		Nozzle Cyclone ≤ 1072.8 mls		MeCl2 Rinse ≤ 25		DI H2O Impinger	
RUN#	Cont. #	Filter #	Filter Tare	Cont. #	Vol. (mls)	Cont. #	Vol. (mls)	Cont. #	Vol. (mls)	Cont. #	Vol. (mls)
SmH1-M2018-1	900	SF47-324	.1124	377	90	558	100	707	50		
2	1	SF47-325	.1135	2029	90	1096	80	103	40		
3	997	SF47-326	.1131	2077	80	2097	100	2032	40		
SmH2-M2018-1	699	SF47-327	.1157	1295	100	1163	100	466	40		
SmH2-M2018-2	1196	SF47-328	.1151	1167	100	2066	110	771	30		
SmH2-M2018-3	2019	SF47-329	.1137	566	80	1283	90	2010	40		
BLANK				142	120						

6.1

APPENDIX B

Test Results

Plant	Polar Minerals
City	Wellsville
State	Ohio
Sampling Location	Roller Mill

PARAMETER	NOMENCLATURE	RM-M201B-1	RM-M201B-2	RM-M201B-3
Sampling Location				
Date		7/17/2001	7/17/2001	7/17/2001
Run Time	Theta	120.00	121.59	125.90
Nozzle Diameter	inches	0.145	0.148	0.145
Pitot Tube Coefficient	Cp	0.84	0.84	0.84
Meter Calibration Factor	Y	1.0020	1.0020	1.0020
Barometric Pressure, inches Hg	Bp - in Hg	29.40	29.40	29.40
Meter Box Pressure Differential	ΔH - in. H2O	0.49	0.46	0.56
Volume of Gas Sampled	Vm - cu. ft.	49.4	49.313	54.515
Dry Gas Meter Temperature	Tm - °F	100.9	103.3	102.3
Volume of Gas Sampled, Dry	Vmstd - cu. ft.	45.840	45.560	50.476
Liquid Collected	ml	36.4	30.5	36.9
Volume of Water Vapor	Vwstd - cu. ft.	1.713	1.436	1.737
Moisture Content	$\%H_20$	3.603	3.05	3.33
Saturation Moisture	$\%H_20$	45.3	60.5	25.6
Dry Mole Fraction	Mfd	0.964	0.969	0.967
Carbon Dioxide	$\%CO_2$	0	0	0
Oxygen	$\%O_2$	20.9	20.9	20.9
Carbon Monoxide	%CO	0	0	0
Nitrogen	$\%N_2$	79.1	79.1	79.1
Gas Molecular Weight, Dry	Md	28.836	28.84	28.84
Gas Molecular Weight, Wet	Ms	28.446	28.505	28.476
Static Pressure	Pg - in. H_2O	0.40	0.40	0.40
Stack Pressure	Ps	29.43	29.43	29.43
Stack Temperature	Ts - °F	174.0	187.0	149.9
Average Velocity Head	Δp - in H_2O	1.191576308	1.2232933	1.346583272
Gas Velocity	vs - ft./sec.	68.22	69.75	71.09
Stack Area	As - sq. ft.	1.396263402	1.396263402	1.396263402
Volumetric Air Flow, Actual	Qaw - ACFM	5,715	5,844	5,956
Volumetric Air Flow, Standard	Qsd - DSCFM	4,513	4,547	4,903
Isokinetic Sampling Rate	%I	103.07	96.31	99.57
Total Particulate Catch	mg	10.2	7.4	8.9
PM10 Catch	mg	5.2	3.5	3.4
PM2.5 Catch	mg	0.7	0.6	0.7

Plant	Polar Minerals				
City	Wellsville				
State	Ohio				
Sampling Location	Roller Mill				
		RM-M201B-1	RM-M201B-2	RM-M201B-3	Average
Total Particulate Emissions					
Grains/DSCF	gr/DSCF	0.00343	0.00251	0.00272	0.00289
Pounds/Hour	lb/hr	0.13283	0.09770	0.11435	0.11496
PM_{10} Emissions					
Grains/DSCF	gr/DSCF	0.00175	0.00119	0.00104	0.00133
Pounds/Hour	lb/hr	0.06772	0.04621	0.04368	0.05254
$PM_{2.5}$ Emissions					
Grains/DSCF	gr/DSCF	0.00024	0.00020	0.00021	0.00022
Pounds/Hour	lb/hr	0.00912	0.00792	0.00899	0.00868
Cut Sizes					
PM_{10} Cut Diameter, (microns)	D_{50} - PM_{10}	10.70	10.92	10.35	10.66
Gas viscosity, (micropoise)	μ	203.748	207.385	197.997	203.04
Gas sampling rate, ACFM	Qs	0.484	0.482	0.487	0.48
Renolds number, (dimensionless)	N_{re}	2708.734	2601.096	2920.096	2743.31
Cunningham correction factor	C	1.078	1.076	1.079	1.08
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}<3162 - $PM_{2.5}$	2.41	2.51	2.25	2.39
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}>3162 - $PM_{2.5}$	2.27	2.33	2.18	2.26
Emission Factors					
Production Rate Tons/Hr		6.52	5.66	4.80	5.66
Total Particulate Emission Factor	Pounds/Ton	0.02038	0.01726	0.02382	0.02049
PM10 Particulate Emission Factor	Pounds/Ton	0.01039	0.00817	0.00910	0.00922
PM2.5 Particulate Emission Factor	Pounds/Ton	0.00140	0.00140	0.00187	0.00156

Plant	Specialty Minerals
City	North Adams
State	MA
Sampling Location	Product Silo

PARAMETER	NOMENCLATURE	SM1-M201B-1	SM1-M201B-2	SM1-M201B-3
Sampling Location				
Date		8/14/2001	8/14/2001	8/14/2001
Run Time	Theta	111.52	116.78	126.34
Nozzle Diameter	inches	0.346	0.341	0.346
Pitot Tube Coefficient	Cp	0.84	0.84	0.84
Meter Calibration Factor	Y	1.0080	1.0080	1.0080
Barometric Pressure, inches Hg	Bp - in Hg	29.15	29.15	29.15
Meter Box Pressure Differential	ΔH - in. H2O	0.47	0.48	0.5
Volume of Gas Sampled	Vm - cu. ft.	43.367	46.613	50.514
Dry Gas Meter Temperature	Tm - °F	76.5	90.7	85.4
Volume of Gas Sampled, Dry	Vmstd - cu. ft.	41.964	43.946	48.084
Liquid Collected	ml	13.9	17.1	18.7
Volume of Water Vapor	Vwstd - cu. ft.	0.654	0.805	0.880
Moisture Content	$\%H_20$	1.535	1.80	1.80
Saturation Moisture	$\%H_20$	3.8	4.5	4.4
Dry Mole Fraction	Mfd	0.985	0.982	0.982
Carbon Dioxide	$\%CO_2$	0	0	0
Oxygen	$\%O_2$	20.9	20.9	20.9
Carbon Monoxide	%CO	0	0	0
Nitrogen	$\%N_2$	79.1	79.1	79.1
Gas Molecular Weight, Dry	Md	28.836	28.84	28.84
Gas Molecular Weight, Wet	Ms	28.670	28.641	28.641
Static Pressure	Pg - in. H_2O	0.01	0.01	0.01
Stack Pressure	Ps	29.15	29.15	29.15
Stack Temperature	Ts - °F	81.8	87.5	86.7
Average Velocity Head	Δp - in H_2O	0.03302	0.03127	0.03467
Gas Velocity	vs - ft./sec.	10.50743	10.28362	10.81893
Stack Area	As - sq. ft.	0.81846	0.81846	0.81846
Volumetric Air Flow, Actual	Qaw - ACFM	516	505	531
Volumetric Air Flow, Standard	Qsd - DSCFM	482	466	491
Isokinetic Sampling Rate	%I	97.78	104.22	97.17
Total Particulate Catch	mg	2.6	7.7	16.6
PM10 Catch	mg	1.9	3.2	1.5
PM2.5 Catch	mg	0.6	0.8	1.1

Plant	Specialty Minerals				
City	North Adams				
State	MA				
Sampling Location	Product Silo				
		SM1-M201B-1	SM1-M201B-2	SM1-M201B-3	Average
Total Particulate Emissions					
Grains/DSCF	gr/DSCF	0.00096	0.00270	0.00533	0.00300
Pounds/Hour	lb/hr	0.00395	0.01080	0.02242	0.01239
PM_{10} Emissions					
Grains/DSCF	gr/DSCF	0.00070	0.00112	0.00048	0.00077
Pounds/Hour	lb/hr	0.00289	0.00449	0.00203	0.00313
$PM_{2.5}$ Emissions					
Grains/DSCF	gr/DSCF	0.00022	0.00028	0.00035	0.00028
Pounds/Hour	lb/hr	0.00091	0.00112	0.00149	0.00117
Cut Sizes					
PM_{10} Cut Diameter, (microns)	D_{50} - PM_{10}	10.93	10.90	10.81	10.88
Gas viscosity, (micropoise)	μ	182.69	183.87	183.67	183.41
Gas sampling rate, ACFM	Qs	0.40	0.41	0.41	0.41
Renolds number, (dimensionless)	N_{re}	2936.14	2922.57	2958.90	2939.21
Cunningham correction factor	C	1.07	1.07	1.07	1.07
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}<3162 - $PM_{2.5}$	2.38	2.38	2.35	2.37
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}>3162 - $PM_{2.5}$	2.32	2.31	2.29	2.30
Emission Factors					
Production Rate Tons/Hr		1.96	1.96	1.96	1.96
Total Particulate Emission Factor	Pounds/Ton	0.00202	0.00551	0.01144	0.00632
PM10 Particulate Emission Factor	Pounds/Ton	0.00147	0.00229	0.00103	0.00160
PM2.5 Particulate Emission Factor	Pounds/Ton	0.00047	0.00057	0.00076	0.00060

Plant	Specialty Minerals
City	North Adams
State	MA
Sampling Location	B15-Classifier

PARAMETER	NOMENCLATURE	SM2-M201B-1	SM2-M201B-2	SM2-M201B-3
Sampling Location				
Date		8/15/2001	8/15/2001	8/15/2001
Run Time	Theta	124.49	104.99	124.97
Nozzle Diameter	inches	0.391	0.39	0.391
Pitot Tube Coefficient	Cp	0.84	0.84	0.84
Meter Calibration Factor	Y	1.0080	1.0080	1.0080
Barometric Pressure, inches Hg	Bp - in Hg	29.30	29.30	29.30
Meter Box Pressure Differential	ΔH - in. H2O	0.47	0.49	0.5
Volume of Gas Sampled	Vm - cu. ft.	50.08	42.24	51.12
Dry Gas Meter Temperature	Tm - °F	90.2	92.3	93.8
Volume of Gas Sampled, Dry	Vmstd - cu. ft.	47.499	39.908	48.168
Liquid Collected	ml	10.4	10.5	11.8
Volume of Water Vapor	Vwstd - cu. ft.	0.490	0.494	0.555
Moisture Content	$\%H_20$	1.020	1.22	1.14
Saturation Moisture	$\%H_20$	10.4	14.8	18.1
Dry Mole Fraction	Mfd	0.990	0.988	0.989
Carbon Dioxide	$\%CO_2$	0	0	0
Oxygen	$\%O_2$	20.9	20.9	20.9
Carbon Monoxide	%CO	0	0	0
Nitrogen	$\%N_2$	79.1	79.1	79.1
Gas Molecular Weight, Dry	Md	28.836	28.84	28.84
Gas Molecular Weight, Wet	Ms	28.725	28.703	28.712
Static Pressure	Pg - in. H_2O	-0.01	-0.01	-0.01
Stack Pressure	Ps	29.30	29.30	29.30
Stack Temperature	Ts - °F	115.5	128.6	136.1
Average Velocity Head	Δp - in H_2O	0.014048605	0.010753251	0.011661888
Gas Velocity	vs - ft./sec.	7.04	6.23	6.53
Stack Area	As - sq. ft.	4	4	4
Volumetric Air Flow, Actual	Qaw - ACFM	1,689	1,495	1,567
Volumetric Air Flow, Standard	Qsd - DSCFM	1,502	1,297	1,343
Isokinetic Sampling Rate	%I	121.84	141.28	137.63
Total Particulate Catch	mg	14	7.6	8.2
PM10 Catch	mg	6.2	3.4	4.2
PM2.5 Catch	mg	2.1	1.6	1.7

Plant	Specialty Minerals				
City	North Adams				
State	MA				
Sampling Location	B15-Classifier				
		SM2-M201B-1	SM2-M201B-2	SM2-M201B-3	Average
Total Particulate Emissions					
Grains/DSCF	gr/DSCF	0.00455	0.00294	0.00263	0.00337
Pounds/Hour	lb/hr	0.05857	0.03268	0.03025	0.04050
PM_{10} Emissions					
Grains/DSCF	gr/DSCF	0.00201	0.00131	0.00135	0.00156
Pounds/Hour	lb/hr	0.02594	0.01462	0.01550	0.01868
$PM_{2.5}$ Emissions					
Grains/DSCF	gr/DSCF	0.00068	0.00062	0.00054	0.00062
Pounds/Hour	lb/hr	0.00878	0.00688	0.00627	0.00731
Cut Sizes					
PM_{10} Cut Diameter, (microns)	D_{50} - PM_{10}	10.91	10.92	10.83	10.89
Gas viscosity, (micropoise)	μ	191.26	194.31	196.21	193.93
Gas sampling rate, ACFM	Qs	0.43	0.44	0.45	0.44
Renolds number, (dimensionless)	N_{re}	2834.50	2783.20	2793.33	2803.68
Cunningham correction factor	C	1.07	1.07	1.07	1.07
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}<3162 - $PM_{2.5}$	2.41	2.44	2.41	2.42
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}>3162 - $PM_{2.5}$	2.32	2.32	2.30	2.31
Emission Factors					
Production Rate Tons/Hr		1.80	1.80	1.80	1.80
Total Particulate Emission Factor	Pounds/Ton	0.03254	0.01816	0.01681	0.02250
PM10 Particulate Emission Factor	Pounds/Ton	0.01441	0.00812	0.00861	0.01038
PM2.5 Particulate Emission Factor	Pounds/Ton	0.00488	0.00382	0.00348	0.00406

Plant	Specialty Minerals
City	North Adams
State	MA
Sampling Location	Raymond Mill

PARAMETER	NOMENCLATURE	SM3-M201B-1	SM3-M201B-2	SM3-M201B-3
Sampling Location				
Date		8/16/2001	8/16/2001	8/16/2001
Run Time	Theta	129.59	115.01	112.73
Nozzle Diameter	inches	0.213	0.216	0.213
Pitot Tube Coefficient	Cp	0.84	0.84	0.84
Meter Calibration Factor	Y	1.0080	1.0080	1.0080
Barometric Pressure, inches Hg	Bp - in Hg	29.30	29.30	29.30
Meter Box Pressure Differential	ΔH - in. H2O	0.48	0.48	0.48
Volume of Gas Sampled	Vm - cu. ft.	51.41	45.31	44.68
Dry Gas Meter Temperature	Tm - °F	71.9	82.2	89.9
Volume of Gas Sampled, Dry	Vmstd - cu. ft.	50.434	43.610	42.397
Liquid Collected	ml	40.0	25.9	38.4
Volume of Water Vapor	Vwstd - cu. ft.	1.883	1.219	1.807
Moisture Content	$\%H_2O$	3.599	2.72	4.09
Saturation Moisture	$\%H_2O$	18.2	23.1	25.5
Dry Mole Fraction	Mfd	0.964	0.973	0.959
Carbon Dioxide	$\%CO_2$	0	0	0
Oxygen	$\%O_2$	20.9	20.9	20.9
Carbon Monoxide	%CO	0	0	0
Nitrogen	$\%N_2$	79.1	79.1	79.1
Gas Molecular Weight, Dry	Md	28.836	28.84	28.84
Gas Molecular Weight, Wet	Ms	28.446	28.541	28.393
Static Pressure	Pg - in. H_2O	0.25	0.25	0.25
Stack Pressure	Ps	29.32	29.32	29.32
Stack Temperature	Ts - °F	136.4	145.6	149.6
Average Velocity Head	Δp - in H_2O	0.307905125	0.282806932	0.249558383
Gas Velocity	vs - ft./sec.	33.70	32.49	30.70
Stack Area	As - sq. ft.	0.944010417	0.944010417	0.944010417
Volumetric Air Flow, Actual	Qaw - ACFM	1,909	1,840	1,739
Volumetric Air Flow, Standard	Qsd - DSCFM	1,596	1,529	1,415
Isokinetic Sampling Rate	%I	93.02	91.98	101.37
Total Particulate Catch	mg	11.8	4	4.3
PM10 Catch	mg	5.7	2.7	1.8
PM2.5 Catch	mg	2.5	2	1.5

Plant	Specialty Minerals				
City	North Adams				
State	MA				
Sampling Location	Raymond Mill				
		SM3-M201B-1	SM3-M201B-2	SM3-M201B-3	Average
Total Particulate Emissions					
Grains/DSCF	gr/DSCF	0.00361	0.00142	0.00157	0.00220
Pounds/Hour	lb/hr	0.04940	0.01856	0.01899	0.02898
PM_{10} Emissions					
Grains/DSCF	gr/DSCF	0.00174	0.00096	0.00066	0.00112
Pounds/Hour	lb/hr	0.02386	0.01252	0.00795	0.01478
$PM_{2.5}$ Emissions					
Grains/DSCF	gr/DSCF	0.00076	0.00071	0.00055	0.00067
Pounds/Hour	lb/hr	0.01047	0.00928	0.00662	0.00879
Cut Sizes					
PM_{10} Cut Diameter, (microns)	D_{50} - PM_{10}	10.52	10.81	10.74	10.69
Gas viscosity, (micropoise)	μ	194.47	197.38	197.35	196.40
Gas sampling rate, ACFM	Qs	0.47	0.46	0.46	0.46
Renolds number, (dimensionless)	N_{re}	2891.21	2759.65	2762.26	2804.37
Cunningham correction factor	C	1.08	1.07	1.07	1.07
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}<3162 - $PM_{2.5}$	2.30	2.42	2.40	2.37
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}>3162 - $PM_{2.5}$	2.22	2.30	2.28	2.27
Emission Factors					
Production Rate Tons/Hr		8.23	14.00	14.00	12.08
Total Particulate Emission Factor	Pounds/Ton	0.00601	0.00133	0.00136	0.00290
PM10 Particulate Emission Factor	Pounds/Ton	0.00290	0.00089	0.00057	0.00145
PM2.5 Particulate Emission Factor	Pounds/Ton	0.00127	0.00066	0.00047	0.00080

