AP42 Section:	11.25
Background Chapter	4
Reference:	6
Title:	*Source Test Report, Plant B, Number 1 Kiln Outlet Particulate Emissions*, Technical Services, Inc., Jacksonville, FL, February, 1979.

Section 4 Reference 6
AP-42 Reference __

Emission Test Report Review Checklist--Short Form

Reviewer: Brian Shrager
Review Date: 4/29/93

A. Background Information

1. Facility name: Waverly Mineral Products
   Location: Meigs, Georgia
2. Source category: Fuller's Earth
3. Test date: 9/13/78
4. Test sponsor: Industry
5. Testing contractor: Technical Services, Inc.
6. Purpose of test: To determine if scrubber system repairs were effective.
7. Pollutants measured (include test method and indicate if valid): Filterable PM - Method 5
   CO_2 - ORSAT
8. Process overview: Attach a process description and a block diagram. Identify processes tested with letters from the beginning of the alphabet (A, B, C, etc...) and APC systems with letters from the end of the alphabet (V, W, X, etc...). Also identify test locations with Arabic numerals (1,2,3, ...). Using the ID symbols from the diagram, complete the table below.

Test ID	Process	Process ID	Emissions tested		APCD (controlled emissions only)
			Uncontrolled	Controlled	
1	Rotary Kiln/Cooler Kiln #1	A		✓	ID: Z Type: (Multiclone) and wet scrubber Model #: (process)
					ID: Type: Model #:
					ID: Type: Model #:
					ID: Type: Model #:

B. Process Information

1. Provide a brief narrative description of the process and attach process flow diagram. (Note: If the process description provided in the test report is adequate, attach a copy here.)

See Section 4 Ref. 5" Process Flow Diagram.

C. 1. List any APCD parameters (supplied in the test report) below.

APCD ID	Parameter	Units	Readings			
			Run 1	Run 2	Run 3	Run 4
2	ΔP		NOT PROVIDED			
Type of APCD: Wet Scrubber						
Type of APCD:						
Type of APCD:						

2. Include any additional information (such as capture techniques for fugitive systems) and descriptions of the air pollution control systems (use a separate page if necessary).

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	°R	610	614.4	624.2	
	Moisture	%	22.6	24.7	25.8	
	Oxygen	%	17	17	17	
	Volumetric flow, actual	ACFM	38,087	37,593	38731	
	Volumetric flow, standard	DSCFM	25,662	24,465	24,414	
	Percent isokinetic		99.7	104.4	98.4	
Circle: Production or feed rate Capacity:		~~AVG~~ TPH	~~9.18~~ 6.58	~~9.18~~ 10.84	~~9.18~~ 10.11	AVE 9.18
	Pollutant concentrations:					
	Filt. PM	gr/DSCF	0.0560	0.0591	0.0529	
	CO_2	%	3	3	3	
	Pollutant mass flux rates:					
	Filt. PM	lb/hr	12.32	12.38	11.07	
	*CO_2	lb/hr	5307	5060	5049	
	Emission factors:		1.87	1.14	1.10	1.37
	Filt. PM	lb/ton	~~1.34~~	~~1.35~~	~~1.21~~	~~1.3~~
	CO_2	lb/ton	~~580~~	~~550~~	~~550~~	~~560~~
			867	467	499	611

* $\%/100 \times 0.1149 \times DSCFM \times 60 = lb/hr$

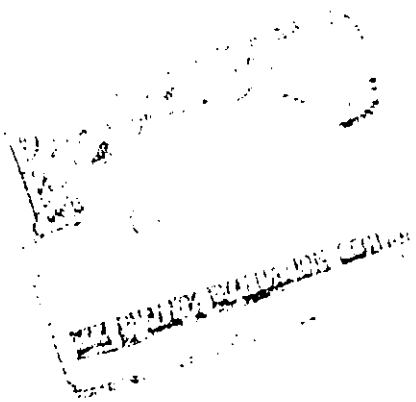
A-82-39
II-A-53

SOURCE TEST REPORT
WAVERLY MINERAL PRODUCTS COMPANY
MEIGS, GEORGIA

SEPTEMBER 13, 1978

NUMBER 1 KILN OUTLET
PARTICULATE EMISSIONS

(FULLER'S EARTH)



PREPARED BY:

STEPHEN L. NECK, B.S.M.E., P.E.

