Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP42 Section:	11.27
Background Chapter	4
Reference:	4
Title:	Particulate Emission Test Report for a Scrubber Stack at The Feldspar Corporation: Spruce Pine, NC, North Carolina Department of Natural Resources & Community Development, Division of Environmental Management, July 1978.

A-82-39
II-A-51

AP-42 Section 11.27
Reference
Report Sect. 4
Reference 4

PARTICULATE EMISSION TEST REPORT

For a Scrubber Stack at

THE FELDSPAR CORPORATION

Spruce Pine, North Carolina

4 X

Performed by the Source Testing Staff
of the
North Carolina Department
of Natural Resources & Community Development
Division of Environmental Management
Air Quality Section
July 25 and 26, 1978

INTRODUCTION

This report presents the results of a particulate source test on a feldspar dryer scrubber stack at The Feldspar Corporation's plant, Spruce Pine, North Carolina. This test was conducted on July 25 and 26, 1978.

George L. Comer and Julius A. Shanklin of the North Carolina Department of Natural Resources & Community Development, Division of Environmental Management, Air Quality Management, conducted the test to determine if this source was in compliance with the North Carolina Emission Control Standard, 15 NCAC 2D .0509, "Particulates from Mica and Feldspar Processing Plants," (Reference 1).

Jerry Hoyle of the North Carolina Air Quality Section, Western Field Office, assisted in the performance of the tests.

DESCRIPTION OF PROCESS AND CONTROL EQUIPMENT

Crushed feldspar is dried in a direct-fired-rotary dryer. The exhaust passes through a cyclone and a scrubber in series before it is vented to the atmosphere by means of a fan and a vertical stack.

The hourly process rate was 15 tons/hr. The maximum allowable emission rate of particulate matter was calculated from a formula given in the Emission Control Standard 15 NCAC 2D .0509 as follows:

$$E = 4 \times (\text{actual process rate})^{0.677}$$

$$E = 4 \times (15)^{0.677}$$

$$E = 25.02 \text{ lb/hr}$$

SAMPLING AND ANALYTICAL PROCEDURES

Particulate testing and sample analysis were performed according to procedures developed by the U.S. Environmental Protection Agency and referred to as Method 5. Sampling port locations were determined according to Method 1. The above federal test methods appear in their original form in the December 23, 1971 Federal Register (Reference 2), with updated versions appearing in the Environment Reporter (Reference 3).

Test point and sampling port locations are shown in Appendix B.

The sampling velocity in all three runs, when compared to the stack gas velocity ("percent isokinetic"), was outside the limits of good practice and required special handling of the results. Normally, the emission rate or "pollutant mass rate" is calculated two ways (see Appendix A, equations 12 and 13). The percent isokinetic (%I) is the ratio of the two results times 100 (see Appendix A, equation 14). The reported emission rate is the average of the two results (see Appendix A, equation 15). When the percent isokinetic is equal to 100% (%I = 100) the two results are the same and there is no uncertainty associated with the average of the two. A small degree of uncertainty is permissible and the range of 90% <I <110% defines the acceptable limits. All three test runs were outside this limit, so a different method must be used to interpret the results. By selecting the lower of the two results rather than the average, we do not remove the uncertainty, but we ensure that it is in favor of the source (The Feldspar Corporation).

Problems arose in computing the molecular weight of the stack gas due to equipment failure in the Orsat apparatus. Gas analysis data was taken from a recent test conducted on similar equipment at the IMC - Sobin Plant. This data yielded a molecular weight of 28.92.

SUMMARY OF RESULTS

The table on the following page presents the final results of the particulate emissions testing and indicates that the subject source is in compliance with North Carolina emission standard 15 NCAC 2D .0509.

George L. Comer

George L. Comer, EIT
Environmental Engineer
Air Quality Management
September 25, 1978

REFERENCES

1. North Carolina Administrative Code, Title 15, Chapter 2, Subchapter 2D, Section .0509, "Particulates From Mica or Feldspar Processing Plants", Environmental Management Commission, Raleigh, North Carolina (January 1977).

2. Federal Register, Standards of Performance for New Stationary Sources, Volume 36, Number 247, U.S. Government Printing Office, Washington, D.C. (December 23, 1971).

3. Environment Reporter, pp 121:1543 - 121:1578 updated thru April 21, 1978, The Bureau of National Affairs, Washington, D.C.

4. Federal Register, Standards for New Stationary Sources - Emissions Monitoring, Volume 40, Number 194, U.S. Government Printing Office, Washington, D.C. (October 6, 1975).

5. Shigehara, Roger T., Roy M. Neulicht, Walter S. Smith and James W. Peeler. Source Evaluation Society News Letter, "Summary of F-Factor Methods for Determining Emissions From Combustion Sources", Volume 1, Number 4, November 1976.