Plant	OMYA Inc.
City	Florence
State	VT
Sampling Location	Flash Dryer #1

PARAMETER	NOMENCLATURE	OI-M201B-1	OI-M201B-2	OI-M201B-3
Sampling Location				
Date		8/17/2001	8/17/2001	8/17/2001
Run Time	Theta	119.14	119.10	121.53
Nozzle Diameter	inches	0.176	0.179	0.176
Pitot Tube Coefficient	Cp	0.84	0.84	0.84
Meter Calibration Factor	Y	1.0080	1.0080	1.0080
Barometric Pressure, inches Hg	Bp - in Hg	29.40	29.40	29.40
Meter Box Pressure Differential	ΔH - in. H2O	0.33	0.34	0.33
Volume of Gas Sampled	Vm - cu. ft.	40.01	39.51	40.63
Dry Gas Meter Temperature	Tm - °F	74.0	76.1	82.1
Volume of Gas Sampled, Dry	Vmstd - cu. ft.	39.216	38.577	39.230
Liquid Collected	ml	233.7	232.1	233.2
Volume of Water Vapor	Vwstd - cu. ft.	11.000	10.925	10.977
Moisture Content	$\%H_2O$	21.906	22.07	21.86
Saturation Moisture	$\%H_2O$	100.0	100.0	100.0
Dry Mole Fraction	Mfd	0.781	0.779	0.781
Carbon Dioxide	$\%CO_2$	1	1	2
Oxygen	$\%O_2$	19	19.5	19
Carbon Monoxide	%CO	0	0	0
Nitrogen	$\%N_2$	80	79.5	79
Fuel Factor	Fo	1.900	1.400	0.950
Gas Molecular Weight, Dry	Md	28.92	28.94	29.08
Gas Molecular Weight, Wet	Ms	26.528	26.526	26.658
Static Pressure	Pg - in. H_2O	-0.25	-0.25	-0.25
Stack Pressure	Ps	29.38	29.38	29.38
Stack Temperature	Ts - °F	296.5	294.3	293.9
Average Velocity Head	Δp - in H_2O	0.975362	0.960756	0.985356
Gas Velocity	vs - ft./sec.	69.87	69.25	69.94
Stack Area	As - sq. ft.	4.908739	4.908739	4.908739
Volumetric Air Flow, Actual	Qaw - ACFM	20,579	20,395	20,598
Volumetric Air Flow, Standard	Qsd - DSCFM	11,015	10,925	11,069
Isokinetic Sampling Rate	%I	86.82	83.28	84.73
Total Filterable Particulate Catch	mg	6.9	9.6	10.8
PM10 Catch	mg	4.2	4.2	4.6
PM2.5 Catch	mg	2.1	2.6	2.7

Plant	OMYA Inc.				
City	Florence				
State	VT				
Sampling Location	Flash Dryer #1				
		OI-M201B-1	OI-M201B-2	OI-M201B-3	Average
Total Filterable Particulate Emissions					
Grains/DSCF	gr/DSCF	0.00272	0.00384	0.00425	0.00360
Grains/DSCF at 7% O_2	gr/DSCF@7%O_2	0.01986	0.03813	0.03108	0.02969
Pounds/Hour	lb/hr	0.25635	0.35963	0.40309	0.33969
PM_{10} Emissions					
Grains/DSCF	gr/DSCF	0.00165	0.00168	0.00181	0.00171
Grains/DSCF at 7% O_2	gr/DSCF@7%O_2	0.01209	0.01668	0.01324	0.01400
Pounds/Hour	lb/hr	0.15604	0.15734	0.17168	0.16169
$PM_{2.5}$ Emissions					
Grains/DSCF	gr/DSCF	0.00083	0.00104	0.00106	0.00098
Grains/DSCF at 7% O_2	gr/DSCF@7%O_2	0.00605	0.01033	0.00777	0.00805
Pounds/Hour	lb/hr	0.07802	0.09740	0.10077	0.09206
Cut Sizes					
PM_{10} Cut Diameter, (microns)	D_{50} - PM_{10}	10.04	10.15	10.17	10.12
Gas viscosity, (micropoise)	μ	220.044	219.634	219.415	219.70
Gas sampling rate, ACFM	Qs	0.615	0.605	0.601	0.61
Renolds number, (dimensionless)	N_{re}	2487.787	2457.655	2457.468	2467.64
Cunningham correction factor	C	1.098	1.096	1.095	1.10
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}<3162 - $PM_{2.5}$	2.33	2.37	2.38	2.36
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}>3162 - $PM_{2.5}$	2.13	2.16	2.16	2.15
Emission Factors					
Production Rate Tons/Hr		11.08	11.06	11.11	11.08
Total Filterable Particulate Emission Factor	Pounds/Ton	0.02314	0.03253	0.03628	0.03065
PM10 Particulate Emission Factor	Pounds/Ton	0.01409	0.01423	0.01545	0.01459
PM2.5 Particulate Emission Factor	Pounds/Ton	0.00704	0.00881	0.00907	0.00831

Plant	J. M. Huber
City	Quincy
State	Illinois
Sampling Location	Horizontal Ball Mill

PARAMETER	NOMENCLATURE	JMH1-M201B-1	JMH1-M201B-2	JMH1-M201B-3
Sampling Location				
Date		9/5/2001	9/5/2001	9/5/2001
Run Time	Theta	131.04	121.47	117.67
Nozzle Diameter	inches	0.13	0.133	0.13
Pitot Tube Coefficient	Cp	0.84	0.84	0.84
Meter Calibration Factor	Y	1.0080	1.0080	1.0080
Barometric Pressure, inches Hg	Bp - in Hg	29.70	29.70	29.70
Meter Box Pressure Differential	ΔH - in. H2O	0.5	0.5	0.52
Volume of Gas Sampled	Vm - cu. ft.	51.343	48.95	47.84
Dry Gas Meter Temperature	Tm - °F	74.1	91.2	100.8
Volume of Gas Sampled, Dry	Vmstd - cu. ft.	50.851	46.978	45.124
Liquid Collected	ml	21	21.6	23.1
Volume of Water Vapor	Vwstd - cu. ft.	0.988	1.017	1.087
Moisture Content	$\%H_2O$	1.907	2.12	2.35
Saturation Moisture	$\%H_2O$	30.5	38.5	46.6
Dry Mole Fraction	Mfd	0.981	0.979	0.976
Carbon Dioxide	$\%CO_2$	0	0	0
Oxygen	$\%O_2$	20.9	20.9	20.9
Carbon Monoxide	%CO	0	0	0
Nitrogen	$\%N_2$	79.1	79.1	79.1
Gas Molecular Weight, Dry	Md	28.836	28.84	28.84
Gas Molecular Weight, Wet	Ms	28.629	28.606	28.581
Static Pressure	Pg - in. H_2O	1.50	1.50	1.50
Stack Pressure	Ps	29.81	29.81	29.81
Stack Temperature	Ts - °F	157.6	167.4	175.8
Average Velocity Head	Δp - in H_2O	2.077598139	2.128682257	2.046921233
Gas Velocity	vs - ft./sec.	88.05	89.87	88.76
Stack Area	As - sq. ft.	1	1	1
Volumetric Air Flow, Actual	Qaw - ACFM	5,283	5,392	5,325
Volumetric Air Flow, Standard	Qsd - DSCFM	4,414	4,425	4,302
Isokinetic Sampling Rate	%I	95.37	90.59	96.70
Total Particulate Catch	mg	50.4	46.7	43.5
PM10 Catch	mg	31.2	28.2	25.7
PM2.5 Catch	mg	11.2	10.6	9.5

Plant	J. M. Huber				
City	Quincy				
State	Illinois				
Sampling Location	Horizontal Ball Mill				
		JMH1-M201B-1	JMH1-M201B-2	JMH1-M201B-3	Average
Total Particulate Emissions					
Grains/DSCF	gr/DSCF	0.01530	0.01534	0.01488	0.01517
Pounds/Hour	lb/hr	0.57874	0.58191	0.54862	0.56976
PM_{10} Emissions					
Grains/DSCF	gr/DSCF	0.00947	0.00926	0.00879	0.00917
Pounds/Hour	lb/hr	0.35827	0.35139	0.32413	0.34459
$PM_{2.5}$ Emissions					
Grains/DSCF	gr/DSCF	0.00340	0.00348	0.00325	0.00338
Pounds/Hour	lb/hr	0.12861	0.13208	0.11981	0.12683
Cut Sizes					
PM_{10} Cut Diameter, (microns)	D_{50} - PM_{10}	10.81	10.82	10.87	10.83
Gas viscosity, (micropoise)	μ	200.94	203.22	205.13	203.10
Gas sampling rate, ACFM	Qs	0.46	0.47	0.47	0.47
Renolds number, (dimensionless)	N_{re}	2759.62	2723.24	2678.93	2720.60
Cunningham correction factor	C	1.07	1.08	1.08	1.07
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}<3162 - $PM_{2.5}$	2.42	2.43	2.46	2.44
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}>3162 - $PM_{2.5}$	2.29	2.30	2.31	2.30
Emission Factors					
Production Rate Tons/Hr		3.75	3.75	3.75	3.75
Total Particulate Emission Factor	Pounds/Ton	0.15433	0.15518	0.14630	0.15193
PM10 Particulate Emission Factor	Pounds/Ton	0.09554	0.09370	0.08643	0.09189
PM2.5 Particulate Emission Factor	Pounds/Ton	0.03430	0.03522	0.03195	0.03382

Plant	J. M. Huber
City	Quincy
State	Illinois
Sampling Location	Vertical Ball Mill

PARAMETER	NOMENCLATURE	JMH2-M201B-1	JMH2-M201B-2	JMH2-M201B-3
Sampling Location				
Date		9/6/2001	9/6/2001	9/6/2001
Run Time	Theta	133.51	116.39	129.39
Nozzle Diameter	inches	0.164	0.162	0.164
Pitot Tube Coefficient	Cp	0.84	0.84	0.84
Meter Calibration Factor	Y	1.0080	1.0080	1.0080
Barometric Pressure, inches Hg	Bp - in Hg	29.60	29.60	29.60
Meter Box Pressure Differential	ΔH - in. H2O	0.46	0.46	0.46
Volume of Gas Sampled	Vm - cu. ft.	50.445	44.7	50.12
Dry Gas Meter Temperature	Tm - °F	81.0	89.8	99.6
Volume of Gas Sampled, Dry	Vmstd - cu. ft.	49.152	42.861	47.214
Liquid Collected	ml	27.5	23.4	23.8
Volume of Water Vapor	Vwstd - cu. ft.	1.294	1.101	1.120
Moisture Content	$\%H_20$	2.566	2.51	2.32
Saturation Moisture	$\%H_20$	15.0	15.9	17.0
Dry Mole Fraction	Mfd	0.974	0.975	0.977
Carbon Dioxide	$\%CO_2$	0	0	0
Oxygen	$\%O_2$	20.9	20.9	20.9
Carbon Monoxide	%CO	0	0	0
Nitrogen	$\%N_2$	79.1	79.1	79.1
Gas Molecular Weight, Dry	Md	28.836	28.84	28.84
Gas Molecular Weight, Wet	Ms	28.558	28.565	28.585
Static Pressure	Pg - in. H_2O	-26.00	-26.00	-26.00
Stack Pressure	Ps	27.69	27.69	27.69
Stack Temperature	Ts - °F	126.8	129.1	131.6
Average Velocity Head	Δp - in H_2O	0.88987	0.83713	0.97323
Gas Velocity	vs - ft./sec.	58.36	56.70	61.25
Stack Area	As - sq. ft.	1.76715	1.76715	1.76715
Volumetric Air Flow, Actual	Qaw - ACFM	6,188	6,012	6,494
Volumetric Air Flow, Standard	Qsd - DSCFM	5,020	4,862	5,239
Isokinetic Sampling Rate	%I	88.35	93.51	83.90
Total Particulate Catch	mg	66.4	49.7	51.1
PM10 Catch	mg	57.1	42.6	45.0
PM2.5 Catch	mg	24.4	21.4	22.1

Plant	J. M. Huber				
City	Quincy				
State	Illinois				
Sampling Location	Vertical Ball Mill				
		JMH2-M201B-1	JMH2-M201B-2	JMH2-M201B-3	Average
Total Particulate Emissions					
Grains/DSCF	gr/DSCF	0.02085	0.01789	0.01670	0.01848
Pounds/Hour	lb/hr	0.89702	0.74575	0.75011	0.79763
PM_{10} Emissions					
Grains/DSCF	gr/DSCF	0.01793	0.01534	0.01471	0.01599
Pounds/Hour	lb/hr	0.77139	0.63921	0.66057	0.69039
$PM_{2.5}$ Emissions					
Grains/DSCF	gr/DSCF	0.00766	0.00771	0.00722	0.00753
Pounds/Hour	lb/hr	0.32963	0.32111	0.32441	0.32505
Cut Sizes					
PM_{10} Cut Diameter, (microns)	D_{50} - PM_{10}	10.73	10.73	10.82	10.76
Gas viscosity, (micropoise)	μ	192.89	193.48	194.24	193.54
Gas sampling rate, ACFM	Qs	0.45	0.46	0.45	0.45
Renolds number, (dimensionless)	N_{re}	2738.96	2730.18	2691.57	2720.23
Cunningham correction factor	C	1.07	1.08	1.07	1.07
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}<3162 - $PM_{2.5}$	2.41	2.41	2.45	2.42
$PM_{2.5}$ cut diameter, (microns)	D_{50} N_{re}>3162 - $PM_{2.5}$	2.28	2.28	2.30	2.29
Emission Factors					
Production Rate Tons/Hr		0.50	0.50	0.50	0.50
Total Particulate Emission Factor	Pounds/Ton	1.79405	1.49150	1.50023	1.59526
PM10 Particulate Emission Factor	Pounds/Ton	1.54277	1.27843	1.32114	1.38078
PM2.5 Particulate Emission Factor	Pounds/Ton	0.65926	0.64222	0.64883	0.65010

APPENDIX C

Calibration Data

SAMPLING EQUIPMENT AUDIT

Client PMD

Plant Polar Minerals — Job No. 642

City/State Wellsville, OH — Team Leader TEH

Test Location Roller Mill

BAROMETER
Barometer (Van) No. _____ Checked OK? (√) ___ Shop Auditor _____

In-House Ref. Barometer _____ "Hg vs Van Barometer _____ "Hg

Date Compared _____ Dev. _____ "Hg (Max. Allowable Dev.: ± 0.1 "Hg)

Test Loc. Elevation Above Ground (Van) _____ Ft. Date _____ Field Auditor _____

Field Barometric Pressure Reduced for Test Location Elevation by _____ "Hg

Ref. Therm. Initial Ambient Temp., °F ___	Allowable Deviation From Ambient	Date _____ Auditor _____ Ambient Temperature, °F				✓ OK
THERMOMETERS						
Dry Gas Meter	± 5.4 °F	_____	(Meterbox I.D. _____)			—
Impinger Exit	± 2.0 °F	_____	_____	_____	_____	—
Filter Box	± 5.4 °F	_____	_____	_____	_____	—

THERMOCOUPLES

TC No./ °F	✓ OK	TC No./ °F	✓ OK	TC No./ °F	✓ OK	TC No./ °F	✓ OK	TC No./ °F	✓ OK
100 /100 (Including Temp. Change and Direction)	✓ —	101 /100 (Including Temp. Change and Direction)	✓ —	100 /100 (Including Temp. Change and Direction)	✓ —	101 /100 (Including Temp. Change and Direction)	✓ —	/ (Including Temp. Change and Direction)	—
Auditor TEH		Auditor TEH		Auditor TEH		Auditor TEH		Auditor _____	
* Probe		Exit		meter		STACK			

* As applicable, ASTM ref. thermometer No. Allowable dev. from ambient = ±2°F

ISOKINETIC METERBOX I.D. 702233 Gamma (Y) 1.002 ΔH@ 1.711

As Applicable (check): Zero Magnehelics? N/A Zero/Level Manometer? ✓

Barometric Pressure (P_{bar}) 29.2 Auditor TEH Date 7/6/01

Dry Gas Meter Reading (Cubic Ft.)	Meter Temperature (°F)	Lower and Upper Limits for Audit Gamma
Final 644.795	Final 105	0.96 * Y = 0.962
Initial 637.000	Initial 101	1.04 * Y = 1.042

Dry Gas Volume Metered (Cubic Ft.)	Average Meter Temp. (°F)	Run Time (Base = 10)	
		(Minutes)	(Seconds)
Vm = 7.795	Tm = 103	10	0

$$Y_c = \frac{[10 + (0 / 60)]}{7795} * \left[\frac{0.0319\,(103 + 460)}{29.2}\right]^{.5} = 1.006 \text{ Audit Gamma}$$

Audit Gamma Acceptable (between lower & upper limits)? (√) Yes ✓ No ___

Ideal Sampling Rate = 0.75

Positive Pressure Leak Check OK? Yes ✓ No ___

APEX INSTRUMENTS

EPA Method 5

522 Series Meter Box Calibration

Post-Test Orifice Method

English Meter Box Units, English K' Factor

Filename: \\Todd\c\DRY GAS METER CALS\ACTPC CALIBRATIONS\702233 A-M-1 Calibrations\Post-test Cal\[5-03-01.xls

Revised: 7/25/95 Version: 2.2

Model #:	522	Date: ---------->	5/3/2001
Serial #:	702233	Barometric Pressure: ---------->	30.30 (in. Hg)
Meterbox Y, (Gamma)	1.002	Theoretical Critical Vacuum:--->	14.29 (in. Hg)

!!!!!!!!!

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical

IMPORTANT Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units,

IMPORTANT (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

!!!!!!!!!

---------- DRY GAS METER READINGS ----------									-CRITICAL ORIFICE READINGS-					
dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	-- Initial Temps -- Inlet (deg F)	Outlet (deg F)	-- Final Temps. -- Inlet (deg F)	Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	-- Ambient Temperature -- Initial (deg F)	Final (deg F)	Average (deg F)
1.10	8.37	273.049	278.247	5.198	72.0	72.0	74.0	73.0	FO55	0.457	20.0	73.0	72.0	72.5
1.10	8.27	278.247	283.364	5.117	74.0	73.0	76.0	74.0	FO55	0.457	20.0	74.0	73.0	73.5
1.10	8.24	283.364	288.445	5.081	76.0	74.0	77.0	75.0	FO55	0.457	20.0	73.0	73.0	73.0

702233

********** RESULTS **********

--- DRY GAS METER ---		--------- ORIFICE ---------			-- DRY GAS METER --		--------- ORIFICE ---------		
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	CALIBRATION FACTOR Y Value (number)	Variation (number)	CALIBRATION FACTOR dH@ Value (in H2O)	Value (mm H2O)	Variation (in H2O)
5.229	148.1	5.023	142.2	5.004	0.961	-0.006	1.725	43.83	0.002
5.133	145.4	4.958	140.4	4.949	0.966	0.000	1.725	43.83	0.002
5.085	144.0	4.942	140.0	4.928	0.972	0.006	1.721	43.70	-0.003
							1.724	43.79	Average dH@

Average Y, (Gamma)	0.966
Percent Deviation from Pre-test	3.58

Note: Acceptable tolerance of average Calibration Factor (Y) to pre-test calibration Y is +- 5 percent.