TECHNICAL SERVICES, INC.
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JACKSONVILLE, FLORIDA 32201

TABLE OF CONTENTS

I. INTRODUCTION

Particulate emission testing was performed on Scrubber #1 that receives particulate matter from Kiln and Cooler #1 at the Waverly Mineral Products Company plant in Meigs, Georgia.

The wet scrubber system had been recently repaired in hope of reducing emission to within compliance limitations. This present testing was initiated to determine if the repairs were successful.

The testing was performed on September 13, 1978 by personnel of Technical Services, Inc. of Jacksonville, Florida. Three test runs were made using the modified E. P.A. method 5 sampling train.

II. SUMMARY AND DISCUSSION OF RESULTS

Results of the testing are summarized in Table I. Complete emission data and process weight determinations are located in Appendix.

The first test was conducted on a single pass operation while runs two and three were conducted on a double pass system (Section III).

Allowable emissions for each run are:

$$E_1 = 4.1(6.58)^{0.67} = 14.48 \text{ lb/hr.}$$

$$E_2 = 4.1(10.84)^{0.67} = 20.24 \text{ lb/hr.}$$

$$E_3 = 4.1(10.11)^{0.67} = 19.32 \text{ lbs/hr.}$$

Compliance performance is therefore demonstrated for each test run and for both feed conditions.

4

TABLE 1

EMISSION SUMMARY

DATE	RUN NO.	TIME	EMISSION			% H_2O	VOLUMETRIC FLOW		STACK TEMPERATURE °F
			GRAINS/ACF	GRAINS/S.C.F.	LBS/HR.		ACMF	SCFMD	
9/13/78	1	0955-1100	0.0377	0.0560	12.32	22.6	38087	25662	150.0
9/13/78	2	1307-1409	0.0385	0.0591	12.38	24.7	37953	24465	154.4
9/13/78	3	1533-1637	0.0333	0.0529	11.07	25.8	38731	24414	164.2
	MEAN		0.0365	0.0560	11.92	24.4	38137	24847	156.2

CO_2 = 3% O_2 = 17° N_2 = 80%

STACK GAS SPECIFIC GRAVITY RELATIVE TO AIR = 0.91

III. PROCESS DESCRIPTION AND OPERATION WITH FLOW DIAGRAM

The Waverly Mineral Products Company in Meigs, Georgia, mines, dries and processes clay for absorbent products.

Kiln #1 receives raw clay from C-3, as per attached Flow Diagram, that contains approximately fifty percent (50%) moisture. Depending upon customer requirement, Kiln #1 is operated in either one of two procedures referred to as single pass or double pass. On single pass operation, all the drying received by the clay from its crude or raw state to its finished or packaged state, is performed in Kiln #1. For this reason, the raw clay input feed rate to Kiln #1 is substantially lower on single pass as compared to double pass. On double pass operation, the raw clay is partially dried in Kiln #1 and receives further drying in Kiln #2. For this reason, maximum raw clay input feed rate to Kiln #1 can be achieved. The first tonnage check and the first moisture sample were taken on single pass. The second and third tonnage check plus the second and third moisture samples were taken on double pass.