6. Smith, Walter S., and D. James Grove, Stack Sampling Nomographs for Field Estimations, Entropy Environmentalists, Inc., Research Triangle Park, North Carolina, (1973).

TEST SUMMARY - THE FELDSPAR CORPORATION

	Parameter	Run 1	Run 2	Run 3
Q_s	Stack volume flow rate, acfm	9302	9313	9962
Q_{std}	Stack volume flow rate, scfm	7294	7001	7369
%I	Percent isokinetic	81.9	83.0	69.1
P	Process rate, tons/hr.	15	15	15
E	Maximum allowable emission rate based on Standard .0509,* lb/hr.	25.0	25.0	25.0
E	Maximum allowable average		25.0	
pmr_a	Emission rate, lb/hr.	1.68	1.15	1.70
pmr_a	Test average		1.51	

*Reference 4

Calculation Summary

SOURCE The Feldspar Corp. Date 7/26/78

LOCATION Spruce Pine, Mitchell County

ENTRY	RUN 1	RUN 2	RUN 3	ANSWER
Ave. ΔH (in H_2O)	2.4000	2.2300	1.8000	
P_{atm} (in Hg)	27.8500	26.8000	26.8000	
	28.0265	26.9640	26.9324	P_m (in Hg)
P_s(gage)(in H_2O)	0.0000	0.0000	0.0000	
	27.8500	26.8000	26.8000	P_s (in Hg)
T_m (^oR)	560.0000	568.7000	572.5000	
V_m (ft^3)	54.8480	53.2760	48.6390	
	48.6138	44.7353	40.5230	$V_{m_{std}}$ (ft^3)
V_{lq} (ml)	286.8000	291.5000	277.8000	
	13.5656	13.7880	13.1399	V_{vstd} (ft^3)
	62.1795	58.5233	53.6630	V_{std} (ft^3)
	21.8169	23.5598	24.4860	%M
	0.7818	0.7644	0.7551	M_d
MW_d	28.9200	28.9200	28.9200	
	26.5376	26.3473	26.2461	M
T_s (^oR)	629.0000	631.4000	641.6000	
$\Sigma\sqrt{\Delta p}$	23.8402	23.2852	24.6607	
$n\Delta p$	32.0000	32.0000	32.0000	
	0.7450	0.7277	0.7706	Ave $\sqrt{\Delta p}$
C_p	0.8400	0.8400	0.8400	
	49.3498	49.4073	52.8483	v_s (ft/sec)
D_s (in)	24.0000	24.0000	24.0000	
	3.1416	3.1416	3.1416	A_s (ft^2)
	9302.	9313.	9962.	Q_s (ft^3/min)
	7294.	7001.	7369.	Q_{std} (ft^3/min)
W_t (gm)	0.1324	0.0878	0.1358	
	2.0549	1.3895	2.4672	pmr_c (lb/hr)
D_n (in)	0.3060	0.3010	0.3080	
	0.0735	0.0712	0.0745	A_n (in^2)
θ (min)	64.0000	64.0000	64.0000	
	1.6836	1.1539	1.7045	pmr_a (lb/hr)
	81.9345	83.0420	69.0867	%I
	1.8692	1.2717	2.0859	pmr_{avg} (lb/hr)
%CO				
$\%O_2$				
$\%N_2$				
				%EA
F Factor				
				HI (10^6 BTU)
				pmr_u(lbs/10^6BTU)

EQUATIONS

1. Absolute Pressure in Dry Gas Meter - P_m (in. Hg.)

$$P_m = P_{atm} + \frac{\Delta H}{13.6}$$

2. Absolute Stack Pressure - P_s (in. Hg.)

$$P_s = P_{atm} + \frac{P_{s(gage)}}{13.6}$$

3. Sample Volume at Standard Conditions - $V_{m_{std}}$ (ft^3)

$$V_{m_{std}} = V_m \frac{T_{std}}{T_m} \frac{P_m}{P_{std}}$$

4. Volume of Water Vapor Collected, Corrected to Standard Conditions - $V_{v_{std}}$ (ft^3)

$$V_{v_{std}} = K_2 V_{lq} \frac{T_{std}}{P_{std}} \qquad K_2 = 0.00267 \text{ (units conversion)}$$