33

SIGNED: Daniel M Rueda

Date: 5/3/01

SAMPLING EQUIPMENT AUDIT

Client Specialty Minerals

Plant _____ Job No. 642

City/State North Adams MA Team Leader TEH

Test Location Product Silo

BAROMETER
Barometer (Van) No. _____ Checked OK? (√) ___ Shop Auditor _____

In-House Ref. Barometer _____ "Hg vs Van Barometer _____ "Hg

Date Compared _____ Dev. _____ "Hg (Max. Allowable Dev.: ± 0.1 "Hg)

Test Loc. Elevation Above Ground (Van) _____ Ft. Date _____ Field Auditor _____

Field Barometric Pressure Reduced for Test Location Elevation by _____ "Hg

Ref. Therm. Initial Ambient Temp., °F ___	Allowable Deviation From Ambient	Date _____ Auditor _____ Ambient Temperature, °F				√ OK
THERMOMETERS						
Dry Gas Meter	± 5.4 °F	_____	(Meterbox I.D. _____)			—
Impinger Exit	± 2.0 °F	_____	_____	_____	_____	—
Filter Box	± 5.4 °F	_____	_____	_____	_____	—

THERMOCOUPLES

TC No. / °F	√ OK	TC No. / °F	√ OK	TC No. / °F	√ OK	TC No. / °F	√ OK	TC No. / °F	√ OK
/ (Including Temp. Change and Direction)	—	/ (Including Temp. Change and Direction)	—	/ (Including Temp. Change and Direction)	—	/ (Including Temp. Change and Direction)	—	/ (Including Temp. Change and Direction)	—
Auditor _____		Auditor _____		Auditor _____		Auditor _____		Auditor _____	
* _____		_____		_____		_____		_____	

* As applicable, ASTM ref. thermometer No. Allowable dev. from ambient = ±2°F

ISOKINETIC METERBOX I.D. 0011077 Gamma (Y) 1.008 ΔH@ 1.795

As Applicable (check): Zero Magnehelics? NA Zero/Level Manometer? ✓

Barometric Pressure (P_{bar}) 29.25 Auditor TEH Date 8/13/01

Dry Gas Meter Reading (Cubic Ft.)	Meter Temperature (°F)	Lower and Upper Limits for Audit Gamma
Final 744.982	Final 82	0.96 * Y = 0.96768
Initial 737.500	Initial 81	1.04 * Y = 1.04832

Dry Gas Volume Metered (Cubic Ft.)	Average Meter Temp. (°F)	Run Time (Base = 10)	
		(Minutes)	(Seconds)
Vm = 7.482	Tm = 81.5	10	0

$$Y_c = \frac{[10 + (0 / 60)]}{7.482} * \left[\frac{0.0319\ (81.5 + 460)}{29.25}\right]^{.5} = \frac{1.027}{\text{Audit Gamma}}$$

Audit Gamma Acceptable (between lower & upper limits)? (√) Yes ✓ No ___

Ideal Sampling Rate = 0.75

Positive Pressure Leak Check OK? Yes ___ No ___

SAMPLING EQUIPMENT AUDIT

Client JM Huber NSBA PMD

Plant JM Huber — Job No. 642

City/State Quincy IL — Team Leader TH

Test Location Ball Mill #7

BAROMETER
Barometer (Van) No. _____ Checked OK? (√) ___ Shop Auditor _____

Entropy In-House Ref. Barometer _____ "Hg vs Van Barometer _____ "Hg

Date Compared _____ Dev. _____ "Hg (Max. Allowable Dev.: ± 0.1 "Hg)

Test Loc. Elevation Above Ground (Van) 80 Ft. Date 9/4/01 Field Auditor TH

Field Barometric Pressure Reduced for Test Location Elevation by 0.1 "Hg

Ref. Therm. Initial Ambient Temp., °F 88	Allowable Deviation From Ambient	Date 9/4/01 Auditor TH Ambient Temperature, °F				√ OK
THERMOMETERS						
Dry Gas Meter	± 5.4 °F	88	(Meterbox I.D. 11077)			√
Impinger Exit	± 2.0 °F	88				√
Filter Box	± 5.4 °F	NA				—

THERMOCOUPLES

TC No. / °F	√ OK	TC No. / °F	√ OK	TC No. / °F	√ OK	TC No. / °F	√ OK	TC No. / °F	√ OK
Stack / 88	√	Probe / 88	√	/	—	/	—	/	—
(Including Temp. Change and Direction)		(Including Temp. Change and Direction)		(Including Temp. Change and Direction)		(Including Temp. Change and Direction)		(Including Temp. Change and Direction)	
Auditor TH		Auditor TH		Auditor _____		Auditor _____		Auditor _____	

Allowable Deviation from Ambient: ± 8.0°F * (or ± 2.0°F) **
* ± 8.0 °F = ± 1.5% of ambient absolute temperature.
** (± 2.0 °F if used in saturated or water droplet-laden gas stream.)

ISOKINETIC METERBOX I.D. 11077 Gamma (Y) 1.008 ΔH@ 1.795

As Applicable (check): Zero Magnehelics? ___ Zero/Level Manometer? √

Barometric Pressure (P_{bar}) 29.6 Auditor TH Date 9/4/01

Dry Gas Meter Reading (Cubic Ft.)	Meter Temperature (°F)	Lower and Upper Limits for Audit Gamma
Final 876.38	Final 89	0.96 * Y = 0.96768
Initial 868.90	Initial 87	1.04 * Y = 1.04832

Dry Gas Volume Metered (Cubic Ft.)	Average Meter Temp. (°F)	Run Time (Base = 10)	
		(Minutes)	(Seconds)
Vm = 7.48	Tm = 88	10	0

$$Y_c = \frac{[10 + (0 / 60)]}{7.48} * \left[\frac{0.0319\,(88 + 460)}{29.6}\right]^{.5} = \frac{1.0274}{\text{Audit Gamma}}$$

Audit Gamma Acceptable (between lower & upper limits)? (√) Yes √ No ___

Ideal Sampling Rate = 0.75

Positive Pressure Leak Check OK? Yes √ No ___

APEX INSTRUMENTS

EPA Method 5

522 Series Meter Box Calibration

Post-Test Orifice Method

English Meter Box Units, English K' Factor

Filename: \\Todd\c\DRY GAS METER CALS\ACTPC CALIBRATIONS\0011077 Calibrations\Post-test Cal\[3-20-01.xls]522C

Revised: 7/25/95 Version: 2.2

3/20/01

Model #:	522	Date: ---------->	########
Serial #:	11077	Barometric Pressure: ---------->	29.90 (in. Hg)
Meterbox Y, (Gamma)	1.008	Theoretical Critical Vacuum:--->	14.10 (in. Hg)

!!!!!!!!!

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical

IMPORTANT Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units,

IMPORTANT (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

!!!!!!!!!

---------- DRY GAS METER READINGS ----------

-CRITICAL ORIFICE READINGS-

dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	-- Initial Temps -- Inlet (deg F)	Outlet (deg F)	-- Final Temps. -- Inlet (deg F)	Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	-- Ambient Temperature -- Initial (deg F)	Final (deg F)	Average (deg F)
1.10	8.47	157.586	162.623	5.037	55.0		56.0		F055	0.457	21.0	63.0	58.0	60.5
1.15	8.40	162.623	167.721	5.098	56.0		57.0		F055	0.457	21.5	58.0	57.0	57.5
1.15	8.40	167.721	172.817	5.096	57.0		57.0		F055	0.457	21.5	58.0	56.0	57.0

11077

********** RESULTS **********

--- DRY GAS METER ---		--------- ORIFICE ---------			-- DRY GAS METER --		--------- ORIFICE ---------		
					CALIBRATION FACTOR Y		CALIBRATION FACTOR dH@		
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	Value (number)	Variation (number)	Value (in H2O)	Value (mm H2O)	Variation (in H2O)
5.168	146.3	5.073	143.7	5.006	0.982	0.010	#DIV/0!	#DIV/0!	#DIV/0!
5.221	147.8	5.046	142.9	4.951	0.966	-0.006	#DIV/0!	#DIV/0!	#DIV/0!
5.214	147.6	5.048	143.0	4.948	0.968	-0.004	#DIV/0!	#DIV/0!	#DIV/0!
							#DIV/0!	#DIV/0!	Average dH@

Average Y, (Gamma)	0.972
Percent Deviation from Pre-test	3.56

Note: Acceptable tolerance of average Calibration Factor (Y) to pre-test calibration Y is +- 5 percent.

SIGNED: Daniel A Richards

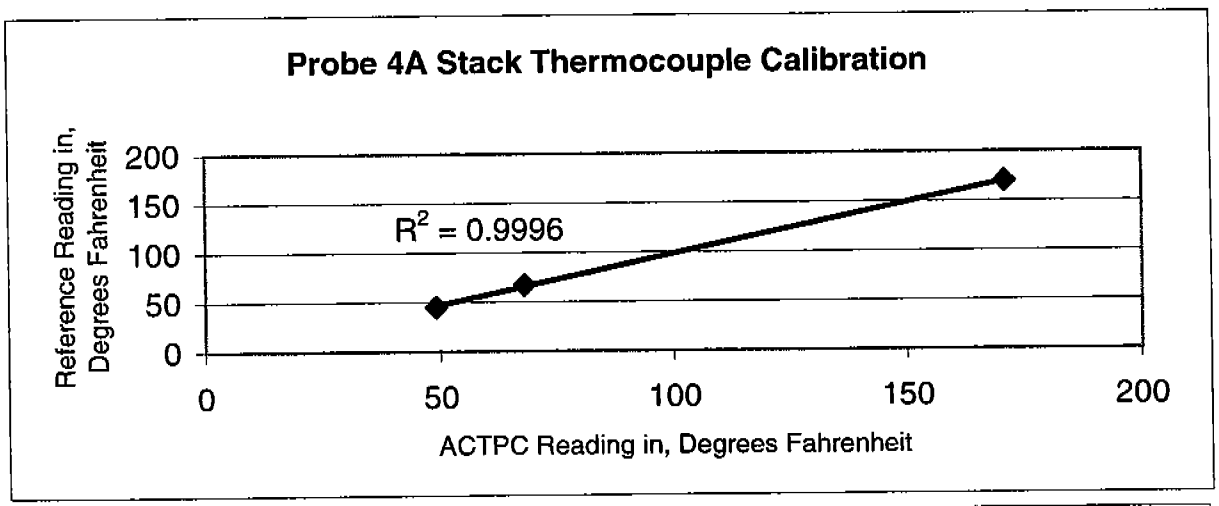
Date: 3/20/01

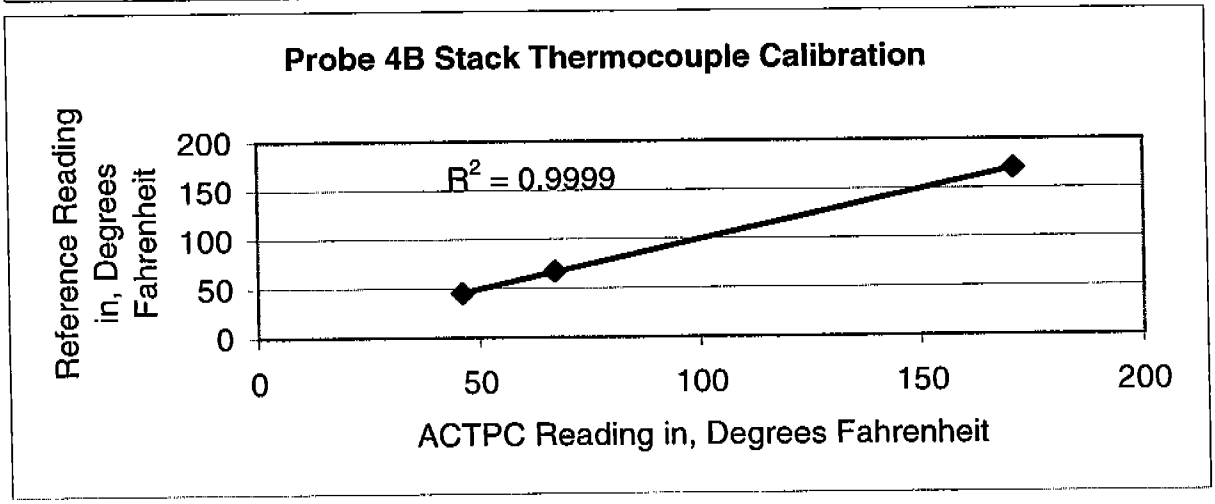
Air Control Techniques, P.C.
Probe Stack Thermocouple Calibrations

Date:	3/26/2001
Performed by:	TTB
Signature	

Thermocouple I.D.	ACT, P.C. *	Reference *
Stack 4A	49	45
Stack 4A	68	67
Stack 4A	171	170
Stack 4B	46	45
Stack 4B	67	67
Stack 4B	171	170

* = Degrees Fahreheit





		CHEROKEE INSTRUMENTS				
C # 1814	PM10	NOZZLE CALIBRATION SHEET				
DATE	NOZZLE ID#		NOZZLE DIAMETER, DN (INCHES)			
		<1>	<2>	<3>	HI-LO	AVG
8/7/01	1I	0.134	0.134	0.133	0.001	0.134
8/7/01	2I	0.145	0.145	0.145	0.000	0.145
8/7/01	3I	0.161	0.161	0.161	0.000	0.161
8/7/01	4I	0.178	0.177	0.178	0.001	0.178
8/7/01	5I	0.195	0.195	0.195	0.000	0.195
8/7/01	6I	0.212	0.212	0.212	0.000	0.212
8/7/01	7I	0.235	0.235	0.235	0.000	0.240
8/7/01	8I	0.261	0.261	0.261	0.000	0.261
8/7/01	9I	0.300	0.300	0.300	0.000	0.300
8/7/01	10I	0.339	0.338	0.339	0.001	0.339
8/7/01	11I	0.388	0.387	0.388	0.001	0.388
QA/QC	CHECK					
YES	EACH DIAMETER MEASURED TO WITHIN =/- 0.001 INCHES					
YES	HIGH - LOW </- 0.004 INCHES					
PREPARED BY :	MARK CATON				DATE:	8/7/01

		CHEROKEE INSTRUMENTS				
C # 1813	PM10	NOZZLE CALIBRATION SHEET				
DATE	NOZZLE ID#	NOZZLE DIAMETER, DN (INCHES)				
		<1>	<2>	<3>	HI-LO	AVG
1/10/01		0.129	0.129	0.129	0.000	0.129
1/10/01	1D	0.148	0.149	0.148	0.001	0.148
1/10/01	2D	0.162	0.162	0.162	0.000	0.162
1/10/01	3D	0.179	0.179	0.179	0.000	0.179
1/10/01	4D	0.195	0.195	0.196	0.001	0.195
1/10/01	5D	0.216	0.216	0.216	0.000	0.216
1/10/01	6D	0.232	0.232	0.232	0.000	0.240
1/10/01	7D	0.265	0.264	0.265	0.001	0.265
1/10/01	8D	0.300	0.301	0.300	0.001	0.300
1/10/01	9D	0.341	0.341	0.340	0.001	0.341
1/10/01	10D	0.390	0.390	0.391	0.001	0.390
1/10/01	11D					
QA/QC	CHECK					
YES	EACH DIAMETER MEASURED TO WITHIN =/- 0.001 INCHES					
YES	HIGH - LOW </- 0.004 INCHES					
PREPARED BY :	MARK CATON				DATE:	1/10/01

		CHEROKEE INSTRUMENTS				
#00084	PM10	NOZZLE CALIBRATION SHEET				
DATE	NOZZLE ID#	NOZZLE DIAMETER, DN (INCHES)				
		<1>	<2>	<3>	HI-LO	AVG
3/2/00	B-1	0.130	0.130	0.130	0.000	0.130
3/24/99	B-2	0.146	0.146	0.146	0.000	0.146
3/24/99	B-3	0.164	0.164	0.164	0.000	0.164
12/1/99	B-4	0.178	0.179	0.178	0.001	0.178
12/1/99	B-5	0.195	0.194	0.195	0.001	0.195
3/24/99	B-6	0.218	0.218	0.217	0.001	0.218
3/24/99	B-7	0.235	0.236	0.235	0.001	0.235
3/24/99	B-8	0.270	0.270	0.269	0.001	0.270
3/24/99	B-9	0.301	0.300	0.301	0.001	0.301
3/24/99	B-10	0.346	0.346	0.346	0.000	0.346
3/24/99	B-11	0.391	0.392	0.391	0.001	0.391
QA/QC	CHECK					
Yes	EACH DIAMETER MEASURED TO WITHIN =/- 0.001 INCHES					
Yes	HIGH - LOW </- 0.004 INCHES					
PREPARED BY :		MARK CATON			DATE:	3/2/01

		CHEROKEE INSTRUMENTS				
C # 1612	PM10	NOZZLE CALIBRATION SHEET				
DATE	NOZZLE ID#	NOZZLE DIAMETER, DN (INCHES)				
		<1>	<2>	<3>	HI-LO	AVG
8/7/01	1J	0.132	0.133	0.132	0.001	0.132
8/7/01	2J	0.146	0.147	0.146	0.001	0.146
8/7/01	3J	0.167	0.167	0.166	0.001	0.167
8/7/01	4J	0.175	0.176	0.176	0.001	0.176
8/7/01	5J	0.195	0.194	0.195	0.001	0.195
8/7/01	6J	0.213	0.213	0.213	0.000	0.213
8/7/01	7J	0.233	0.233	0.233	0.000	0.233
8/7/01	8J	0.258	0.259	0.258	0.001	0.258
8/7/01	9J	0.299	0.299	0.298	0.001	0.299
8/7/01	10J	0.340	0.340	0.340	0.000	0.340
8/7/01	11J	0.390	0.391	0.390	0.001	0.390
QA/QC	CHECK					
YES	EACH DIAMETER MEASURED TO WITHIN =/- 0.001 INCHES					
YES	HIGH - LOW </- 0.004 INCHES					
PREPARED BY :	MARK CATON				DATE:	8/7/01

		CHEROKEE INSTRUMENTS					
C#2296	PM10	NOZZLE CALIBRATION SHEET					
DATE	NOZZLE ID#		NOZZLE DIAMETER, DN (INCHES)				
		<1>	<2>	<3>	HI-LO	AVG	
5/27/01	K-1	0.133	0.133	0.133	0.000	0.133	
5/27/01	K-2	0.146	0.146	0.146	0.000	0.146	
5/27/01	K-3	0.162	0.162	0.162	0.000	0.162	
5/27/01	K-4	0.182	0.182	0.182	0.000	0.182	
5/27/01	K-5	0.195	0.195	0.195	0.000	0.195	
5/27/01	K-6	0.211	0.211	0.211	0.000	0.211	
5/27/01	K-7	0.234	0.234	0.234	0.000	0.234	
5/27/01	K-8	0.268	0.268	0.268	0.000	0.268	
5/27/01	K-9	0.301	0.302	0.301	0.001	0.301	
5/27/01	K-10	0.342	0.342	0.342	0.000	0.342	
5/27/01	K-11	0.393	0.392	0.393	0.001	0.393	
QA/QC	CHECK						
X	EACH DIAMETER MEASURED TO WITHIN =/- 0.001 INCHES						
X	HIGH - LOW </- 0.004 INCHES						
PREPARED BY :		MARK CATON			DATE:	,5-27-01	

APPENDIX D

Field Data Sheets

Method 1 - Air Control Techniques, P.C.

Date 7/16/01

Client	PMD
Job #	
Plant Name	Polar
City	Wellsville
State	Ohio
Sampling Location	RW Cyclone Outlet

No. of Ports Available	2
No. of Ports Used	2
Port Inside Diameter, Inches	3
Distance From Far Wall To Outside Of Port, Inches	20"
Nipple Length And/Or Wall Thickness, Inches	4"
Depth Of Stack Or Duct, Inches	16"
Stack Or Duct Width (if rectangular), Inches	—
Equiv. Diameter = 2DW/(D+W), Inches	16"
Stack/Duct Area, Square Inches ($\pi \times R^2$ or L x W)	

	Upstream	Downstream
Distance to Flow Disturbances	27"	18"
Diameters	1.69	13.5

Note: If more than 8 and 2 diamteters and if duct dia. is less than 24" use 8 or 9 points.