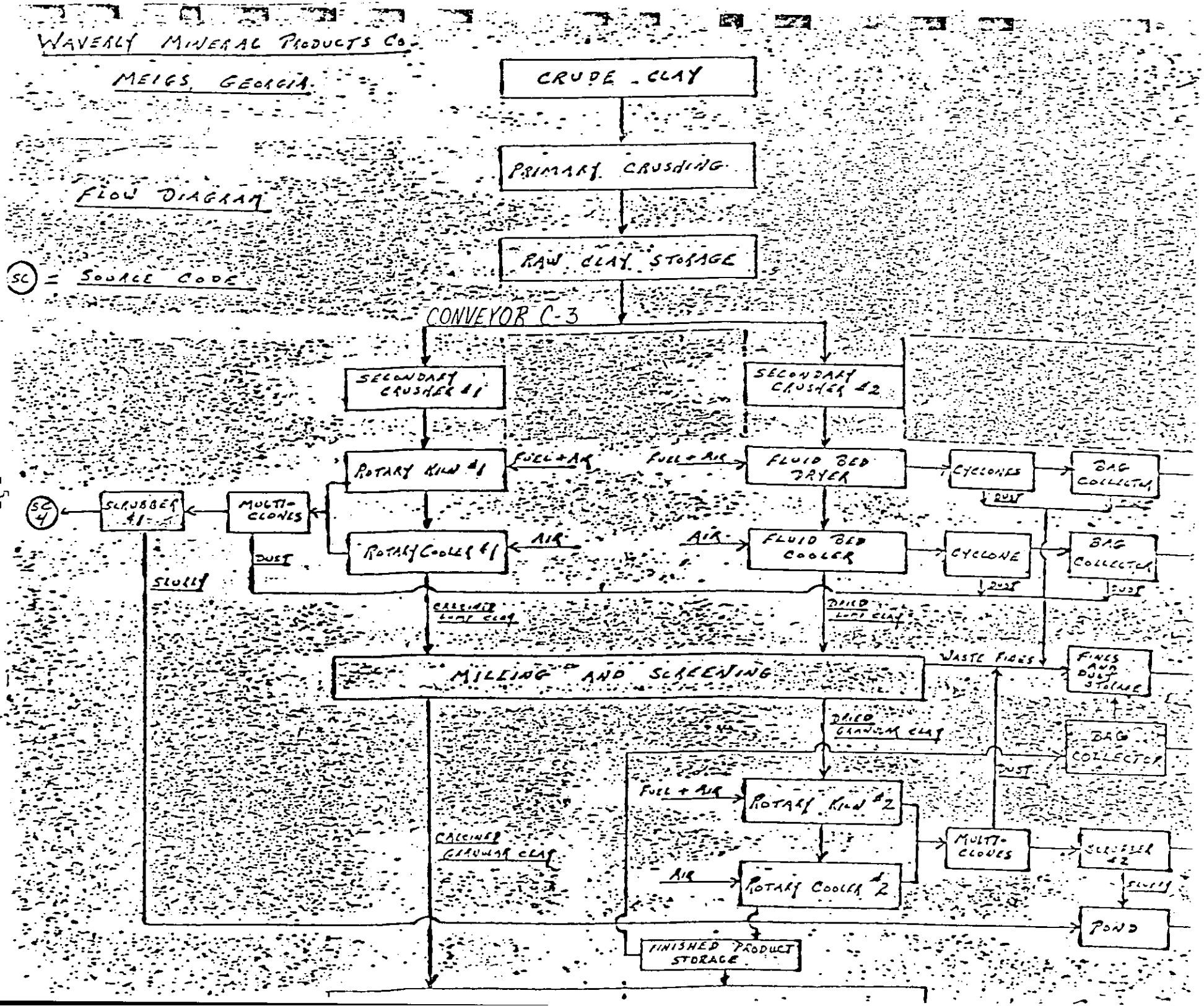
The Kiln and Cooler #1 vent gases pass through a bank of miniature cyclone dry collectors and then the wet scrubber before emission to the atmosphere.

WAVERLY MINERAL PRODUCTS CO.

MEIGS, GEORGIA.