5. Total Sample Volume at Standard Conditions - V_{std} (ft^3)

$$V_{std} = V_{m_{std}} + V_{v_{std}}$$

6. Percent Moisture in Stack Gas - %M

$$\%M = \frac{V_{v_{std}}}{V_{std}} \times 100$$

7. Mole Fraction of Dry Gas - M_d

$$M_d = \frac{100 - \%M}{100}$$

8. Molecular Weight of Wet Gas - M (lb/lb mole)

$$M = (MW_d \times M_d) + 18(1 - M_d)$$

9. Stack Velocity - v_s (ft/sec)

$$v_s = K_p C_p \sqrt{\frac{T_s}{P_s M}} \quad \frac{\Sigma\sqrt{\Delta p}}{n_{\Delta p}}$$

$$K_p = 85.48 \text{ (units conversion factor)}$$

10. Stack Volume Flow Rate - Q_s (ft^3/min)

$$Q_s = K_1 \, v_s \, A_s' \qquad K_1 = 60 \text{ (units conversion)}$$

11. Stack Volume Flow Rate at Standard Conditions - Q_{std} (ft^3/min)

$$Q_{std} = \frac{T_{std}}{P_{std}} \, \frac{P_s}{T_s} \, Q_s$$

12. Pollutant Mass Rate Based on Particulate Concentration - pmr_c (lb/hr)

$$pmr_c = K_3 \, \frac{W_t \, Q_{std}}{V_{std}} \qquad K_3 = 0.1323 \text{ (units conversion)}$$

13. Pollutant Mass Rate Based on the Ratio of the Cross Sectional Area of the Stack and the Sampling Nozzle - pmr_a (lb/hr)

$$pmr_a = K_3 \, \frac{W_t \, A_s}{\theta \, A_n} \qquad K_3 = 0.1323 \text{ (units conversion)}$$

14. Percent Isokineticity - %I

$$\%I = \frac{pmr_a}{pmr_c} \times 100$$

15. Average Pollutant Mass Rate - pmr_{avg} (lb/hr)

$$pmr_{avg} = \frac{pmr_a + pmr_c}{2}$$

16. Percent Excess Air - %EA

$$\%EA = \frac{\%O_2 - .5(\%CO)}{.264(\%N_2) - \%O_2 + .5(\%CO)} \, (100)$$

17. Heat Input Rate - HI (10^6 BTU/hr)

$$HI = \frac{60 \; Q_{std} \; M_d}{F(100 + \%EA)} \, (100)$$

18. Specific Emission Rate - pmr_u (lb/10^6 BTU)

$$pmr_u = \frac{pmr_{avg}}{HI}$$

NOMENCLATURE

A_n	(in^2), Cross sectional area of nozzle
A_s	(in^2), Cross sectional area of stack
A_s'	(ft^2), Cross sectional area of stack
C_p	Pitot tube calibration coefficient
%EA	Percent Excess Air
F	(scfd/10^6 BTU), F factor
ΔH	(in H_2O), Average orifice meter reading
HI	(10^6 BTU/hr), Heat Input Rate
%I	Percent Isokineticity
M	(lb/lb mole), Molecular Weight of wet gas
%M	Percent Moisture
M_d	Mole fraction of dry gas
MW_d	(lb/lb mole) Molecular weight of dry gas
$n_{\Delta p}$	Number of Δp readings
P_{atm}	(in Hg), Local atmospheric pressure
P_m	(in Hg), Absolute pressure in dry gas meter
P_s	(in Hg), Absolute stack pressure
$P_{s(gage)}$	(in H_2O), Measured static stack pressure
P_{std}	(29.92 in Hg), Standard pressure
pmr_a	(lb/hr), Pollutant mass rate based on ratio of areas
pmr_{avg}	(lb/hr), Average pollutant mass rate
pmr_c	(lb/hr), Pollutant mass rate based on concentration
pmr_u	(lb/10^6 BTU), Specific emission rate
Δp	(in H_2O), Velocity pressure
Q_s	(ft^3/min), Actual stack volume flow rate
Q_{std}	(ft^3/min), Stack volume flow rate at standard conditions