Diameters

Velocity	UP	Down	Particulate
12	8	2	12
12	7	1.75	12
12	6	1.5	16
16	5	1.25	20
16	2	0.5	24 or 25

Point Location Data

M29 Cyclonic

Point	% of Duct Depth	Distance From Inside Wall	Distance From Outside of Port
1	2.1	1.0	5.0
2	6.7	1.1	5.1
3	11.8	1.89	5.89
4	17.7	2.83	6.83
5	25.0	4.0	8.0
6	35.6	5.70	9.70
7	64.4	10.30	14.30
8	75.0	12.0	16.0
9	82.3	13.17	17.17
10	88.2	14.11	18.11
11	93.3	14.93	18.93
12	97.9	15.0	19.0
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.6	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.6	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Location of Points in Rectangular Stacks or Ducts

	2	3	4	5	6	7	8	9	10	11	12
1	25	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75	50	37.5	30.0	25	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50	43.8	28.9	35.0	31.8	29.2
5				90.0	75	64.3	56.3	50	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

Method 1 - Air Control Techniques, P.C.

Date 7/16/01

Client	PMD
Job #	642
Plant Name	Polar Minerals
State	OH
City	Wellsville
Sampling Location	Roller Mill Duct

No. of Ports Available	2
No. of Ports Used	2
Port Inside Diameter, Inches	3"
Distance From Far Wall To Outside Of Port, Inches	16"
Nipple Length And/Or Wall Thickness, Inches	0"
Depth Of Stack Or Duct, Inches	16"
Stack Or Duct Width (if rectangular), Inches	N/A
Equiv. Diameter = 2DW/(D+W), Inches	N/A
Stack/Duct Area, Square Inches ($\pi \times R^2$ or L x W)	201.062

	Upstream	Downstream
Distance to Flow Disturbances	27"	252"
Diameters	1.69	15.75

Note: If more than 8 and 2 diamteters and if duct dia. is less than 24" use 8 or 9 points.

Diameters

Velocity	UP	Down	Particulate
12	8	2	12
12	7	1.75	12
12	6	1.5	16
16	5	1.25	20
16	2	0.5	24 or 25

Point Location Data

Point	% of Duct Depth	Distance From Inside Wall	Distance From Outside of Port
1	4.4	0.697	1
2	14.6	2.343	2 3/8
3	29.6	4.734	4 3/4
4	70.4	11.266	11 1/4
5	85.4	13.657	13 5/8
6	95.6	15.303	15
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

M201B ONLY 12

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.6	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.6	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Location of Points in Rectangular Stacks or Ducts

	2	3	4	5	6	7	8	9	10	11	12
1	25	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75	50	37.5	30.0	25	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50	43.8	28.9	35.0	31.8	29.2
5				90.0	75	64.3	56.3	50	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

PRELIMINARY INFORMATION

Plant Name	Polar	Date	7/16/01
City, State	Wellsville, Ohio	Project #	642
Personnel	TEH	Pitot Identification	3
Test Location	Roller Mill	Pitot Coefficient (Cp)	0.84

Stack Dimensions			Pressures		
Diameter of Stack (D)	16"	in	Barometric Pressure (Pb)	29.	in Hg
Width of Stack (W)	—	in	Static Pressure (Pg)	+0.6	in H_2O
Area of Stack (As)	201.062	ft^2	Absolute Stack Pressure (Ps)		in Hg

Stack Gas Composition				
Carbon Dioxide (%CO_2)	0	Moisture Content (Bws)	5	%
Oxygen (%O_2)	20.75	Dry Molecular Weight (Md)		lb/lb-mole
Nitrogen Concentration (%N_2)		Wet Molecular Weight (Ms)		lb/lb-mole

PRELIMINARY TRAVERSE

Pitot Tube Leak Checks: A ✓@ 7" B ✓@5"

Start 1708

Port	Point	Angle, °	Δp, in H_2O	Temp. °F	ft/sec
A	1	2	2.30	161	
	2	0	2.70	162	
	3	0	2.40	162	
	4	1	2.20	162	
	5	0	2.10	162	
	6	0	1.80	162	
	7	0	1.30	162	
	8	3	1.10	162	
	9	0	0.88	162	
	10	0	0.70	162	
	11	-7	0.73	162	
	12	-10	0.70	162	
B	1	-1	3.60	162	
	2	-4	3.7	162	
	3	0	3.5	162	
	4	0	3.6	162	
	5	0	3.2	162	
	6	0	2.2	162	
	7	0	0.90	162	
	8	1	0.75	162	
	9	2	0.70	162	
	10	2	0.65	162	
End	11	0	0.70	162	
	12	5	0.70	162	

Average Angle, Degrees	1.58
Average Velocity Pressure	1.629
Average Gas Temperature (°F)	162
Average Stack Gas Velocity (ft/sec)	79.47
Actual Cubic Feet per minute (ACFM)	6,658
Dry Standard Cubic Feet per Minute (DSCFM)	5247

Run # 1

PRELIMINARY INFORMATION

Plant Name	Polar Minerals	Date	7/17/01
City, State	Wellsville, Ohio	Project #	642
Personnel	TEH, SH	Pitot Identification	3
Test Location	Roller Mill	Pitot Coefficient (Cp)	0.84

Stack Dimensions			Pressures		
Diameter of Stack (D)	16"	in	Barometric Pressure (Pb)	29.4	in Hg
Width of Stack (W)		in	Static Pressure (Pg)	+0.4	in H_2O
Area of Stack (As)		ft^2	Absolute Stack Pressure (Ps)		in Hg

Stack Gas Composition			
Carbon Dioxide (%CO_2)	0	Moisture Content (Bws)	%
Oxygen (%O_2)	20.9	Dry Molecular Weight (Md)	lb/lb-mole
Nitrogen Concentration (%N_2)	79.1	Wet Molecular Weight (Ms)	lb/lb-mole

PRELIMINARY TRAVERSE

Pitot Tube Leak Checks: A | B

Port	Point	Angle, °	Δp, in H_2O	Temp. °F	ft/sec
Start 845 A	1		1.40	170	
	2		1.40	172	
	3		1.00	172	
	4		0.65	173	
	5		0.50	173	
	6		0.45	172	
B	1		3.30	176	
	2		3.60	176	
	3		2.40	176	
	4		0.70	176	
	5		0.55	176	
	6		0.50	176	
End 0900					

Average Angle, Degrees	—
Average Velocity Pressure	1.269
Average Gas Temperature (°F)	174
Average Stack Gas Velocity (ft/sec)	
Actual Cubic Feet per minute (ACFM)	
Dry Standard Cubic Feet per Minute (DSCFM)	

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	RM-M201B-1
Condition	Normal

IDENTIFICATION INFORMATION

Plant Name	Polar Minerals
City	Wellsville,
State	Ohio
Source Number	1
Sampling Location	Roller Mill
Test Personnel	TTB, TEH, SH
Date	7/17/01
Start	0911
Stop	1115
Meterbox ID	702233
ΔH @	1.7110
Gamma, γ	1.002
Nozzle ID	1814-2
Nozzle Diameter	0.145
Orsat/Fyrite	Fyrite

Filter ID	Tare
SF47-232	0.1131

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.00	0.019	10

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@5"	0@3"
Pitot Tube Posttest Leak Check	0@6"	0@5"

Barometric Pressure, In.,Hg.	29.4	Static Pressure, In. W.C.	+0.4

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	36.4	Moisture, %	3.603
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.45

Sampling Information / Orifice

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (In.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, In. W.C.	Target Orifice Delta H, In. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	10.84	0	645.00	1.40	87	170	1	60	0.49				
	2	10.84	10:50	649.43	1.40	96	172	1	60					
	3	9.16	21:41	653.85	1.0	99	172	1	62					
	4	7.39	30:50	657.59	0.65	99	173	1	63					
	5	6.48	38:14	660.64	0.50	102	173	1	63					
	6	6.15	44.42	663.33	0.45	102	172	1	64					
B	1	16.64	50:51	665.87	3.30	100	176	1	64					
	2	17.38	1:07:29	672.76	3.60	104	176	1	55					
	3	14.19	1:24:52	679.98	2.40	106	176	1	56					
	4	7.66	1:39:04	685.90	0.70	106	176	1	57					
	5	6.79	1:46:44	689.06	0.55	105	176	1	57					
	6	6.48	1:53:31	691.75	0.50	105	176	1	57					
Total Run Time			2:00:00	694.4										
Total Volume, ACF				49.400										
Averages					1.191576	100.9	174.0			0.49		103.1	10.70	2.41
					in. H2O	°F	°F			in H2O		%	microns	

Run	RM-M201B-1

PRELIMINARY INFORMATION

Plant Name	Polar Metals	Date	7/17/01
City, State	Wellsville, NH	Project #	1042
Personnel		Pitot Identification	PTUA
Test Location		Pitot Coefficient (Cp)	0.84

Stack Dimensions			Pressures		
Diameter of Stack (D)	16	in	Barometric Pressure (Pb)	27.4	in Hg
Width of Stack (W)	—	in	Static Pressure (Pg)	+.4	in H_2O
Area of Stack (As)	201.062	ft^2	Absolute Stack Pressure (Ps)		in Hg

Stack Gas Composition				
Carbon Dioxide (%CO_2)	0	Moisture Content (Bws)		%
Oxygen (%O_2)	20.9	Dry Molecular Weight (Md)		lb/lb-mole
Nitrogen Concentration (%N_2)	79.1	Wet Molecular Weight (Ms)		lb/lb-mole

Run #2

PRELIMINARY TRAVERSE

Pitot Tube Leak Checks? A B

	Port	Point	~~Angle,°~~	~~Δp, in H_2O~~	Temp. °F	ft/sec
Start 1125	A	1	2.0		190	
		2	1.40		196	
		3	1.00		194	
		4	0.65		195	
		5	0.40		196	
		6	0.40		194	
	B	1	3.80		190	
		2	3.80		185	
		3	2.40		182	
		4	0.50		175	
		5	0.50		173	
		6	0.55		175	
End						

Average Angle, Degrees 1.22893

Average Velocity Pressure

Average Gas Temperature (°F) 189

Average Stack Gas Velocity (ft/sec)

Actual Cubic Feet per minute (ACFM)

Dry Standard Cubic Feet per Minute (DSCFM)

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	RM-M201B-2
Condition	Normal

IDENTIFICATION INFORMATION

Plant Name	Polar Minerals
City	Wellsville
State	Ohio
Source Number	1
Sampling Location	Roller Mill
Test Personnel	TEH, SH
Date	7/17/01
Start	1310
Stop	1520
Meterbox ID	702233
ΔH @	1.711
Gamma, γ	1.002
Nozzle ID	2D
Nozzle Diameter	0.148
Orsat/Fyrite	—

Filter ID	Tare
SF47-233	0.1134

C 1813

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.00		8

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0 @ 6"	0 @ 4"
Pitot Tube Posttest Leak Check		

Barometric Pressure, In.,Hg.	29.4	Static Pressure, In. W.C.	+0.40

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	36.5	Moisture, %	3.055
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.50

Traverse Information

Cyclone Data

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (In.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, In. W.C.	Target Orifice Delta H, In. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	12.96	0	695.30	2.00	98	190	1	60	0.46				
	2	10.84	12:57	700.48	1.40	102	196	1	60	0.46				
	3	9.16	23:48	704.85	1.00	104	194	1	61	0.46				
	4	7.39	32:57	708.58	0.65	105	195	1	61	0.46				
	5	5.79	40:20	711.48	0.40	106	195	1	57	0.46				
	6	5.79	46:08	713.94	0.40	106	194	1	55	0.46				
B	1	17.86	51:56	716.30	3.80	102	190	1	61	0.46				
	2	17.86	1:09:47	723.56	3.80	105	185	1	56	0.46				
	3	14.19	1:27:39	730.77	2.40	100	182	1	57	0.46				
	4	6.48	1:41:50	736.56	0.50	104	175	1	56	0.46				
	5	6.48	1:48:19	739.19	0.50	104	173	1	57	0.46				
	6	6.79	1:54:48	741.84	0.55	104	175	1	57	0.46				
Total Run Time			2:01:35	744.613										
Total Volume, ACF				49.313										
Averages					1.223243	103.3	187							
					in. H2O	°F	°F							

046	
in H2O	

96.4	10.91	2.50
%	microns	

Run	

101

Run # 3

PRELIMINARY INFORMATION

Plant Name	Polar Minerals	Date	7/17/01
City, State	Wellsville, Ohio	Project #	642
Personnel	TEH, SH	Pitot Identification	3
Test Location	Roller Mill	Pitot Coefficient (Cp)	0.84

Stack Dimensions			Pressures		
Diameter of Stack (D)	116"	in	Barometric Pressure (Pb)	29.4	in Hg
Width of Stack (W)	—	in	Static Pressure (Pg)	+	in H_2O
Area of Stack (As)	201.2	ft^2	Absolute Stack Pressure (Ps)		in Hg

Stack Gas Composition				
Carbon Dioxide (%CO_2)	0	Moisture Content (Bws)		%
Oxygen (%O_2)	20.9	Dry Molecular Weight (Md)		lb/lb-mole
Nitrogen Concentration (%N_2)	79.1	Wet Molecular Weight (Ms)		lb/lb-mole

PRELIMINARY TRAVERSE

Pitot Tube Leak Checks			A	B	
Port	Point	Angle, °	Δp, in H_2O	Temp. °F	ft/sec
Start 1530 A	1		~~1.70~~ 2.0	150	
	2		1.60	150	
	3		1.10	150	
	4		0.70	150	
	5		0.55	149	
	6		0.50	148	
B	1		4.10	151	
	2		3.70	151	
	3		2.50	151	
	4		0.75	150	
	5		0.60	150	
	6		0.55	149	
End					

Average Angle, Degrees	
Average Velocity Pressure	1.345
Average Gas Temperature (°F)	149.9
Average Stack Gas Velocity (ft/sec)	
Actual Cubic Feet per minute (ACFM)	
Dry Standard Cubic Feet per Minute (DSCFM)	

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	RM-M201B-3
Condition	Normal

IDENTIFICATION INFORMATION

Plant Name	Polar Minerals
City	Wellsville
State	Ohio
Source Number	1
Sampling Location	Roller Mill
Test Personnel	TTB, JEH, SH
Date	7/17/01
Start	1549
Stop	1755
Meterbox ID	702233
ΔH @	1.711
Gamma, γ	1.002
Nozzle ID	1814-2
Nozzle Diameter	0.145
Orsat/Fyrite	Fyrite

Filter ID	Tare
SR47-235	0.1117

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.00		10

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@8"	0@6"
Pitot Tube Posttest Leak Check	0@7"	0@5"

Barometric Pressure, In.,Hg.	29.4	Static Pressure, In. W.C.	+0.40

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	36.9	Moisture, %	3.327
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.48

Sampling Information / CALCULATIONS

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (in.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	12.19	0	746.100	2.0	100	150	1	59	0.56				
	2	11.44	12:47	751.09	1.6	103	150	1	52	0.56				
	3	9.48	24:13	756.09	1.1	103	150	1	52	0.56				
	4	7.56	33:42	760.25	0.70	103	150	1	52	0.56				
	5	6.71	41:16	764.02	0.55	104	149	1	53	0.56				
	6	6.39	47:59	767.58	0.50	104	148	1	53	0.56				
B	1	18.31	54:22	769.51	4.1	99	151	1	56	0.56				
	2	17.39	1:12:41	777.35	3.7	103	151	1	53	0.56				
	3	14.30	1:30:04	785.0	2.5	103	151	1	54	0.56				
	4	7.83	1:44:22	791.26	0.75	102	150	1	55	0.56				
	5	7.00	1:52:12	794.79	0.60	102	150	1	55	0.56				
	6	6.71	1:59:12	797.69	0.55	101	149	1	55	0.56				
Total Run Time			2:05:54	860.615										
Total Volume, ACF				54.515										
Averages					1.346583 in. H2O	102.3 °F	149.9 °F			0.56 in H2O		99.6 %	10.35 microns	2.25 microns

Run	RM-M201B-3

Method 4 - Air Control Techniques, P.C.

Date 7/16/01

Identification Information

Client	PMD	Job	642
Plant Name	Polar Minerals	Process	Roller Mill
City	Wellsville, OH	State	

Sampling Information

Run Number				Balance Number	✓
Sampling Date				Balance Type	E-1
Analysit Date				Balance Level	✓
Personnel				Recovery Area	✓

Location Moisture Data

	RM-M201B-1	2	3
Run Number			
Impinger 1			
Final Weight, grams/mls	745.3	784.2	770.5
Initial Weight, grams/mls	715.8	763.0	745.3
Condensed Water, grams	29.5	21.2	25.2
Filter #	SF47-232	233	234
	0.1131	0.1134	0.1129
Impinger 2			
Final Weight, grams/mls	725.4	736.9	747.0
Initial Weight, grams/mls	725.3	736.0	725.4
Condensed Water, grams	0.1	.9	1.6
Impinger 3			
Final Weight, grams/mls	616.8	600.3	617.5
Initial Weight, grams/mls	616.8	599.8	616.8
Condensed Water, grams	0.0	.5	0.7
Condensed Water, grams			
Silica Gel			
Final Weight, grams	782.7	778.6	792.1
Initial Weight, grams	775.9	739.7	782.7
Adsorbed Water, grams	6.8	7.9	9.4
Adsorbed Water, grams			
Total Water, grams	36.4	30.5	36.9

Vm(std) = Volume of gas sampled at standard conditions (dscf)
Vm(std) = ((Gamma * 17.64 * Vm * (Pbar + (Δ H / 13.6))) / (Tm + 460)
Vwc(std) = volume of water vapor at standard conditions (scf)
Vwc(std) = (0.04707) * (volume of water collected (mls))
Bws = Mole fraction of water vapor
Bws = Vwc(std) / (Vm(std) + Vwc(std))
Percent Moisture = 100 * Bws

Method 1 - Air Control Techniques, P.C.

Date 8/13/01

Client	Specialty Minerals
Job #	642
Plant Name	Specialty Minerals
State	MA
City	North Adams
Sampling Location	Product Silo

No. of Ports Available	2
No. of Ports Used	2
Port Inside Diameter, Inches	4"
Distance From Far Wall To Outside Of Port, Inches	12¼"
Nipple Length And/Or Wall Thickness, Inches	0
Depth Of Stack Or Duct, Inches	12¼"
Stack Or Duct Width (if rectangular), Inches	—
Equiv. Diameter = 2DW/(D+W), Inches	—
Stack/Duct Area, Square Inches ($\pi \times R^2$ or L x W)	117.858

	Upstream	Downstream
Distance to Flow Disturbances	68"	12"
Diameters	5.55	0.98

Note: If more than 8 and 2 diameters and if duct dia. is less than 24" use 8 or 9 points.

Diameters

Velocity	UP	Down	Particulate
12	8	2	12
12	7	1.75	12
12	6	1.5	16
16	5	1.25	20
16	2	0.5	24 or 25

Point Location Data

Point	% of Duct Depth	Distance From Inside Wall	Distance From Outside of Port
1	4.4	1.0"	1.0"
2	14.6	1.79"	1.79"
3	29.6	3.63"	3.63"
4	70.4	8.62"	8.62"
5	85.4	10.46"	10.46"
6	95.6	11.0"	11.0"
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.6	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.6	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Location of Points in Rectangular Stacks or Ducts

	2	3	4	5	6	7	8	9	10	11	12
1	25	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75	50	37.5	30.0	25	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50	43.8	38.9	35.0	31.8	29.2
5				90.0	75	64.3	56.3	50	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

Method 2 - Air Control Techniques, P.C.