T_m (^oR), Average dry gas meter temperature

T_s (^oR), Average stack temperature

T_{std} (530 ^oR), Standard temperature

V_{lq} (ml), Liquid volume

V_m (ft^3), Sample volume measured by dry gas meter

$V_{m_{std}}$ (ft^3), Sample volume at standard conditions

V_{std} (ft^3), Total sample volume at standard conditions

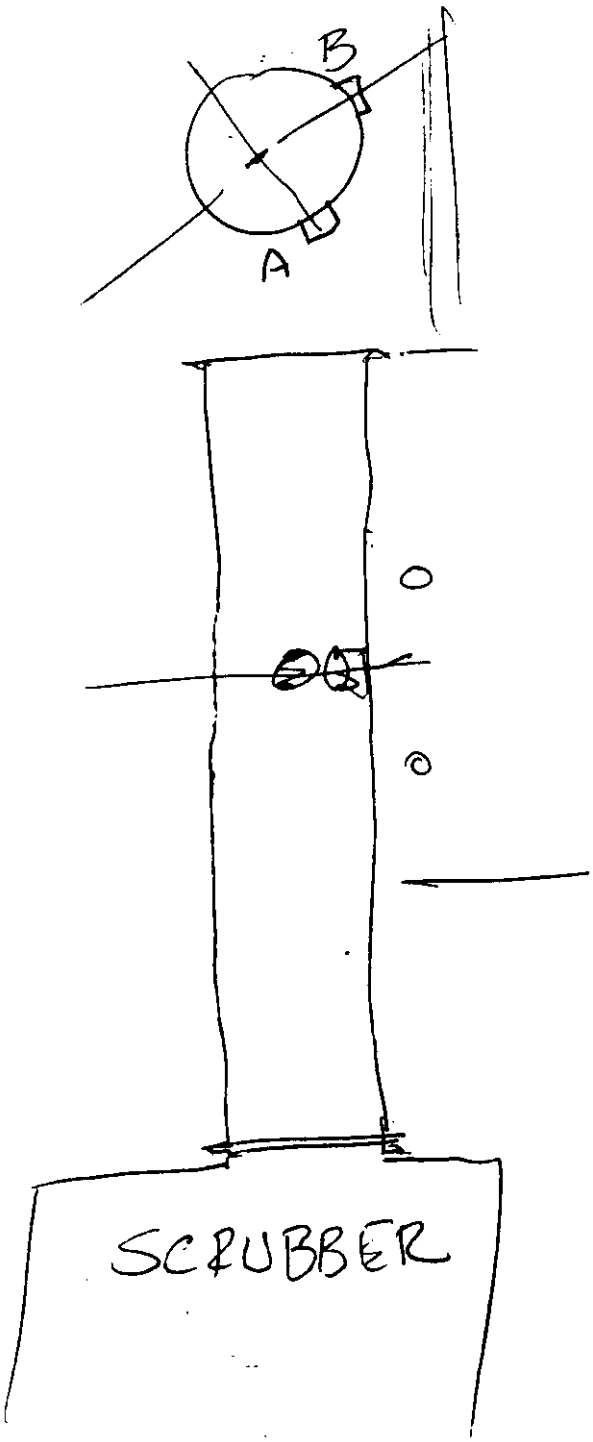
$V_{v_{std}}$ (ft^3), Volume of water vapor collected, corrected to standard conditions

v_s (ft/sec), Stack velocity

W_t (gm), Total weight of particulate collected

θ (min), Duration of test

Preliminary Field Data



Plant Feldspar Corporation

Date 7/25/78

Port Location STACK

Nearest Disturbance:

Before Port 6'-10" (3.4 dias)

After Port 5'-2"

Duct Diameter 24"

(.28' nipple length)

Point Number	% of Diameter	Distance From Near Wall
1	.016	(.032) .083
2	.049	.098
3	.085	.17
4	.125	.25
5	.169	.338
6	.220	.44
7	.283	.566
8	.375	.75
9	.625	1.25
10	.717	1.434
11	.780	1.56
12	.831	1.662
13	.875	1.75
14	.915	1.83
15	.951	1.902
16	.984	(1.968) 1.917

Sketch of stack or duct showing location of sampling ports

AQ-104 2-21-78 WOGR

ANALYTICAL DATA

Lab No. 2492

Plant FELDSPAR CORP

Run Number 1 Date 7/26/78

Location Spruce Pine

8/8/78 8/8/78 Mayer

FILTER WEIGHTS				TOTALS
Filter Number	55562			
Final Weight (g)				*
Tare Weight (g)	.3979			

WASHINGS				TOTALS
Beaker Number	6A			
Volume (Acetone)	350			
Final Weight (g)	174.6588			
Tare Weight (g)	174.1262			

ACETONE BLANK		TOTAL PARTICULATE CATCH	
Lot Number	Fisher 772553	Filter Final Weight	*
Beaker Number	2	+ Washings, Final Weight	174.6588
Volume (ml)	450	- Filter Tare	.3979
Final Weight (g)	172.7494	- Beaker Tare (Washings)	174.1262
Tare Weight (g)	172.7465	- Corrected Blank	.0023
Blank Residue (g)	.0029	= Total Particulate (g)	0.1324

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\frac{(350)}{(450)} \times (.0029) = .0023$$

IMPINGERS (1, 2, 3)		SILICA GEL	
Final Volume (ml)	466	Final Weight (g)	220.8
Initial Volume (200 ml)	200	Initial Weight (g)	200
Water Collected (ml)	266	Moisture Collected (g)	20.8

Total Water Collected (ml) 286.8

*These blocks will be blank if filter is weighed together with the washings.

10-23-75 WOGR

APPENDIX C

ANALYTICAL DATA

Lab No. 2493

8/8/78 [illegible]

√ 8/8/78 Meyer [illegible]

Plant FELDSPAR CORP.

Run Number 2 Date 7/26

Location Spruce Pine

FILTER WEIGHTS				TOTALS
Filter Number	55563			
Final Weight (g)				*
Tare Weight (g)	.4007			

WASHINGS				TOTALS
Beaker Number	BHF-6			
Volume (Acetone)	250			
Final Weight (g)	168.1747			
Tare Weight (g)	167.6846			

ACETONE BLANK		TOTAL PARTICULATE CATCH	
Lot Number	Fisher 772553	Filter Final Weight	*
Beaker Number		+ Washings, Final Weight	168.1747
Volume (ml)	from	- Filter Tare	.4007
Final Weight (g)	run	- Beaker Tare (Washings)	167.6846
Tare Weight (g)	1	- Corrected Blank	.0016
Blank Residue (g)		= Total Particulate (g)	0.0878

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\frac{(250)}{(450)} \times (.0029) = .0016$$

IMPINGERS (1, 2, 3)		SILICA GEL	
Final Volume (ml)	474	Final Weight (g)	217.5
Initial Volume (200 ml)	200	Initial Weight (g)	200
Water Collected (ml)	274	Moisture Collected (g)	17.6

Total Water Collected (ml) 291.5

*These blocks will be blank if filter is weighed together with the washings.

10-23-75 WOGR

ANALYTICAL DATA

Lab No. 2494

8/8/78

✓ 8/8/78 Meyer only

Plant FELDSPAR CORP

Run Number 3 Date 7/26/78

Location Spruce Pine

FILTER WEIGHTS				TOTALS
Filter Number	55564			
Final Weight (g)				*
Tare Weight (g)	.3969			

WASHINGS				TOTALS
Beaker Number	J			
Volume (Acetone)	400			
Final Weight (g)	175.7018			
Tare Weight (g)	175.1665			

ACETONE BLANK

Lot Number	Fisher 772553
Beaker Number	from
Volume (ml)	Run
Final Weight (g)	one
Tare Weight (g)	
Blank Residue (g)	

TOTAL PARTICULATE CATCH

Filter Final Weight	*
+ Washings, Final Weight	175.7018
- Filter Tare	.3969
- Beaker Tare (Washings)	175.1665
- Corrected Blank	.0026
= Total Particulate (g)	0.1358

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\frac{(400)}{(450)} \times (.0029) = .0026$$

IMPINGERS (1, 2, 3)

Final Volume (ml)	461
Initial Volume (200 ml)	200
Water Collected (ml)	261

SILICA GEL

Final Weight (g)	216.8
Initial Weight (g)	200
Moisture Collected (g)	16.8

Total Water Collected (ml) 277.8

*These blocks will be blank if filter is weighed together with the washings.

10-23-75 WOGR

APPENDIX C

Attn. Shanklin

ANALYTICAL DATA

Lab No. 2495

Plant FELDSPAR CORD

Run Number 1 Back Half Date 7/26/78

Location Spruce Pine

8/8/78

8/8/78 meye

FILTER WEIGHTS				TOTALS
Filter Number				
Final Weight (g)				*
Tare Weight (g)				

WASHINGS				TOTALS
Beaker Number	6			
Volume (~~Acetone~~)	400ml			
Final Weight (g)	147.2537			
Tare Weight (g)	147.2519			

ACETONE BLANK	
Lot Number	
Beaker Number	
Volume (ml)	
Final Weight (g)	
Tare Weight (g)	
Blank Residue (g)	

TOTAL PARTICULATE CATCH	
Filter Final Weight	*
+ Washings, Final Weight	147.2537
- Filter Tare	
- Beaker Tare (Washings)	147.2519
- Corrected Blank	
= Total Particulate (g)	0.0018

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\frac{(\quad\quad)}{(\quad\quad)} \times (\quad\quad) = \_\_\_\_$$

IMPINGERS (1, 2, 3)		SILICA GEL	
Final Volume (ml)		Final Weight (g)	
Initial Volume (200 ml)		Initial Weight (g)	
Water Collected (ml)		Moisture Collected (g)	

Total Water Collected (ml) ____

*These blocks will be blank if filter is weighed together with the washings.