Date: 8/19/10

Identification Information

Client	PMD	Job	642
Plant Name	Specialty Minerals	Process	Product Silo
City	N. Adams	State	Ma

Sampling Location and Port Information

Unit #	Product Silo	Pitot ID	PHA
Sampling Location	11	Pitot Coeff. (Cp)	0.84
Measured Barometric, in. Hg	29.15	TC ID	TCH
O_2,%	20.9	Duct/Stack Dia., In.	12.25
CO_2,%	0		
H_2O,%	1.5	Stactic Pressure, in. WC	0.01

Leak Checks & Physical Condition

	Side A	Side B
Pre	✓	✓
Post	✓	✓

Measurement Data

Point	Angle	Δp, in. WC	Temp. °F
A-1	1	0.03	82
2	2	.04	↓
3	2	0.04	↓
4	1	0.04	↓
5	0	0.04	↓
6	1	0.04	↓
B-1	1	0.03	↓
2	1	0.03	↓
3	0	0.04	↓
4	0	0.04	↓
5	1	0.04	↓
6	2	0.04	↓
Average	1.00	0.038	82

SCFM (Qsd):
ACFM (Qaw):
Velocity, Ft/Sec:

Personnel:

Notes:

$V_s = 85.49 * C_p * ((\Delta P \text{ avg}) * (460 + t_s) / (P_s * M_s))^{0.5}$

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	SMI-201B-1
Condition	

IDENTIFICATION INFORMATION

Plant Name	Specialty Minerals
City	N. Adams
State	MA
Source Number	
Sampling Location	Product Silo
Test Personnel	TEH, SH
Date	8/14/01
Start	0835
Stop	1031
Meterbox ID	0011077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	84-10 (B-10)
Nozzle Diameter	0.346
Orsat/Fyrite	Fyrite

Filter ID	Tare
SF47-313	0.1626

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.005	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.000		10"

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@6"	0@3"
Pitot Tube Posttest Leak Check	0@8"	0@4"

Barometric Pressure, In.,Hg.	29.15	Static Pressure, In. W.C.	0.01

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	13.9	Moisture, %	1.535
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.67

Traverse Information / EPA Checks

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (in.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, In. W.C.	Target Orifice Delta H, In. W.C.	% iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	8.86	0	745.200	0.03	67	82	1	50	0.47				
	2	8.86	8:51	748.62	0.03	69	85	1	49	0.47				
	3	8.86	17:43	752.61	0.03	71	85	1	50	0.47				
	4	10.23	26:34	755.48	0.04	73	87	1	53	0.47				
	5	10.23	36:48	759.45	0.04	74	78	1	55	0.47				
	6	8.86	47:02	763.38	0.03	75	80	1	57	0.47				
B	1	10.23	55:53	766.82	0.04	78	80	1	59	0.47				
	2	10.23	1:06:07	770.78	0.04	79	80	1	60	0.47				
	3	10.23	1:16:21	774.78	0.04	81	79	1	61	0.47				
	4	8.86	1:26:34	778.77	0.03	83	74	1	60	0.47				
	5	7.23	1:35:26	782.25	0.02	84	84	1	60	0.47				
	6	8.86	1:42:40	785.15	0.03	84	88	1	61	0.47				
Total Run Time			1:51:31	788.567										
Total Volume, ACF				43.367										
Averages					0.033023	76.5	81.83			0.47				
					in. H2O	°F	°F			in H2O		%	microns	

Run: SMI-2018-1

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	SMI-M201B-2
Condition	

IDENTIFICATION INFORMATION

Plant Name	Specialty Minerals
City	N. Adams
State	MA
Source Number	
Sampling Location	Product Silo
Test Personnel	TEH, SH
Date	8/14/01
Start	1045
Stop	1246
Meterbox ID	0011077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	10D
Nozzle Diameter	0.341
Orsat/Fyrite	Fyrite

Filter ID	Tare
SF47-318	0.1134

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.001	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.001		4

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@7"	0@4"
Pitot Tube Posttest Leak Check		

Barometric Pressure, In.,Hg.	29.15	Static Pressure, In. W.C.	0.01

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	17.1	Moisture, %	1.799
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.64

Sampling Information

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (In.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, In. W.C.
A	1	11.01	0	788.80	0.04	85	89	1	60	0.48
	2	9.53	11:00	793.14	0.03	87	93	1	61	0.48
	3	9.53	20:32	796.93	0.03	89	98	1	63	0.48
	4	9.53	30:04	800.74	0.03	89	92	1	63	0.48
	5	11.01	39:36	804.52	0.04	91	94	1	64	0.48
	6	11.01	50:36	808.93	0.04	91	95	1	64	0.48
B	1	9.53	1:01:37	813.34	0.03	93	86	1	65	0.48
	2	11.01	1:11:09	817.17	0.04	93	84	1	62	0.48
	3	7.78	1:22:09	821.56	0.02	93	81	1	64	0.48
	4	9.53	1:29:56	824.68	0.03	93	80	1	64	0.48
	5	9.53	1:39:28	828.50	0.03	92	79	1	65	0.48
	6	7.78	1:49:00	832.35	0.02	92	79	1	65	0.48
Total Run Time			1:56:47	835.413						
Total Volume, ACF				46.613						
Averages					0.031272	90.7	87.5			0.48
					in. H2O	°F	°F			in H2O

QA/QC

Target Orifice Delta H, In. W.C.	% Iso	Run Cum. D50s, microns PM10	PM2.5
	%	microns	

Run	SMI-M201B-2

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	SMI-M201B-3
Condition	

IDENTIFICATION INFORMATION

Plant Name	Specialty Minerals
City	N Adams
State	MA
Source Number	
Sampling Location	Product Silo
Test Personnel	
Date	8/14/01
Start	1258
Stop	1617
Meterbox ID	0011077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	0.346 B-10
Nozzle Diameter	0.346
Orsat/Fyrite	Fyrite

Filter ID	Tare
SF47-315	0.1132

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.000	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.000		10"

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@7"	0@5"
Pitot Tube Posttest Leak Check	0@6"	0@3"

Barometric Pressure, In.,Hg. 29.15 Static Pressure, In. W.C. 0.01

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	18.7	Moisture, %	1.798
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.64

Sampling Information / Data

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (In.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, In. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	9.79	0	835.700	0.03	91	82	1	60	0.50				
	2	9.79	9:48	839.62	0.03	~~104~~ 90	104	1	54	0.50				
	3	8.00	19:35	843.56	0.02	90	102	1	55	0.50				
	4	9.79	27:35	846.81	0.03	83	83	1	61	0.50				
	5	11.31	37:23	850.69	0.04	83	85	1	58	0.50				
	6	11.31	48:41	855.20	0.04	83	84	1	59	0.50				
B	1	11.31	1:00:00	859.75	0.04	83	82	1	62	0.50				
	2	11.31	1:11:19	864.23	0.04	83	87	1	~~87~~ 60	0.50				
	3	11.31	1:22:37	868.74	0.04	86	87	1	60	0.50				
	4	11.31	1:33:56	873.25	0.04	84	83	1	61	0.50				
	5	11.31	1:45:14	877.77	0.04	84	80	1	61	0.50				
	6	9.79	1:56:33	882.35	0.03	85	81	1	62	0.50				
Total Run Time			2:06:21	886.214										
Total Volume, ACF				50.514										
Averages					0.035106 in. H2O	85.4 °F	86.67 °F			0.50 in H2O		97.2 %	10.81 microns	2.35 microns

106

stop 1326

1438 start

Run SMI-M201B-3

1326 Run stopped to Remove Material from Silo

Method 4 - Air Control Techniques, P.C.

Date 8/13/01

Identification Information

Client	NSRRA	Job	1042
Plant Name	Specialty Minerals	Process	Product Silo
City	North Adams, Mass	State	Ma

Sampling Information

Run Number				Balance Number	E-2
Sampling Date				Balance Type	Electronic
Analysit Date				Balance Level	✓
Personnel				Recovery Area	✓

Location Moisture Data

Run Number	Sm-m208-1	2	3
Impinger 1		756.8	
Final Weight, grams/mls	744.9	~~762.5~~	753.1
Initial Weight, grams/mls	738.7	753.3	744.9
Condensed Water, grams	6.2	3.5	8.2
Impinger 2	SF47-312	SF47-313	SF47-314
Final Weight, grams/mls	703.4	716.3	704.2
Initial Weight, grams/mls	703.8	716.1	703.4
Condensed Water, grams	-0.4	0.2	0.8
Impinger 3			
Final Weight, grams/mls	600.3	601.3	601.3
Initial Weight, grams/mls	599.3	598.3	600.3
Condensed Water, grams	1.0	3.0	1.0
Condensed Water, grams			
Silica Gel			
Final Weight, grams	811.0	790.0	819.7
Initial Weight, grams	803.9	779.6	811.0
Adsorbed Water, grams	7.1	10.4	8.7
Adsorbed Water, grams			
Total Water, grams	13.9	17.1	16.7

Vm(std) = Volume of gas sampled at standard conditions (dscf)
Vm(std) = ((Gamma * 17.64 * Vm * (Pbar + (Δ H / 13.6))) / (Tm + 460)
Vwc(std) = volume of water vapor at standard conditions (scf)
Vwc(std) = (0.04707) * (volume of water collected (mls))
Bws = Mole fraction of water vapor
Bws = Vwc(std) / (Vm(std) + Vwc(std))
Percent Moisture = 100 * Bws

Method 1 - Air Control Techniques, P.C.

Date 8/14/01

Client	NSSGA
Job #	142
Plant Name	Specialty Minerals
State	Ma
City	North Adams
Sampling Location	B15 ~~Cyclone~~ Classifier

No. of Ports Available	2
No. of Ports Used	2
Port Inside Diameter, Inches	5" ~~5 1/2" 6"~~
Distance From Far Wall To Outside Of Port, Inches	24 ~~24 1/2"~~
Nipple Length And/Or Wall Thickness, Inches	~~1/2"~~
Depth Of Stack Or Duct, Inches	24"
Stack Or Duct Width (if rectangular), Inches	24"
Equiv. Diameter = 2DW/(D+W), Inches	24
Stack/Duct Area, Square Inches	576
($\pi \times R^2$ or L x W)	

	Upstream	Downstream
Distance to Flow Disturbances	96"	60"
Diameters	4	2.5

Note: If more than 8 and 2 diameters and if duct dia. is less than 24" use 8 or 9 points.

Diameters

Velocity	UP	Down	Particulate
12	8	2	12
12	7	1.75	12
12	6	1.5	16
16	5	1.25	20
16	2	0.5	24 or 25

Point Location Data

Point	% of Duct Depth	Distance From Inside Wall	Distance From Outside of Port
1	12.5	3	3 1/4
2	37.5	9	9 1/4
3	62.5	15	15 1/4
4	87.5	21	21 1/4
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.6	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.6	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Location of Points in Rectangular Stacks or Ducts

	2	3	4	5	6	7	8	9	10	11	12
1	25	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75	50	37.5	30.0	25	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50	43.8	38.9	35.0	31.8	29.2
5				90.0	75	64.3	56.3	50	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

Method 2 - Air Control Techniques, P.C.

Date: 8/14/01

Identification Information

Client	PMD N536A	Job	642
Plant Name	Specialty Minerals	Process	Classifier
City	N. Adams	State	Ma

Sampling Location and Port Information

Unit #	Classifier B15	Pitot ID	P14A
Sampling Location	"	Pitot Coeff. (Cp)	0.84
Measured Barometric, in. Hg	29.3	TC ID	TC4
O_2,%	20.9	Duct/Stack Dia., In.	24x24"
CO_2,%	0		
H_2O,%	1.7	Stactic Pressure, in. WC	-0.01

Leak Checks & Physical Condition

	Side A	Side B
Pre	✓	✓
Post	✓	✓

Measurement Data

Point	Angle	Δp, in. WC	Temp. °F
A-1	0	0.02	102
2	0	0.02	102
3	0	0.02	102
4	0	0.02	102
		0.	
B-1	0	0.02	100
2	0	0.015	100
3	0	0.01	100
4	0	0.01	99
C1	0	0.01	96
2	0	0.01	96
3	0	0.005	96
4	0	0.005	95
Average	0	0.013	99.2

SCFM (Qsd)	
ACFM (Qaw)	
Velocity, Ft/Sec	.
Personnel	

Notes

$V_s = 85.49 * C_p * ((\Delta P \text{ avg}) * (460 + t_s) / (P_s * M_s))^{0.5}$

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	SM2-M201B-1
Condition	

IDENTIFICATION INFORMATION

Plant Name	Specialty Minerals
City	N. Adams
State	MA
Source Number	Classifier
Sampling Location	B15 Classifier
Test Personnel	TH, SH
Date	8/15/01
Start	1036
Stop	1242
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	~~C319~~
Nozzle Diameter	0.391
Orsat/Fyrite	Fyrite

Filter ID	Tare
SF42-36	0.1332

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.00		7"

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@8"	0@5"
Pitot Tube Posttest Leak Check	0@7"	0@3"

Barometric Pressure, In.,Hg.	29.3	Static Pressure, In. W.C.	-0.01

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	10.4	Moisture, %	1.041
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.72

Sampling Information / QA Checks

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (In.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, In. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	11.41	0	886.500	0.017	79	115	1	40	0.47				
	2	11.07	11:25	890.91	0.016	82	121	1	41	0.47				
	3	10.36	22:29	895.21	0.014	86	113	1	43	0.47				
	4	10.36	32:51	899.25	0.014	89	100	1	45	0.47				
B	1	9.98	43:12	903.32	0.013	93	110	1	47	0.47				
	2	8.75	53:11	907.28	0.010	93	127	1	46	0.47				
	3	7.83	1:01:56	910.75	0.008	94	105	1	48	0.47				
	4	7.83	1:09:45	913.88	0.008	94	100	1	49	0.47				
C	1	12.38	1:17:35	917.15	0.020	93	113	1	52	0.47				
	2	12.06	1:29:58	921.96	0.019	93	132	1	50	0.47				
	3	11.74	1:42:01	926.77	0.018	93	119	1	51	0.47				
	4	10.72	1:53:46	931.55	0.015	93	115	1	52	0.47				
Total Run Time			2:04:29	926.580										
Total Volume, ACF				50.080										
Averages					0.014049	90.2	115.5			0.47				
					in. H2O	°F	°F			in H2O		%	microns	

Run	

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	SM2-M201D-2
Condition	

IDENTIFICATION INFORMATION

Plant Name	Specialty Minerals
City	N. Adams
State	MA
Source Number	Classifier
Sampling Location	B15 Clarifier
Test Personnel	
Date	8/15/01
Start	1255
Stop	1445
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	
Nozzle Diameter	0.390
Orsat/Fyrite	Fyrite

Filter ID	Tare
SP473K	0.1146

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.000	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.000		7"

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@8"	0@4"
Pitot Tube Posttest Leak Check	0@6"	0@3"

Barometric Pressure, In.,Hg.	29.3	Static Pressure, In. W.C.	-0.01

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	10.5	Moisture, %	1
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	29.41

Sampling Information

Comments

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (in.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	7.06	0	936.20	0.007	91	134	1	65	0.49				
	2	6.54	7:03	939.00	0.006	92	129	1	64	0.49				
	3	5.34	13:36	941.63	0.004	92	122	1	62	0.49				
	4	5.97	18:56	943.76	0.005	92	115	1	61	0.49				
B	1	10.33	24:54	946.17	0.015	92	122	1	61	0.49				
	2	9.62	35:13	950.34	0.013	92	138	1	60	0.49				
	3	8.44	44:50	954.22	0.010	92	127	1	62	0.49				
	4	8.44	53:17	957.64	0.010	92	122	1	64	0.49				
C	1	11.32	1:01:43	961.06	0.018	93	130	1	61	0.49				
	2	11.63	1:13:02	965.52	0.019	93	145	1	62	0.49				
	3	10.33	1:24:40	970.08	0.015	93	134	1	62	0.49				
	4	9.98	1:35:01	974.45	0.014	94	125	1	63	0.49				
Total Run Time			1:44:59	978.44										
Total Volume, ACF				42.240										
Averages					0.010563	92.3	128.6			0.49				
					in. H2O	°F	°F			in H2O				

%	microns	

Run	

11-4

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	SM2-M201B-3
Condition	

IDENTIFICATION INFORMATION

Plant Name	Specialty Minerals
City	N. Adams
State	MA
Source Number	Classifier
Sampling Location	B15 Clarifier
Test Personnel	TEH
Date	8/15/01
Start	1452
Stop	1658
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	
Nozzle Diameter	0.391
Orsat/Fyrite	Fyrite

Filter ID	Tare
SM2F317	0.1139

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.000	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.000		6

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@6"	0@3"
Pitot Tube Posttest Leak Check		

Barometric Pressure, In.,Hg.	29.30	Static Pressure, In. W.C.	-0.01

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	11.8	Moisture, %	1.140
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.71

Sampling Information / QA Check

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (In.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	12.94	0	980.90	0.018	94	138	1	63	0.50				
	2	13.29	12:56	986.17	0.019	95	149	1	59	0.50				
	3	12.57	26:14	991.65	0.017	95	130	1	61	0.50				
	4	11.81	38:48	996.71	0.015	95	125	1	63	0.50				
B	1	12.20	50.37	1001.58	0.016	94	139	1	63	0.50				
	2	10.50	1:02:49	1006.57	0.013	94	150	1	66	0.50				
	3	10.11	1:13:43	1011.15	0.011	93	132	1	66	0.50				
	4	9.64	123:55	1015.18	0.010	93	130	1	63	0.50				
C	1	9.64	1:33:34	1019.17	0.010	93	138	1	63	0.50				
	2	7.47	1:43:12	1022.12	0.006	94	145	1	62	0.50				
	3	7.47	1:50:41	1026.17	0.006	93	130	1	62	0.50				
	4	6.82	1:58.09	1029.23	0.005	93	127	1	62	0.50				
Total Run Time			2:04:58	1032.02										
Total Volume, ACF				51.120										
Averages					0.012405 in. H2O	93.8 °F	136.1 °F			0.50 in H2O		137.7 %	10.83 microns	2.41 microns

Run	

Method 4 - Air Control Techniques, P.C.

Date 8/14/01

Identification Information

Client	NSSEA	Job	642
Plant Name	Specialty Minerals	Process	[illegible]
City	North Adams, Mass	State	Ma

Clarifier Classifi

Sampling Information

Run Number				Balance Number	F-2
Sampling Date				Balance Type	Electronic
Analysit Date				Balance Level	✓
Personnel				Recovery Area	

Location Moisture Data

Run Number	SM2-M201B-1	2	3
Impinger 1			
Final Weight, grams/mls	761.9	754.0	766.6
Initial Weight, grams/mls	756.8	753.1	761.9
Condensed Water, grams	5.1	0.9	4.7
Impinger 2	SF47315	SF47-316	SF47-317
Final Weight, grams/mls	716.3	704.5	716.4
Initial Weight, grams/mls	716.3	704.2	716.3
Condensed Water, grams	0.0	0.3	0.1
Impinger 3			
Final Weight, grams/mls	600.9	601.8	601.7
Initial Weight, grams/mls	601.3	601.3	600.9
Condensed Water, grams	-0.4	0.5	0.8
Condensed Water, grams			
Silica Gel			
Final Weight, grams	795.7	818.5	801.9
Initial Weight, grams	790.0	819.7	795.7
Adsorbed Water, grams	5.7	8.8	6.2
Adsorbed Water, grams			
Total Water, grams	10.4	10.5	11.8

Vm(std) = Volume of gas sampled at standard conditions (dscf)
Vm(std) = ((Gamma * 17.64 * Vm * (Pbar + (Δ H / 13.6))) / (Tm + 460)
Vwc(std) = volume of water vapor at standard conditions (scf)
Vwc(std) = (0.04707) * (volume of water collected (mls))
Bws = Mole fraction of water vapor
Bws = Vwc(std) / (Vm(std) + Vwc(std))
Percent Moisture = 100 * Bws

Method 1 - Air Control Techniques, P.C.