10-23-75

APPENDIX C

ATTN Shanklin

ANALYTICAL DATA

Lab No. 2496

8/8/78

Plant FELDSPAR

Run Number 2 BACK HALF Date 7/26/78

Location Spruce Pine

✓ 8/8/7

FILTER WEIGHTS				TOTALS
Filter Number				
Final Weight (g)				*
Tare Weight (g)				

WASHINGS				TOTALS
Beaker Number	L			
Volume ~~(Acetone)~~	400			
Final Weight (g)	132.6947			
Tare Weight (g)	132.6926			

ACETONE BLANK

Lot Number

Beaker Number

Volume (ml)

Final Weight (g)

Tare Weight (g)

Blank Residue (g)

TOTAL PARTICULATE CATCH

Filter Final Weight *

+ Washings, Final Weight 132.6947

- Filter Tare

- Beaker Tare (Washings) 132.6926

- Corrected Blank

= Total Particulate (g) 0.0021

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\frac{(\quad)}{(\quad)} \times (\quad) = \_\_\_\_$$

IMPINGERS (1, 2, 3)

Final Volume (ml)

Initial Volume (200 ml)

Water Collected (ml)

SILICA GEL

Final Weight (g)

Initial Weight (g)

Moisture Collected (g)

Total Water Collected (ml)

*These blocks will be blank if filter is weighed together with the washings.

APPENDIX C

Attn Shanklin

ANALYTICAL DATA

Lab No. 2497

Plant FELDSPAR CORP

Run Number 3 backhalf Date 7-26-78

Location SPRUCE PINE

8/8/78 [illegible]

8/8/78 Meyer

FILTER WEIGHTS				TOTALS
Filter Number				
Final Weight (g)				*
Tare Weight (g)				

WASHINGS				TOTALS
Beaker Number	B			
Volume ~~(Acetone)~~	500			
Final Weight (g)	182.0273			
Tare Weight (g)	182.0250			

ACETONE BLANK		TOTAL PARTICULATE CATCH	
Lot Number		Filter Final Weight	*
Beaker Number		+ Washings, Final Weight	182.0273
Volume (ml)		- Filter Tare	
Final Weight (g)		- Beaker Tare (Washings)	182.0250
Tare Weight (g)		- Corrected Blank	
Blank Residue (g)		= Total Particulate (g)	0.0023

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\frac{(\quad)}{(\quad)} \times (\quad) = \_\_\_\_$$

IMPINGERS (1, 2, 3)		SILICA GEL	
Final Volume (ml)		Final Weight (g)	
Initial Volume (200 ml)		Initial Weight (g)	
Water Collected (ml)		Moisture Collected (g)	

Total Water Collected (ml) _____

*These blocks will be blank if filter is weighed together with the washings.

15 T/7 hr
7½/Dryer
"New Dryer"

AIR QUALITY SECTION
SOURCE SAMPLING FIELD DATA

Plant Feldspar Corporation
Date 7/26/78
Location Spruce Pine
Sample Type Particulate
Run Number 1
Operator JAG
Sample Box No. 1
Meter Box No. 2

Meter $\Delta H_@$ 1.856
C Factor Varies, .56 @ 165
Probe Type Pyrex
Probe Length 5'
Probe Tip Dia., In. .306
Probe Heater Setting Hi
Heater Box Setting Hi
Assumed Moisture % Varies, 35% @ 165

Ambient Temperature 70 F
Barometric Pressure, In. Hg. 27.85
Static Pressure (P_s),
Stack Dimension(s) 24"
Distance: Disturbance to port 6'-10"
Distance: Port to exit 5'-2"
Leak Rate .001/.002 cfm@ 15/14½
Filter number(s) 55562

Remarks:

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
A 1	0 0942½	315.900	.55		3.15	150		88	6	150	65
2	2	317.92	.56		3.20	150		88	6	160	47
3	4	319.94	.56		3.20	155		89	6½	170	45
4	6	321.97	.56		3.20	155		90	6½	175	48
5	8	323.96	.49	2.00	2.85	160		91	6½	190	—
6	10	325.—	.39		1.90	160		92	5	190	59
7	12	327.66	.22		1.05	160		93	3	195	60
8	14	328.92	.12	.50	.48	165		94	2½	200	64
9	16	329.—	.05		.22	165		95	2	200	65
10	18	330.61	.22		.95	165		95	3	205	65
11	20	331.67	.48		2.10	165		96	5	200	65
12	22	333.23	.66		2.95	165		98	6½	200	65
13	24	335.—	.88	3.80	3.80	165		99	8	200	67
14	26	337.27	1.10	4.60	4.60	165		100	10	195	70
15	28	339.—	1.35	5.10	5.80	170		102	13	195	76
16	30	342.25	1.25	4.30	4.75	175		103	10½	190	84
A 17	32	344.685									

AQ-44

12-15-72 6-2-76

Plant Feldspar Corporation Run No. 1 Date 7/26/78

TRAVERSE POINT NUMBER	SAMPLING TIME min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
B1	32	344.685	0.76		2.65	175		103	6	195	82
2	34	346.56	0.68		2.40	175		103	5½	195	63
3	36	348.39	0.70		2.45	175		104	6	190	62
4	38	350.23	0.74		2.60	175		104	6	195	62
5	40	352.12	0.71		2.50	175		104	6½	195	60
6	42	354.00	0.57		2.00	175		105	5	195	60
7	44	355.69	0.36		1.30	175		105	4	190	60
8	46	357.–	0.20	0.7	0.20	175		105	4	180	61
9	48	358.41	0.12		0.36	180		105	3	190	60
10	50	–	0.31		0.85	180		105	3	195	61
11	52	360.34	0.52		1.40	180		105	4½	200	60
12	54	361.70	0.68		1.85	180		105	5	200	58
13	56	363.26	0.88	2.40	2.40	180		106	6	200	58
14	58	365.01	0.92		2.50	180		107	6	200	58
15	60	366.87	0.84		2.70	175		108	6½	205	59
16	62	368.81	0.91		2.85	175		109	7	200	60
B16	64	370.748									
					76.7/32	5420/32		3196/32			
DIFF.	64	54.848	–								
AVG.	–	–	(.7450)		2.40	169°F		100°F			
						629°R		560°F			
		$\Sigma T_{\Delta p}$	23.8402								
		$n_{\Delta p}$	32								
					Leak	Check	OK				

AQ-44 (con.)

12-15-72 WOOD

AIR QUALITY SECTION

SOURCE SAMPLING FIELD DATA

Plant Feldspar Corporation
Date 7/26/78
Location Spruce Pine
Sample Type Particulate
Run Number 2
Operator Comer
Sample Box No. 2
Meter Box No. 2

Meter $\Delta H_@$ 1.856
C Factor Varies
Probe Type Pyrex
Probe Length 6'
Probe Tip Dia., In. .301
Probe Heater Setting Hi
Heater Box Setting Hi
Assumed Moisture % Varies

Ambient Temperature 80°F
Barometric Pressure, In. Hg. 26.8
Static Pressure (P_s),
Stack Dimension(s) 24"
Distance: Disturbance to port 6'-10"
Distance: Port to exit 5'-2"
Leak Rate .001 cfm@ 15 1/2
Filter number(s) 55563

Remarks:

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O Yellow	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
B1	0 11:31	371.100	.61	~~2.35~~	2.35	170		102	5	180	58
2	2	—	.69	2.6	2.6	170		102	5	185	52
3	4	374.79	.67		2.55	170		102	5	190	48
4	6	376.52	.73		2.8	170		102	6	199	48
5	8	378.42	.72		2.75	170		102	6	202	52
6	10	380.33	.67		2.55	175		103	6	205	53
7	12	382.18	.53		1.80	175		104	5	209	58
8	14	383.78	.33		1.15	175		104	3.5	208	62
9	16	385.09	.05		.17	175		105	2	206	65
10	18	385.80	.21		.70	175		105	3	205	64
11	20	386.71	.45		1.5	175		105	4	205	64
12	22	388.03	.58		1.9	170		106	4	205	64
13	24	389.63	.71		2.8	170		106	6	205	64
14	26	391.46	.76		3.15	170		107	6	205	64
15	28	393.45	.84		3.25	170		108	7	205	66
16	30	395.51	.84		3.25	170		109	7	205	68
B16	32	397.689									

AQ-44

Plant Feldspar Corporation Run No. 2 Date 7/26/78

TRAVERSE POINT NUMBER	SAMPLING TIME min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
A1	32 12:04	397.689	.51		2.1	170		110	4	209	65
2	34	399.30	.53		2.1	170		110	5	210	66
3	36	401.00	.56		2.25	170		112	5	210	63
4	38	402.65	.61		2.45	170		112	5	210	61
5	40	404.41	.61		2.45	170		112	5	212	59
6	42	406.21	.54		2.1	170		112	5	212	58
7	44	407.89	.39		1.5	170		113	4	206	57
8	46	409.34	.27		1.1	170		114	3	205	57
9	48	410.61	- Rev flow		0	175		114	0	205	58
10	50	411	.19		.64	175		114	2	200	59
11	52	412.58	.38		1.25	175		113	3.5	199	56
12	54	413.72	.61		2.35	170		112	5	200	56
13	56	415.45	.81	3.1	3.1	170		114	6.5	203	54
14	58	417.45	.96	3.7	4.7	170		114	8.5	205	54
15	60	419.73	1.0		4.0	170		114	7	206	56
16	62	422.07	1.05		4.0	170		115	8	207	58
16	64	424.376									
					71.36/32	5435/32		3477/32			
DIFF	64	53.276									
AVG.	-	-	(.7277)		2.23	171.4		108.7			
		$\Sigma\sqrt{\Delta p_s}$	23.2852			631.4°R		568.7			
		$n\Delta p$	32								
		Leak Check									
				.001	cf	in	1 min				

AQ-44 (con.)