Date 8/15/01

Client	NSSCA
Job #	642
Plant Name	Specialty Minerals
State	Ma
City	North Adams
Sampling Location	[illegible] Blo Raymond Mill

No. of Ports Available	3
No. of Ports Used	3
Port Inside Diameter, Inches	Slot
Distance From Far Wall To Outside Of Port, Inches	10 7/8"
Nipple Length And/Or Wall Thickness, Inches	—
Depth Of Stack Or Duct, Inches	10 7/8"
Stack Or Duct Width (if rectangular), Inches	12 1/2"
Equiv. Diameter = 2DW/(D+W), Inches 11.631"	11 5/8
Stack/Duct Area, Square Inches ($\pi \times R^2$ or L x W)	135.9375

	Upstream	Downstream
Distance to Flow Disturbances	60"	25"
Diameters	5.1586	2.1494

Note: If more than 8 and 2 diameters and if duct dia. is less than 24" use 8 or 9 points.

Diameters

Velocity	UP	Down	Particulate
12	8	2	12
12	7	1.75	12
12	6	1.5	16
16	5	1.25	20
16	2	0.5	24 or 25

Point Location Data

Point	% of Duct Depth	Distance From Inside Wall	Distance From Outside of Port
1	12.5	1.3594	1 3/8"
2	37.5	4.0781	4 1/8"
3	62.5	6.7969	6 3/4
4	87.5	9.5156	9 1/2
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.6	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.6	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Location of Points in Rectangular Stacks or Ducts

	2	3	4	5	6	7	8	9	10	11	12
1	25	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75	50	37.5	30.0	25	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50	43.8	38.9	35.0	31.8	29.2
5				90.0	75	64.3	56.3	50	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

PRELIMINARY INFORMATION

Plant Name	Specialty Minerals	Date	8/15/01
City, State	North Adams, Mass	Project #	642
Personnel	TFH 55H	Pitot Identification	PTHA
Test Location	B6 Raymond Mill	Pitot Coefficient (Cp)	0.84

Stack Dimensions			Pressures		
Diameter of Stack (D)	10 7/8	in	Barometric Pressure (Pb)	27.3	in Hg
Width of Stack (W)	12 1/2	in	Static Pressure (Pg)	0.25	in H_2O
Area of Stack (As)	0.9440	ft^2	Absolute Stack Pressure (Ps)	27.32	in Hg

Stack Gas Composition				
Carbon Dioxide (%CO_2)	0	Moisture Content (Bws)	3.5 1.2	%
Oxygen (%O_2)	20.9	Dry Molecular Weight (Md)	28.84	lb/lb-mole
Nitrogen Concentration (%N_2)	79.1	Wet Molecular Weight (Ms)	28.46	lb/lb-mole

PRELIMINARY TRAVERSE

B6

Pitot Tube Leak Checks			A	B	
Port	Point	Angle, °	Δp, in H_2O	Temp. °F	ft/sec
Start A	1	3	0.45	158	
	2	1	0.36	158	
	3	1	0.20	158	
	4	2	0.15	158	
B	1	2	0.40	158	
	2	3	0.35	158	
	3	3	0.30	158	
	4	1	0.25	158	
C	1	1	0.15	158	
	2	1	0.20	158	
	3	2	0.15	158	
	4	3	0.10	158	
End					

Average Angle, Degrees	1.92
Average Velocity Pressure	0.264
Average Gas Temperature (°F)	158
Average Stack Gas Velocity (ft/sec)	31.67
Actual Cubic Feet per minute (ACFM)	1,791
Dry Standard Cubic Feet per Minute (DSCFM)	1,481

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	SM3-M201B-1
Condition	

IDENTIFICATION INFORMATION

Plant Name	Specialty Minerals
City	N. Adams
State	MA
Source Number	B-6
Sampling Location	Raymond Mill
Test Personnel	TB, TH, SH
Date	8/16/01
Start	0800
Stop	1015
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	J6
Nozzle Diameter	0.213
Orsat/Fyrite	Fyrite

Filter ID	Tare
SF47-318	0.1138

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.000	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.000		7"

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@8"	0@6"
Pitot Tube Posttest Leak Check	0@7	0@3

Barometric Pressure, In.,Hg.	29.30	Static Pressure, In. W.C.	0.25

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	40.0	Moisture, %	3.599
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.45

Sampling Information

MP Worksheet

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (in.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (in.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	11.68	0	32.40	0.36	60	128	1	55	0.48				
	2	12.31	11:41	37.05	0.40	62	130	1	53					
	3	10.30	23:59	41.95	0.28	66	134	1	54					
	4	7.54	34:17	46.13	0.15	69	130	1	55					
B	1	13.06	41:49	49.13	0.45	71	140	1	55					
	2	13.48	54:53	54.31	0.48	73	143	1	56					
	3	10.66	1:08:21	59.61	0.30	75	140	1	57					
	4	8.02	1:19:01	63.83	0.17	76	138	1	58					
C	1	13.48	1:27:03	66.95	0.48	77	145	1	58					
	2	11.68	1:40:32	72.36	0.36	78	144	1	59					
	3	9.13	1:52:12	77.00	0.22	78	135	1	60					
	4	8.26	2:01:20	80.60	0.18	78	130	1	61					
Total Run Time			2:09:35	83.81										
Total Volume, ACF				51.410										
Averages					0.307906 in. H2O	71.9 °F	136.4 °F			0.48 in H2O		93.1 %	10.51 microns	2.30 microns

stop 0953
0958 Restart

Run	

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	SM3-M201B-2
Condition	

IDENTIFICATION INFORMATION

Plant Name	Specialty Minerals
City	N. Adams
State	MA
Source Number	B-6
Sampling Location	Raymond Mill
Test Personnel	TB, TH, SH
Date	8/16/01
Start	1021
Stop	1220
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	D6
Nozzle Diameter	0.216
Orsat/Fyrite	Fyrite

Filter ID	Tare
SR47-319	0.1136

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.000	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.000		7

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@7"	0@4"
Pitot Tube Posttest Leak Check		

Barometric Pressure, In.,Hg.	29.3	Static Pressure, In. W.C.	+.25

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	25.4	Moisture, %	~~3.34~~ 2.37
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	~~28.45~~ 28.54

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Sampling Information / QA Checks

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (In.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
C	1	12.35	0	84.00	0.47	78	145	1	65	0.48				
	2	10.81	12:21	89.02	0.36	79	148	1	63					
	3	9.54	23:10	92.95	0.28	79	144	1	63					
	4	7.65	32:42	96.88	0.18	80	143	1	63					
B	1	11.95	40:21	99.83	0.44	81	148	1	63					
	2	11.82	52:18	104.55	0.43	82	148	1	64					
	3	9.01	1:04:07	109.21	0.25	83	145	1	65					
	4	6.98	1:13:08	112.78	0.15	83	138	1	60					
A	1	~~8.86~~	1:20:06	115.54	0.26	84	150	1	57					
	2	10.51	1:28:38	119.17	0.34	85	148	1	60					
	3	8.45	1:39:48	123.31	0.22	86	144	1	60					
	4	6.74	1:48:16	126.64	0.14	86	146	1	61					
Total Run Time			1:55:00	129.31										
Total Volume, ACF				45.310										
Averages					0.298254	82.2	145.6			0.48		92.0	10.80	2.47
					in. H2O	°F	°F			in H2O		%	microns	

Run	

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	SM3-M201B-3
Condition	

IDENTIFICATION INFORMATION

Plant Name	Specialty Minerals
City	N. Adams
State	MA
Source Number	B-6
Sampling Location	Raymond Mill
Test Personnel	TB, TH, SH
Date	8/16/01
Start	1226
Stop	1424
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	J6
Nozzle Diameter	0.213
Orsat/Fyrite	Fyrite

Filter ID	Tare
SP47-320	0.1135

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.000	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.000		7

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@7"	0@5"
Pitot Tube Posttest Leak Check	0@8"	0@4"

Barometric Pressure, In.,Hg.	29.3	Static Pressure, In. W.C.	0.25

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	38.4	Moisture, %	4.089
CO_2 %	0	Md_run	28.89
O_2 %	20.9	Mw_run	28.39

TRAIN INFORMATION / Pitot Leaks

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (In.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, In. W.C.	Target Orifice Delta H, In. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	10.96	0	131.00	0.34	87	151	1	66	0.48				
	2	10.64	10:58	135.35	0.32	88	152	1	59					
	3	7.28	20:36	139.55	0.15	88	149	1	57					
	4	6.78	28:53	142.44	0.13	89	147	1	57					
B	1	12.04	35:40	145.15	0.41	89	153	1	56					
	2	12.89	47:42	149.93	0.40	89	153	1	57					
	3	7.52	59:36	154.62	0.16	89	148	1	58					
	4	6.24	1:07:07	157.86	0.11	91	144	1	59					
C	1	12.47	1:13:21	160.11	0.44	91	152	1	60					
	2	10.96	1:25:49	165.00	0.34	92	153	1	60					
	3	8.41	1:36:48	169.37	0.20	93	151	1	61					
	4	7.52	1:45:12	172.71	0.16	93	142	1	62	↓				
Total Run Time			1:52:43	175.68										
Total Volume, ACF				44.680										
Averages					0.258683 in. H2O	89.9 °F	149.6 °F			0.48 in H2O				

Run	

101.4 %	10.74	2.4 microns

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Method 4 - Air Control Techniques, P.C.

Date 8/15/01

Identification Information

Client	NSSCA	Job	642
Plant Name	Specialty Minerals	Process	Bc Raymond Mill
City	North Adams, Mass	State	MA

Sampling Information

Run Number				Balance Number	E-2
Sampling Date				Balance Type	Electronic
Analysit Date				Balance Level	✓
Personnel				Recovery Area	✓

Location Moisture Data

	SM3-M2018-1	2	3
Run Number			
Impinger 1			
Final Weight, grams/mls	785.2	786.6	811.9
Initial Weight, grams/mls	754.0	766.6	785.2
Condensed Water, grams	31.2	20.0	26.7
Impinger 2	SF47-318	SF47-319	SF47-320
Final Weight, grams/mls	705.6	716.9	708.4
Initial Weight, grams/mls	704.5	716.4	705.6
Condensed Water, grams	1.1	0.5	2.8
Impinger 3			
Final Weight, grams/mls	602.0	601.8	603.1
Initial Weight, grams/mls	601.8	601.7	602.0
Condensed Water, grams	0.2	0.1	1.1
Condensed Water, grams			
Silica Gel			
Final Weight, grams	836.0	807.2	831.5
Initial Weight, grams	828.5	801.9	823.7
Adsorbed Water, grams	7.5	5.3	7.8
Adsorbed Water, grams	40.0	25.9	38.4
Total Water, grams			

Vm(std) = Volume of gas sampled at standard conditions (dscf)
Vm(std) = ((Gamma * 17.64 * Vm * (Pbar + (Δ H / 13.6))) / (Tm + 460)
Vwc(std) = volume of water vapor at standard conditions (scf)
Vwc(std) = (0.04707) * (volume of water collected (mls))
Bws = Mole fraction of water vapor
Bws = Vwc(std) / (Vm(std) + Vwc(std))
Percent Moisture = 100 * Bws

Method 1 - Air Control Techniques, P.C.

Date 8/17/01

Client	NSSGA
Job #	642
Plant Name	OMYA
State	VT
City	Florence
Sampling Location	Flash Dryer #1

No. of Ports Available	2
No. of Ports Used	2
Port Inside Diameter, Inches	4"
Distance From Far Wall To Outside Of Port, Inches	34"
Nipple Length And/Or Wall Thickness, Inches	4"
Depth Of Stack Or Duct, Inches	30"
Stack Or Duct Width (if rectangular), Inches	—
Equiv. Diameter = 2DW/(D+W), Inches	—
Stack/Duct Area, Square Inches ($\pi \times R^2$ or L x W)	706.8583

	Upstream	Downstream
Distance to Flow Disturbances	126"	30"
Diameters	4.2	1

Note: If more than 8 and 2 diamteters and if duct dia. is less than 24" use 8 or 9 points.

Diameters

Velocity	UP	Down	Particulate
12	8	2	12
12	7	1.75	12
12	6	1.5	16
16	5	1.25	20
16	2	0.5	24 or 25

Point Location Data

Point	% of Duct Depth	Distance From Inside Wall	Distance From Outside of Port
1	4.4	1.307	5.307
2	14.6	4.393	8.393
3	29.6	8.876	12.876
4	70.4	21.124	25.124
5	85.4	25.607	29.607
6	95.6	28.693	32.693
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.6	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.6	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Location of Points in Rectangular Stacks or Ducts

	2	3	4	5	6	7	8	9	10	11	12
1	25	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75	50	37.5	30.0	25	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50	43.8	38.9	35.0	31.8	29.2
5				90.0	75	64.3	56.3	50	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

Method 2 - Air Control Techniques, P.C.

Date: 8/16/01

Identification Information

Client	NSSA PMD	Job	642
Plant Name	OMYA, INC	Process	Flash Dryer
City	Florence	State	VT

Sampling Location and Port Information

Unit #	Flash Dryer #1	Pitot ID	PTYA
Sampling Location	FD1	Pitot Coeff. (Cp)	0.84
Measured Barometric, in. Hg	29.4	TC ID	TC4
O_2,%	19.0	Duct/Stack Dia., In.	30"
CO_2,%	1.0		
H_2O,%	22	Stactic Pressure, in. WC	-0.25

Leak Checks & Physical Condition

	Side A	Side B
Pre	✓	✓
Post	✓	✓

Measurement Data

Point	Angle	Δp, in. WC	Temp. °F
A-1	3	0.75	296
2	5	0.92	296
3	4	0.98	298
4	2	1.2	300
5	5	1.25	294
6	4	0.75	295
B-1	5	1.2	298
2	6	1.2	299
3	3	1.3	297
4	2	0.85	291
5	6	0.80	281
6	8	0.80	300
Average	4.22	0.989	295.4

SCFM (Qsd):
ACFM (Qaw):
Velocity, Ft/Sec:

Personnel:

Notes:

$V_s = 85.49 * C_p * ((\Delta P \text{ avg}) * (460 + t_s) / (P_s * M_s))^{0.5}$

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	OI-M201B-1
Condition	

IDENTIFICATION INFORMATION

Plant Name	OMYA Inc
City	Florence
State	VT
Source Number	
Sampling Location	Flash Dryer #1
Test Personnel	TB, TH, SH
Date	8/17/01
Start	0908
Stop	1118
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	3DJ4
Nozzle Diameter	0.176 (0.~~186~~)
Orsat/Fyrite	Fyrite

Filter ID	Tare
SR47-321	0.1143

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.00		8"

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@8	0@4"
Pitot Tube Posttest Leak Check	0@6"	0@3"

Barometric Pressure, In.,Hg.	29.4	Static Pressure, In. W.C.	-0.25

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	233.7	Moisture, %	21.906
CO_2 %	1.0	Md_run	28.92
O_2 %	19.0	Mw_run	26.53

Sampling Information / QA Checks

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (In.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, In. W.C.	Target Orifice Delta H, In. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	8.11	0	176.10	0.65	70	294	1	62	0.33				
	2	8.71	8:06	178.79	0.75	71	297	2	60					
	3	9.54	16:48	181.48	0.90	71	298	2	61					
	4	11.01	26:21	184.69	1.20	73	300	2	60					
	5	10.54	37:22	188.62	1.10	74	298	2	61					
	6	11.01	47:55	191.92	1.20	75	297	2	57					
B	1	12.72	58:55	195.69	1.60	75	297	2	58					
	2	12.72	1:11:38	200.12	1.60	75	298	2	56					
	3	12.31	1:24:21	204.45	1.50	76	298	2	56					
	4	8.99	1:36:40	208.75	0.80	76	297	2	57					
	5	7.46	1:45:39	211.65	0.55	76	294	2	58					
	6	6.03	1:53:07	214.01	0.36	76	290	2	58					
Total Run Time			1:59:09	216.11										
Total Volume, ACF				40.010	0.975362									
Averages				~~1.046703~~		74.0	296.5			0.33		86.9	10.05	2.33
						in. H2O	°F	°F		in H2O		%	microns	

Run	

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	OT-M201B-2
Condition	

IDENTIFICATION INFORMATION

Plant Name	OMYA Inc
City	Florence
State	VT
Source Number	
Sampling Location	Flash Dryer #1
Test Personnel	TB, TH, SH
Date	8/17/01
Start	1131
Stop	1332
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	DH 90
Nozzle Diameter	0.179
Orsat/Fyrite	Fyrite

Filter ID	Tare
5F47-322	0.1143

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.00		7"

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@6"	0@3"
Pitot Tube Posttest Leak Check	0@7"	0@4"

Barometric Pressure, In.,Hg.	29.4	Static Pressure, In. W.C.	-0.25

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	232.1	Moisture, %	22.070
CO_2 %	1	Md_run	28.94
O_2 %	19.5	Mw_run	26.53

Sampling Information / DP Checks

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (in.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (in.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
AB	1	12.81	0	216.60	1.60	75	297	1	62	0.34				
	2	12.81	12:48	220.81	1.60	75	297	2	56					
	3	11.98	25:37	224.94	1.40	76	301	2	56					
	4	9.06	37:36	228.94	0.80	76	298	2	55					
	5	7.84	46:39	232.01	0.60	76	295	2	55					
	6	6.56	54:29	234.55	0.42	76	282	2	57					
AB	1	8.47	1:01:03	236.71	0.70	76	292	2	57					
	2	8.77	1:09:31	239.43	0.75	76	295	2	57					
	3	9.34	1:18:18	242.27	0.85	76	296	2	56					
	4	11.09	1:27:38	245.34	1.20	77	298	2	56					
	5	11.09	1:38:44	249.12	1.20	77	296	2	57					
	6	9.28	1:49:49	252.94	0.84	77	285	2	58					
Total Run Time			1:59:06	256.11										
Total Volume, ACF				39.510	0960756									
Averages				~~0.912756~~	1.161	76.1	294.3			0.34		83.3	10.15	2.37
					in. H2O	°F	°F			in H2O		%	microns	

Run	OT-M201B-2

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Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	OI-M201B-3
Condition	

IDENTIFICATION INFORMATION

Plant Name	OMYA Inc.
City	Florence
State	VT
Source Number	
Sampling Location	Flash Dryer #1
Test Personnel	TB, TH, SH
Date	8/17/01
Start	1340
Stop	1543
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	J4
Nozzle Diameter	0.176
Orsat/Fyrite	Fyrite

Filter ID	Tare
SF47-323	0.1144

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.000	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.000		8"

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@8"	0@4"
Pitot Tube Posttest Leak Check	0@7"	0@3"

Barometric Pressure, In.,Hg.	29.40	Static Pressure, In. W.C.	-0.25

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	231.2	Moisture, %	21.863
CO_2 %	2	Md_run	29.08
O_2 %	19	Mw_run	26.16

Sampling Information / Calculated

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (in.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (in.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
	1	8.23	0	256.30	0.65	76	291	1	62	0.33				
	2	8.66	8:13	259.01	0.72	77	296	1	56	0.33				
	3	9.13	16:53	261.85	0.80	78	295	1	57					
	4	11.63	26:00	265.05	1.30	79	295	1	57					
	5	10.70	37:38	268.77	1.16	81	291	1	58					
	6	9.94	48:20	272.51	0.95	82	287	1	59					
	1	12.90	58:17	275.75	1.60	83	293	1	62					
	2	12.90	1:11:74	280.02	1.60	84	297	1	61					
	3	12.07	1:24:06	284.35	1.40	85	296	1	62					
	4	9.57	1:36:10	288.20	0.88	86	298	1	66					
	5	8.23	1:45:44	291.42	0.65	87	297	1	64					
	6	7.57	1:53:58	294.32	0.55	87	291	1	64	↓				
Total Run Time			2:01:31	296.93										
Total Volume, ACF														
Averages					0.985356 in. H2O	82.1 °F	293.9 °F							

		84.73 %	1017 microns 2.38
	in H2O		

Run	OI-M201B-3

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Method 4 - Air Control Techniques, P.C.

Date 8/16/01

Identification Information

Client	NSSA	Job	1042
Plant Name	CMYA, INC	Process	Flash Dryer
City	Florence	State	VT

Sampling Information

Run Number				Balance Number	
Sampling Date				Balance Type	
Recovery Date				Balance Level	
Personnel				Recovery Area	

Location Moisture Data

OI-M201B-

Run Number	1	2	3
Impinger 1			
Final Weight, grams/mls	924.1	945.9	901.4
Initial Weight, grams/mls	698.9	721.1	679.3
Condensed Water, grams	225.2	224.8	222.1
Impinger 2 FILTER	SF47-321	322	323
Final Weight, grams/mls	680.2	691.9	698.0
Initial Weight, grams/mls	671.8	691.7	691.0
Condensed Water, grams	0.4	0.2	7.0
Impinger 3			
Final Weight, grams/mls	703.7	668.1	707.2
Initial Weight, grams/mls	704.6	669.0	712.1
Condensed Water, grams	-0.9	-0.9	-4.9
Condensed Water, grams			
Silica Gel			
Final Weight, grams	833.9	835.5	842.9
Initial Weight, grams	824.9	827.5	833.9
Adsorbed Water, grams	9.0	8.0	9.0
Adsorbed Water, grams			
Total Water, grams	233.7	232.1	232.2

Vm(std) = Volume of gas sampled at standard conditions (dscf)
Vm(std) = ((Gamma * 17.64 * Vm * (Pbar + (Δ H / 13.6))) / (Tm + 460)
Vwc(std) = volume of water vapor at standard conditions (scf)
Vwc(std) = (0.04707) * (volume of water collected (mls))
Bws = Mole fraction of water vapor
Bws = Vwc(std) / (Vm(std) + Vwc(std))
Percent Moisture = 100 * Bws

Method 1 - Air Control Techniques, P.C.

Date 9/5/01

Client	~~Harbor~~ PMI) N5561
Job #	642
Plant Name	VM Hobart
State	IL
City	Quincy
Sampling Location	M.11 #7

No. of Ports Available	2
No. of Ports Used	2
Port Inside Diameter, Inches	4"
Distance From Far Wall To Outside Of Port, Inches	13/8"
Nipple Length And/Or Wall Thickness, Inches	1 1/8"
Depth Of Stack Or Duct, Inches	12"
Stack Or Duct Width (if rectangular), Inches	12"
Equiv. Diameter = 2DW/(D+W), Inches	12
Stack/Duct Area, Square Inches ($\pi \times R^2$ or L x W)	144

	Upstream	Downstream
Distance to Flow Disturbances	27"	30"
Diameters	2.25	2.5

Note: If more than 8 and 2 diamteters and if duct dia. is less than 24" use 8 or 9 points.

Diameters			
Velocity	UP	Down	Particulate
12	8	2	12
12	7	1.75	12
12	6	1.5	16
16	5	1.25	20
16	2	0.5	24 or 25

Point Location Data

Point	% of Duct Depth	Distance From Inside Wall	Distance From Outside of Port
1	8.3	1.0	2 1/8
2	25	3.0	4 1/8
3	41.7	5.0	6 1/8
4	58.3	7.0	8 1/8
5	75	9.0	10 1/8
6	91.7	11.0	12 1/8
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.6	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.6	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Location of Points in Rectangular Stacks or Ducts

	2	3	4	5	6	7	8	9	10	11	12
1	25	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75	50	37.5	30.0	25	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50	43.8	38.9	35.0	31.8	29.2
5				90.0	75	64.3	56.3	50	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

0.0000-0.0625 - 0
0.0625-0.1875 - 1/8
0.1875-0.3125 - 1/4
0.3125-0.4375 - 3/8
0.4375-0.5625 - 1/2
0.5625-0.6875 - 5/8
0.6875-0.8125 - 3/4
0.8125-0.9375 - 7/8
0.9375-1.0000 - 1

PRELIMINARY INFORMATION

Plant Name	Huber	Date	9/4/01
City, State	Quincy IL	Project #	642
Personnel	TB, TH, SH	Pitot Identification	PTA
Test Location	M117 HCBM	Pitot Coefficient (Cp)	0.84

Stack Dimensions			Pressures		
Diameter of Stack (D)	12"	in	Barometric Pressure (Pb)		in Hg
Width of Stack (W)	12"	in	Static Pressure (Pg)	+1.5	in H_2O
Area of Stack (As)	1	ft^2	Absolute Stack Pressure (Ps)		in Hg

Stack Gas Composition				
Carbon Dioxide (%CO_2)	0	Moisture Content (Bws)	1.9	%
Oxygen (%O_2)	20.9	Dry Molecular Weight (Md)	28.84	lb/lb-mole
Nitrogen Concentration (%N_2)	77.1	Wet Molecular Weight (Ms)	28.63	lb/lb-mole

PRELIMINARY TRAVERSE

Pitot Tube Leak Checks			A	B	
Port	Point	Angle, °	Δp, in H_2O	Temp. °F	ft/sec
Start 1800 A	1	1	1.70	153	
	2	0	1.80	153	
	3	1	1.90	154	
	4	2	1.90	155	
	5	2	1.70	155	
	6	4	1.50	155	
B	1	3	1.40	158	
	2	2	2.00	159	
	3	0	2.10	159	
	4	0	2.00	160	
	5	1	1.60	160	
	6	4	1.40	160	
End					

wet bulb 90°

Average Angle, Degrees	1.67
Average Velocity Pressure	1.742
Average Gas Temperature (°F)	156.8
Average Stack Gas Velocity (ft/sec)	80.58
Actual Cubic Feet per minute (ACFM)	4,835
Dry Standard Cubic Feet per Minute (DSCFM)	4,045

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	JMH1-M801B-1
Condition	

IDENTIFICATION INFORMATION

Plant Name	JM Huber
City	Quincy
State	IL
Source Number	
Sampling Location	Ball Mill #7
Test Personnel	TB, TH, SH
Date	9/5/01
Start	0807
Stop	1037
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	B-1
Nozzle Diameter	0.130
Orsat/Fyrite	Fyrite

Filter ID	Tare
SF47-324	0.1142

PRELIMINARY CHECKS & MEDIA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.00		5

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@7"	0@3"
Pitot Tube Posttest Leak Check	0@6"	0@3"

Barometric Pressure, In.,Hg.	29.7	Static Pressure, In. W.C.	+1.5

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	21.0	Moisture, %	1.907
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.63

Sampling Information / Data

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (In.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, In. W.C.	Target Orifice Delta H, In. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	11.74	0	876.700	2.4	64	150	1	48	0.5				
	2	11.24	11:44	881.25	2.2	67	155	1	45					
	3	10.98	22:58	885.58	2.1	69	157	1	48					
	4	10.98	33:57	889.85	2.1	71	158	1	48					
	5	10.44	44:56	894.11	1.9	72	158	1	48					
	6	9.88	55:22	898.19	1.7	73	158	1	49					
B	1	11.24	1:05:15	902.05	2.2	74	157	1	52					
	2	12.45	1:16:30	906.46	2.7	76	158	1	51					
	3	11.74	1:28:56	911.39	2.4	78	159	1	53					
	4	11.24	1:40:40	916.04	2.2	80	160	1	54					
	5	10.16	1:51:54	920.47	1.8	82	160	1	55					
	6	8.96	2:02:04	924.50	1.4	83	160	1	56	↓				
Total Run Time			2:11:02	928.043										
Total Volume, ACF				51.343										
Averages				2.017698 in. H2O		74.1 °F	157.5 °F							

Run	

0.500 in H2O

95.4 %	10.80 microns	2.41 microns

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Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	JMHI-M201B-2
Condition	

IDENTIFICATION INFORMATION

Plant Name	JM Huber
City	Quincy
State	IL
Source Number	
Sampling Location	Ball Mill #7
Test Personnel	TB, TH, SH
Date	9/5/01
Start	1049
Stop	1254
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	K-1
Nozzle Diameter	0.133
Orsat/Fyrite	Fyrite

Filter ID	Tare
SF47-325	0.1135

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.00		7

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0 @ 7"	0 @ 3"
Pitot Tube Posttest Leak Check	0 @ 6"	0 @ 3"

Barometric Pressure, In.,Hg.	29.7	Static Pressure, In. W.C.	+1.5

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	21.6	Moisture, %	2.118
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.61

Sampling Information / QA Checks

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (in.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (in.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	10.75	0	929.100	2.4	84	164	1	60	0.5				
	2	10.52	10:45	933.39	2.3	85	164	1	57					
	3	10.29	21:16	937.52	2.2	86	165	1	60					
	4	10.05	31:34	941.56	2.1	88	167	1	61					
	5	9.56	41:37	945.65	1.9	89	167	1	61					
	6	8.78	51:11	949.51	1.6	90	161	1	62					
B	1	10.97	59:57	953.01	2.5	92	169	1	61					
	2	10.97	1:10:55	957.45	2.5	93	170	1	57					
	3	10.97	1:21:54	961.91	2.5	95	170	1	58					
	4	10.52	1:32:52	966.37	2.3	96	171	1	58					
	5	9.31	1:43:23	970.71	1.8	98	172	1	61					
	6	8.78	1:52:42	974.50	1.6	98	169	1	61	↓				
Total Run Time			2:01:28	978.05										
Total Volume, ACF				48.950										
Averages					2.128682	91.2	167.4							
					in. H2O	°F	°F							

		0.500	
		in H2O	

90.6	10.82	2.43
%	microns	

Run JMHI-M201B-2

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	JMH1-M201B-3
Condition	

IDENTIFICATION INFORMATION

Plant Name	JM Huber
City	Quincy
State	IL
Source Number	
Sampling Location	Ball Mill #7
Test Personnel	TB, TH, SH
Date	9/5/01
Start	1306
Stop	1508
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	B-1
Nozzle Diameter	0.130
Orsat/Fyrite	Fyrite

Filter ID	Tare
1F47-326	0.1131

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.00		7

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@8"	0@4"
Pitot Tube Posttest Leak Check	0@6"	0@3"

Barometric Pressure, In.,Hg.	29.7	Static Pressure, In. W.C.	+1.5

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	23.1	Moisture, %	2.353
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.58

Sampling Information / QA Checks

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (in.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	10.17	0	978.700	2.2	98	174	1	65	0.52				
	2	10.17	10:10	982.81	2.2	99	174	1	64					
	3	9.93	20:20	986.95	2.1	101	175	1	63					
	4	9.93	30:16	991.00	2.1	100	176	1	63					
	5	9.45	40:11	995.01	1.9	101	176	1	64					
	6	8.67	49:39	998.85	1.6	102	170	1	63					
B	1	9.93	58:19	1002.43	2.1	101	176	1	64					
	2	11.05	108:14	1006.38	2.6	101	177	1	65					
	3	10.62	1:19:18	1010.92	2.4	101	178	1	62					
	4	10.17	1:29:55	1015.22	2.2	102	178	1	61					
	5	9.20	1:40:05	1019.38	1.8	102	178	1	62					
	6	8.39	1:49:17	1023.13	1.5	102	178	1	61	↓				
Total Run Time			1:57:41	1026.54										
Total Volume, ACF				47.840										
Averages					2.046921 in. H2O	100.8 °F	175.8 °F			0.520 in H2O		96.7 %	10.87 microns	2.46 microns

Run

Method 4 - Air Control Techniques, P.C.

Date 9/5/01

Identification Information

Client	PMD N556A	Job	642
Plant Name	J M Huber	Process	Mill 7
City	Quincy	State	IL

Sampling Information

Run Number				Balance Number	E1
Sampling Date				Balance Type	Electronic
Analysit Date				Balance Level	✓
Personnel				Recovery Area	✓

Location Moisture Data

Run Number	JM Hub-MM5H-1	2	3
Impinger 1			
Final Weight, grams/mls	715.6	709.3	729.8
Initial Weight, grams/mls	705.5	718.0	715.6
Condensed Water, grams	10.1	11.3	14.2
Impinger 2 Filter TARE	SF47-324 0.1142	SF47-325 0.1135	SF47-326 0.1131
Final Weight, grams/mls	699.8	703.1	700.8
Initial Weight, grams/mls	699.0	702.1	699.8
Condensed Water, grams	0.8	1.0	1.0
Impinger 3			
Final Weight, grams/mls	566.4	611.0	566.8
Initial Weight, grams/mls	564.9	609.5	566.4
Condensed Water, grams	1.5	1.5	0.4
Condensed Water, grams			
Silica Gel			
Final Weight, grams	867.5	857.9	875.0
Initial Weight, grams	858.9	850.1	867.5
Adsorbed Water, grams	8.6	7.8	7.5
Adsorbed Water, grams	21.0	21.6	23.1
Total Water, grams			

Vm(std) = Volume of gas sampled at standard conditions (dscf)
Vm(std) = ((Gamma * 17.64 * Vm * (Pbar + (Δ H / 13.6))) / (Tm + 460)
Vwc(std) = volume of water vapor at standard conditions (scf)
Vwc(std) = (0.04707) * (volume of water collected (mls))
Bws = Mole fraction of water vapor
Bws = Vwc(std) / (Vm(std) + Vwc(std))
Percent Moisture = 100 * Bws

Method 1 - Air Control Techniques, P.C.

Date 9/5/01

Client	NSSGA PMD
Job #	1642
Plant Name	Huber
State	IL
City	Quincy
Sampling Location	Mill 17 Dust Collector

No. of Ports Available	2
No. of Ports Used	2
Port Inside Diameter, Inches	5"
Distance From Far Wall To Outside Of Port, Inches	2 1/2
Nipple Length And/Or Wall Thickness, Inches	3 1/2
Depth Of Stack Or Duct, Inches	18"
Stack Or Duct Width (if rectangular), Inches	N/A
Equiv. Diameter = 2DW/(D+W), Inches	N/A
Stack/Duct Area, Square Inches ($\pi \times R^2$ or L x W)	254.469

	Upstream	Downstream
Distance to Flow Disturbances	96"	44"
Diameters	16.3	2.44

Note: If more than 8 and 2 diameters and if duct dia. is less than 24" use 8 or 9 points.

Diameters

Velocity	UP	Down	Particulate
12	8	2	12
12	7	1.75	12
12	6	1.5	16
16	5	1.25	20
16	2	0.5	24 or 25

Point Location Data

Point	% of Duct Depth	Distance From Inside Wall	Distance From Outside of Port
1	4.4	0.79≈1	4 1/2
2	14.6	2.628	6 1/8
3	29.6	5.328	8 7/8
4	70.4	12.672	16 1/8
5	85.4	15.372	18 7/8
6	95.6	17.208≈17	20 1/2
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.6	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.8	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.6	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Location of Points in Rectangular Stacks or Ducts

	2	3	4	5	6	7	8	9	10	11	12
1	25	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75	50	37.5	30.0	25	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50	43.8	38.9	35.0	31.8	29.2
5				90.0	75	64.3	56.3	50	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

PRELIMINARY INFORMATION

Plant Name	JM Huber	Date	9/5/01
City, State	Quincy, IL	Project #	642
Personnel	TB, TH, SH	Pitot Identification	PT4
Test Location	Mill 17	Pitot Coefficient (Cp)	0.84

Stack Dimensions			Pressures		
Diameter of Stack (D)	18	in	Barometric Pressure (Pb)	29.6	in Hg
Width of Stack (W)	—	in	Static Pressure (Pg)	-26	in H_2O
Area of Stack (As)	1.767	ft^2	Absolute Stack Pressure (Ps)	27.69	in Hg

Stack Gas Composition				
Carbon Dioxide (%CO_2)	0	Moisture Content (Bws)	25	%
Oxygen (%O_2)	20.9	Dry Molecular Weight (Md)	28.84	lb/lb-mole
Nitrogen Concentration (%N_2)	79.1	Wet Molecular Weight (Ms)	28.54	lb/lb-mole

PRELIMINARY TRAVERSE

Pitot Tube Leak Checks			A	B	
	Port	Point	Angle, °	Δp, in H_2O	Temp. °F	ft/sec
Start	A	1	3	0.68	136	
		2	3	0.80	135	
		3	2	0.83	136	
		4	2	0.98	127	
		5	2	0.60	135	
		6	1	0.60	122	
	B	1	3	0.80	134	
		2	4	0.95	135	
		3	1	0.80	135	
		4	0	0.58	~~135~~ 134	
		5	2	0.62	133	
		6	1	0.48	125	
End						

Average Angle, Degrees	2.00
Average Velocity Pressure	0.719
Average Gas Temperature (°F)	132.3
Average Stack Gas Velocity (ft/sec)	52.69
Actual Cubic Feet per minute (ACFM)	5587
Dry Standard Cubic Feet per Minute (DSCFM)	4494

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	JMHZ-M201B-1
Condition	

IDENTIFICATION INFORMATION

Plant Name	JM Huber
City	Quincy
State	IL
Source Number	
Sampling Location	Mill 17
Test Personnel	TB, TH, SH
Date	9/6/01
Start	0712
Stop	0928
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	B-3
Nozzle Diameter	0.164
Orsat/Fyrite	Fyrite

Filter ID	Tare
SF47-327	0.1157

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.00		12

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@7"	0@3"
Pitot Tube Posttest Leak Check	0@5"	0@3"

Barometric Pressure, In.,Hg.	29.6	Static Pressure, In. W.C.	-26.0

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	27.5	Moisture, %	2.566
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.56

Sampling Information / QA Checks

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (in.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, In. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	11.43	0	27.265	0.94	74	125	9.5	62	0.46				
	2	10.61	11:26	31.80	0.81	75	126	9.5	53					
	3	11.43	22:03	35.74	0.94	77	127	9.5	52					
	4	11.56	33:29	40.00	0.96	79	127	9.5	52					
	5	10.68	45:03	44.31	0.82	80	127	9.5	52					
	6	10.15	55:43	48.27	0.74	81	120	9.5	53					
B	1	11.31	1:05:52	52.05	0.92	83	127	9.5	55					
	2	12.37	1:17:11	56.51	1.1	83	129	9.5	54					
	3	11.79	1:29:33	61.17	1.0	84	129	9.5	54					
	4	10.94	1:41:21	65.62	0.86	85	130	9.5	55					
	5	10.68	1:52:17	69.74	0.82	85	128	9.5	56					
	6	10.55	2:02:58	73.75	0.80	86	127	9.5	56					
Total Run Time			2:13:30	77.71										
Total Volume, ACF				50.445										
Averages					0.88	81.0	126.8							
					in. H2O	°F	°F							