AIR QUALITY SECTION

SOURCE SAMPLING FIELD DATA

Plant Feldspar Corporation
Date 7/26/78
Location Spruce Pine
Sample Type Particulate
Run Number 3
Operator JAS
Sample Box No. 3
Meter Box No. 2

Meter $\Delta H_@$ 1.856
C Factor Varies
Probe Type Pyrex
Probe Length 5'
Probe Tip Dia., In. .308
Probe Heater Setting HI.
Heater Box Setting HI.
Assumed Moisture % Varies

Ambient Temperature 80F
Barometric Pressure, In. Hg. 26.80
Static Pressure (P_s),
Stack Dimension(s) 24"
Distance: Disturbance to port 6-10"
Distance: Port to exit 5-2"
Leak Rate .001/.01 cfm@ 15/11½
Filter number(s) 53564

Remarks:

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
A1	0	1312	424.518	0.32		1.25	170		103	3½	200	63
2	2		425.83	0.42		1.60	170		104	—	198	59
3	4		427.30	0.52		2.00	170		104	5	200	55
4	6		428.86	0.60		2.25	170		104	6	202	55
5	8		430.57	0.64		2.45	173		105	7	205	57
6	10		432.39	0.53	1.80	2.00	175		106	6	205	60
7	12		434.08	0.37		1.25	175		107	4½	205	67
8	14		435.47	0.27		0.90	175		107	3½	205	73
9	16		436.64	0.20		0.66	175		108	3	205	76
10	18		437.66	0.31		1.05	175		109	3½	210	70
11	20		438.81	0.57		1.90	175		109	5	205	66
12	22		440.24	0.81		2.70	175		110	7	205	62
13	24		442.06	0.86		2.90	175		111	8	210	67
14	26		444.05	0.94		3.05	175		112	8½	215	61
15	28		446.14	0.97		3.20	175		113	—	215	64
16	30		448.17	1.20		3.90	175		114	10½	215	65
A16	32		450.403									

AQ-44

12-15-72 6-2-76

Plant Feldspar Corporation Run No. 3 Date 7/26/78

TRAVERSE POINT NUMBER	SAMPLING TIME min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
B1	32	1353	450.403	0.80		2.20	180		114	6	220	65
2	34		452.19	0.76		2.10	177		114	5½	220	50
3	36		453.89	0.82		2.25	178		114	6	215	47
4	38		455.63	0.77		2.10	180		114	6	215	47
5	40		457.33	0.75		2.00	180		115	5½	210	47
6	42		459.12	0.70		1.85	182		116	5½	210	47
7	44		460.60	0.52		1.40	182		117	4½	210	47
8	46		462.03	0.35		0.96	183		117	4	205	47
9	48		463.24	0.27		0.72	183		118	3½	205	47
10	50		464.30	0.26	?	0.70	205		118	3½	210	47
11	52		465.30	0.40	?	0.75	200		118	3½	210	47
12	54		466.35	0.43		0.80	200		119	3½	210	47
13	56		467.40	0.62		1.15	200		119	4	210	47
14	58		468.61	0.85		1.60	200		120	5	210	47
15	60		469.99	0.99		1.80	200		121	5½	210	47
16	62		471.—	1.15		2.10	202		121	6	210	47
B16	64		473.157									
						57 54/32	5810/32		3601/32			
				$\Sigma\sqrt{\Delta p}$	24.6607							
DIFF.	64		48.639	$n\Delta p$	32							
AVG.	—		-	Avg.	(.7706)	1.80	181.56		112.53			
							641.6		572.5			

AQ-44 (con.)

12-15-72 WQ25

NOMOGRAPH DATA

PLANT Feldspar Corporation

DATE 7/26/78

SAMPLING LOCATION Stack

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m_{avg.}}$	
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	35
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	-0.7
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	164
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.59
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	1.20
C FACTOR	.56	
CALCULATED NOZZLE DIAMETER, in.	~~.50~~ .28	
ACTUAL NOZZLE DIAMETER, in.	.301 .306	
REFERENCE Δp, in. H_2O		

EPA (Dur) 234
4/72

Addendum to Appendix E

Feldspar Corp

T_s	Saturated %M	"C" Factor	Ref. Δp	T_s
100	7			100
105	8			105
110	9			110
115	10			115
120	11.5			120
125	13			125
130	15			130
135	17	.89		135
140	19.5	.80		140
145	22	.77	.30	145
150	24.5	.74		150
155	28	.67	.35	155
160	32	.62		160
165	32.5	.56	.42	165
170	38.0	.52	~~.42~~	170
175	44.5	off scale	.65	175
(180)	(49)			(180)
(185)	(56.5)			
(190)	(62.5)			