Run	

0.46
in H2O

88.4	10.73	2.40
%	microns	

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	JMH2-M201B-2
Condition	

IDENTIFICATION INFORMATION

Plant Name	JM Huber
City	Quincy
State	IL
Source Number	
Sampling Location	M.11 17
Test Personnel	TB, TH, SH
Date	9/6/01
Start	0935
Stop	1135
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	IC-3
Nozzle Diameter	0.162
Orsat/Fyrite	Fyrite

Filter ID	Tare
SF47-328	0.1151

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM			

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@8"	0@3"
Pitot Tube Posttest Leak Check		

Barometric Pressure, In.,Hg.	29.6	Static Pressure, In. W.C.	-26.0

ACTUAL MOISTURE/GAS COMPOSITION

Water Recovered, grams	23.4	Moisture, %	2.505
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.56

Sampling Information / Data

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (in.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (in.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, in. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	11.12	0	78.00	1.1	86	129	9	62	0.46				
	2	11.12	11:07	82.35	1.1	87	130	9	58					
	3	10.60	22:14	86.55	1.0	87	130	9	58					
	4	8.74	32:50	90.48	0.68	88	130	9	59					
	5	8.48	41:34	93.95	0.64	88	124	9	60					
	6	8.68	50:03	96.95	0.67	89	129	9	60					
B	1	9.72	58:44	100.10	0.84	89	129	9	61					
	2	10.33	1:08:27	104.42	0.95	90	129	9	55					
	3	10.33	1:18:47	108.92	0.95	92	130	9	56					
	4	10.06	1:29:07	112.55	0.90	92	128	9	54					
	5	8.35	1:39:10	116.22	0.62	94	131	9	55					
	6	8.87	1:47:31	119.43	0.70	95	130	9	55					
Total Run Time			1:56:24	122.700										
Total Volume, ACF				44.700										
Averages					0.837132	89.8	129.1			0.46		93.6	10.73	2.41
					in. H2O	°F	°F			in H2O		%	microns	

Run	

Combined Cyclone PM10 & PM2.5 Run Data Sheet

Run ID	JMH2-M201B-3
Condition	

IDENTIFICATION INFORMATION

Plant Name	JM Huber
City	Quincy
State	IL
Source Number	
Sampling Location	MS11 17
Test Personnel	TB, TH, SH
Date	9/6/01
Start	1142
Stop	1351
Meterbox ID	11077
ΔH @	1.795
Gamma, γ	1.008
Nozzle ID	B-3
Nozzle Diameter	0.164
Orsat/Fyrite	Fyrite

Filter ID	Tare
SR47-329	0.1137

PRELIMINARY CHECKS AND DATA

	Actual	Req'd	Vacuum
Full Train Pretest Leak Check, ACFM	0.00	< 0.02 or 4%	15
Partial Train Posttest Leak Check, ACFM	0.000		10

(Remove cyclone sampling head before posttest leak check. Keep cyclone head upright prior to recovery.) Do not leak check during port changes.

	A	B
Pitot Tube Pretest Leak Check	0@6"	0@3"
Pitot Tube Posttest Leak Check	0@5"	0@4"

Barometric Pressure, In.,Hg.	29.6	Static Pressure, In. W.C.	-26.0

ACTUAL MOISTURE & GAS COMPOSITION

Water Recovered, grams	23.8	Moisture, %	2.318
CO_2 %	0	Md_run	28.84
O_2 %	20.9	Mw_run	28.58

Sampling Information / QA Checks

Port	Point	Dwell Time, (Min.)	Elapsed Time, h:m:s	Dry Gas Meter, (ft3)	Pitot VP, (In.W.C.)	Meter Temp. (F)	Stack Temp., (F)	Sample Train Vac. (in.)	Impinger Exit Gas Temp., (F)	Orifice Delta H, In. W.C.	Target Orifice Delta H, in. W.C.	% Iso	Run Cum. D50s, microns PM10	Run Cum. D50s, microns PM2.5
A	1	10.48	0	123.100	0.92	96	131	9 5	62	0.46				
	2	10.93	10:29	127.13	1.0	97	132	9 5	58					
	3	10.71	21:25	131.38	0.96	97	132	9 5	59					
	4	10.93	32:08	135.50	1.0	98	130	9 5	59					
	5	10.93	43:03	139.65	1.0	99	133	9 5	60					
	6	10.48	53:59	143.75	0.92	100	133	9	61					
B	1	10.25	1:04:28	147.74	0.88	101	133	9	63					
	2	11.20	1:14:43	151.73	1.05	101	133	5	63					
	3	10.71	1:25:55	156.08	0.96	101	129	5	57					
	4	9.84	1:36:37	160.09	0.81	102	133	5	54					
	5	11.46	1:46:28	164.19	1.10	102	131	5	54					
	6	11.46	1:57:55	168.75	1.10	101	129	5	55					
Total Run Time		209:23		173.22										
Total Volume, ACF				50.120										
Averages					0.9732 in. H2O	99.6 °F	131.6 °F			0.46 in H2O		83.9 %	10.82 microns	2.45 microns

Run	

Method 4 - Air Control Techniques, P.C.

Date 9/6/01

Identification Information

Client	NSSGA PMD	Job	6042
Plant Name	Huber	Process	Mill 17 Dust Collector
City	Quincy	State	IL

Sampling Information

Run Number				Balance Number	
Sampling Date				Balance Type	
Analysit Date				Balance Level	
Personnel				Recovery Area	

Location Moisture Data

	JMH2-M2018-1	2	3
Run Number			
Impinger 1			
Final Weight, grams/mls	746.1	744.4	759.1
Initial Weight, grams/mls	729.3	729.8	746.1
Condensed Water, grams	16.8	14.6	13.0
Filter #	SF47-327	SF47-328	SF47-329
Impinger 2 TARE	0.1157	0.1151	0.1137
Final Weight, grams/mls	704.3	701.2	705.5
Initial Weight, grams/mls	703.1	700.8	704.3
Condensed Water, grams	1.2	0.4	1.2
Impinger 3			
Final Weight, grams/mls	612.1	567.9	612.8
Initial Weight, grams/mls	611.0	566.8	612.1
Condensed Water, grams	1.1	1.1	0.7
Condensed Water, grams			
Silica Gel			
Final Weight, grams	866.3	882.3	875.2
Initial Weight, grams	857.9	875.0	866.3
Adsorbed Water, grams	8.4	7.3	8.9
Adsorbed Water, grams	27.5	23.4	23.8
Total Water, grams			

Vm(std) = Volume of gas sampled at standard conditions (dscf)
Vm(std) = ((Gamma * 17.64 * Vm * (Pbar + (Δ H / 13.6))) / (Tm + 460)
Vwc(std) = volume of water vapor at standard conditions (scf)
Vwc(std) = (0.04707) * (volume of water collected (mls))
Bws = Mole fraction of water vapor
Bws = Vwc(std) / (Vm(std) + Vwc(std))
Percent Moisture = 100 * Bws

APPENDIX E

Chain of Custody Sheets

Analysis Request / Chain of Custody

RESOLUTION ANALYTICS, INC.
Specialists in Air Emission Analysis
2733 Lee Avenue, Sanford, NC 27330
Phone (919) 774-5557 • Fax (919) 776-6785 • Email resolute@interpath.com

Reporting Address: Please attach a separate sheet of paper if billing address is different than reporting address.	Phone Number	Fax Number
Company: Air Control Techniques, P.C.	Contact: Todd Brozell	
Street Address: 301 E. Durham Rd.		
City, State. Zip: Cary, NC 27513	**Project:** 642	

Turnaround Time:
- ☒ 10 Days (Standard)
- ☐ 5 Days (1.5x)
- ☐ 3 Days (2x)
- ☐ 2 Days (2.5x)
- ☐ 24 Hours (3x)

Sample ID / Run #	Train/Run Component	Train/Run Component	Train/Run Component	
EXAMPLE: SCRUBBER INLET-1	*0.1 N H_2SO_4 (Imp 1-3)*	*0.1 N H_2SO_4 (Imp 4)*	*0.1 N NaOH (Imp 5, 6)*	
PMD-1	Acetone Blank	N/A	N/A	
RM-M201B-1	PM>10μ Acetone Rinse	PM≤10μ >2.5μ Acetone Rinse	PM≤2.5μ Acetone Rinse	Filter
RM-M201B-2	"	"	"	"
RM-M201B-3	"	"	"	"

Analyses
- ☐ EPA 0011/TO-5/8315 analytes: _____
- ☐ HF (EPA 13B) analytes: _____
- ☐ EPA 26A (HCl/Cl_2) analytes: _____
- ☐ VOC's (HPLC) analytes: _____
- ☐ Amines list: _____
- ☐ Phenol (EPA TO-8)
- ☐ SO_x (EPA 6/8) analytes: _____
- ☐ Ammonia (CTM-027)
- ☐ NO (EPA 7A/7D)
- ☐ Filt Particulate (EPA 5)
- ☐ Conden Part (EPA 202)
- ☐ EPA 29 metals: _____ metals: _____
- ☐ Ontario-Hydro (Hg)
- ☐ EPA 101A (Hg)
- ☐ Other list: Gaseous

Chain of Custody:

Relinquished by (Signature)	Date	Received by (Signature)	Date	Comments
Todd Brozell	7/28/97	[illegible]	7-28-97	
Relinquished by (Signature)	Date	Received by (Signature)	Date	Comments

WHITE: Report Copy CANARY: Client Copy PINK: Lab Copy

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JPC Form No. 37449A

RESOLUTION ANALYTICS, INC.
Specialists in Air Emission Analysis
2733 Lee Avenue, Sanford, NC 27330
Phone (919) 774-5557 • Fax (919) 776-6785 • Email resolute@interpath.com

Analysis Request / Chain of Custody

Reporting Address: [1] Please attach a separate sheet of paper if billing address is different than reporting address.	Phone Number (919) 460-7811	Fax Number (919) 460-7897
Company Air Control Techniques, P.C.	Contact Todd Brozell	
Street Address 301 East Durham Rd		
City, State, Zip Cary, NC, 27513	**Project:** 642	

Turnaround Time:
- [X] 10 Days (Standard)
- [ ] 5 Days (1.5x)
- [ ] 3 Days (2x)
- [ ] 2 Days (2.5x)
- [ ] 24 Hours (3x)

Sample ID / Run #	Train/Run Component	Train/Run Component	Train/Run Component	
EXAMPLE: SCRUBBER INLET-1	*0.1 N H2SO4 (Imp 1-3)*	*0.1 N H2SO4 (Imp 4)*	*0.1 N NaOH (Imp 5-6)*	
SM1-M201B-1	Greater than 10% Rinse	≤10% and >2.5% Rinse	≤2.5% Rinse	Filter
SM1-M201B-2	>10% Rinse	≤10% and >2.5% Rinse	≤2.5% Rinse	Filter
SM1-M201B-3	"	"	"	"
SM2-M201B-1	"	"	"	"
SM2-M201B-2	"	"	"	"
SM2-M201B-3	"	"	"	"

Analyses
- [ ] EPA 0011/TO-5/8315
  - analytes: _____
  - analytes: _____
- [ ] HF (EPA 13B)
- [ ] EPA 26A (HCl/Cl_2)
  - analytes: _____
- [ ] VOC's (HBLC)
  - analytes: _____
- [ ] Amines list: _____
- [ ] Phenol (EPA TO-8)
- [ ] SO_x (EPA 6/8)
  - analytes: _____
- [ ] Ammonia (CTM-027)
- [ ] NO_x (EPA 7A/7D)
- [ ] Filt. Particulate (EPA 5)
- [ ] Condens. Part. (EPA 202)
- [ ] EPA 29
  - metals: _____
  - metals: _____
- [ ] Ontario Hydro (Hg)
- [ ] EPA 101A (Hg)
- [X] Other
  - list: M201B

Chain of Custody:

Relinquished by (Signature)	Date	Received by (Signature)	Date	Comments
[signature]	8/24	[signature]	8/24/01	
Relinquished by (Signature)	Date	Received by (Signature)	Date	Comments
[signature]	8/24	[signature]	8/24/01	

WHITE: Report Copy CANARY: Client Copy PINK: Lab Copy

JPC Form No. 37449A

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Analysis Request / Chain of Custody

RESOLUTION ANALYTICS, INC.
Specialists in Air Emission Analysis
2733 Lee Avenue, Sanford, NC 27330
Phone (919) 774-5557 • Fax (919) 776-6785 • Email resolute@interpath.com

Reporting Address: [1] Please attach a separate sheet of paper if billing address is different than reporting address.	Phone Number	Fax Number
	(919) 460-7811	(919) 460-7897
Company: Air Control techniques, P.C.	Contact: Todd Brozell	
Street Address: 301 East Durham Rd		
City, State, Zip: Cary, NC 27513	**Project:** 642	

Turnaround Time:
- ☐ 10 Days (Standard)
- ☒ 5 Days (1.5x)
- ☐ 3 Days (2x)
- ☐ 2 Days (2.5x)
- ☐ 24 Hours (3x)

Sample ID / Run #	Train/Run Component	Train/Run Component	Train/Run Component	
EXAMPLE: SCRUBBER INLET-1	*0.1 N H_2SO_4 (Imp 1-3)*	*0.1 N H_2SO_4 (Imp 4)*	*0.1 N NaOH (Imp 5-6)*	
JMH1-M201B-1	>10% Rinse	≤10% >2.5% Rinse	≤2.5% Rinse	Filter
-2	"	"	"	"
-3	"	"	"	"
JMH2-M201B-1	"	"	"	"
2	"	"	"	"
3	"	"	"	"
Acetone Blank				

Analyses
- ☐ EPA 0011/TO-5/8315 analytes: _____ analytes: _____
- ☐ HF (EPA 13B)
- ☐ EPA 26A (HCl/Cl_2) analytes: _____
- ☐ VOC's (HPLC) analytes: _____
- ☐ Amines list: _____
- ☐ Phenol (EPA TO-5)
- ☐ SO_x (EPA 6/8) analytes: _____
- ☐ Ammonia (CTM-027)
- ☐ NO_x (EPA 7A/7D)
- ☐ Full Particulate (EPA 5)
- ☐ Conden. Part. (EPA 202)
- ☐ EPA 29 metals: _____ metals: _____
- ☐ Ontario Hydro (Hg)
- ☐ EPA 101A (Hg)
- ☐ Other list: _____

Chain of Custody

Relinquished by (Signature)	Date	Received by (Signature)	Date	Comments
Todd Brozell	9/16/97	[illegible]	9/16/97	
Relinquished by (Signature)	Date	Received by (Signature)	Date	Comments

WHITE: Report Copy CANARY: Client Copy PINK: Lab Copy

JPC Form No. 37449A

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APPENDIX F

Plant Production Data

Subject: Material throughput in Roller Mill test
Date: Wed, 18 Jul 2001 11:02:32 -0400
From: Hector Diaz <Hector.Diaz@polarminerals.com>
To: "'actpc@aircontroltechniques.com'" <actpc@aircontroltechniques.com>
CC: Jennifer Dechellis <JenniferD@polarminerals.com>,
Debbie Ambrose <DebbieA@polarminerals.com>

Dear Todd:

The material throughputs we had while testing for the PM2.5 in Wellsville are as follows:

First test, and 1/2 of second test:
Product: Cosmetic Talc
Total material ran: 88 tons
Total time for run: 13.5 hours
Hourly rate: 6.51 tons/hr

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Third test, and 1/2 of second test:
Product: 7 micron talc
Total material ran: 48 tons
Total time for run: 10 hours
Hourly rate: 4.8 tons/hr

If you have any question, please don't hesitate to call me. Regards,

Hector Diaz-Stringel

Minerals Technologies Inc.
640 North 13th Street
Easton, PA 18042

August 22, 2001

Mr. Todd Brozell
Air Control Techniques, P.C.
301 East Durham Road
Cary, NC 27513

Dear Todd,

The following are the production rates for the equipment you tested last week.

August 14
Limestone Storage Bin
Flexkleen fabric filter dust collector

This bin received fine ground (3.5 microns) limestone product at an average rate of 1.96 tons per hour during the test.

August 15
Two Classifiers (Identical Units)
Torit cartridge dust collector

The two classifiers processed an average rate of 1.8 tons per hour of product with average size range of 5 to 7 microns.

August 16
Roller Mill (Raymond Mill)
Mikropul fabric filter dust collector

This mill produced on average rate of 6.3 tons per hour of product with an average size of 75 microns until 9:45AM. After 9:45AM, the mill produced an average rate of 14.0 tons per hour of product with an average size of 45 microns. There was no downtime for the product changeover; this change occurs instantaneously.

It was a pleasure working you and your crew. Please call me if you have any questions.

Sincerely,

Jeffrey C. Carlton, PE
Environmental Manager
Jeffrey.carlton@mineralstech.com

JCC:mld

A:\todd brozell ltr 082201.doc

Via Facsimile To:
(919) 460-7897
Total of 1 Page

OMYA, Inc.
61 Main Street
Proctor, Vermont 05765
802 459 3311
fax 802 459 3428

September 18, 2001

Todd Brozell
Air Control Techniques, P.C.
301 East Durham Road
Cary, North Carolina 27513

Dear Todd:

The following operating parameter information is submitted in support of the recent PMD stack testing of Flash Dryer #1 at the OMYA's Verpol plant in Florence, Vermont

	Date	Times	Avg. Prod. Rates (M tph)	(US tph)	Avg. Diff. Press. (inches w.c.)
Flash Dryer #1	8/17/01	9:08 - 11:18	10.07	11.08	3.04
		11:31 - 13:32	10.05	11.06	3.05
		13:40 - 15:43	10.10	11.11	3.10

I trust the above will be adequate. If you have further questions, please call me at (802) 770-7261.

Sincerely,

Neal Jordan
Manager of Environmental
& Regulatory Affairs

ENGINEERED MATERIALS

A FAMILY OF SOLUTIONS

J.M. Huber Corporation

3150 Gardner
Expressway
Quincy, Illinois 62301

217.224.8737 x 3353
217.224.1140 fax

September 7, 2001

Todd Brozell – Vice President
Air Control Techniques, P.C.
301 East Durham Road
Cary, North Carolina 27513

RE: J. M. Huber Corporation - Quincy, Illinois
Stack Test Throughput Information

Dear Mr. Brozell:

The throughput information during the stack tests is as follows:

Mill 7

Run #	Run Time	Throughput	Date
1	0807-1037	3.75 tons/hour	9/5/01
2	1049-1254	3.75 tons/hour	9/5/01
3	1306-1508	3.75 tons/hour	9/5/01

Mill 17

Run #	Run Time	Throughput	Date
1	0712-0928	0.50 tons/hour	9/6/01
2	0935-1135	0.50 tons/hour	9/6/01
3	1142-1351	0.50 tons/hour	9/6/01

Should you have any questions regarding this matter, please do not hesitate to contact me at 217-224-8737, ext. 3353.

Sincerely,

Huber Engineered Materials

Rick Zwingelberg
Director of Ground Calcium Carbonate Operations

CC: Jay Hutto – Global Director of Environmental Affairs
Bert Becton – Regional Environmental Engineer
file