FLOW DIAGRAM

(SC) = SOURCE CODE

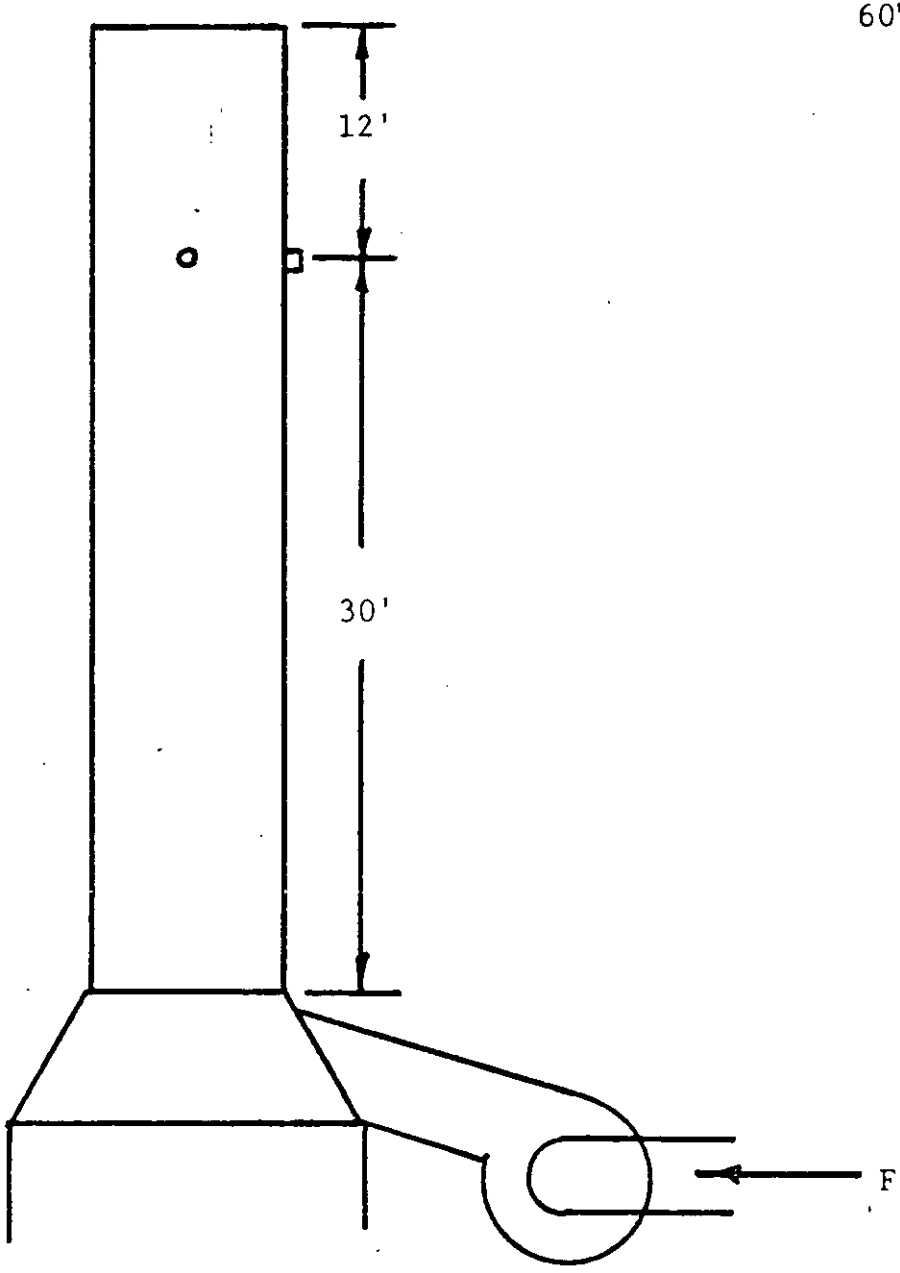


IV. SAMPLING POINT LOCATION

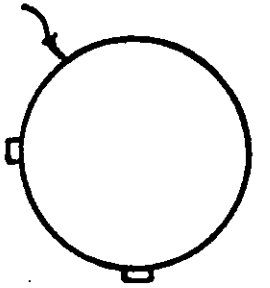
The sampling point location and outlet duct schematic are given in Figure 2.

FIGURE 2

NUMBER 1 KILN OUTLET



60" I.D.



TRAVERSE POINT NUMBER	INCHES INSIDE STACK WALL
1	1.50
2	4.92
3	8.76
4	13.56
5	20.52
6	39.48
7	46.68
8	51.24
9	55.08
10	58.5

6

V. FIELD AND ANALYTICAL PROCEDURES

Sampling

The sampling apparatus consisted of the following:

1. Nozzle - Stainless steel with a sharp, tapered leading edge.

2. Probe - Stainless steel sheath with a 5/8-inch O.D. Pyrex glass insert wrapped with asbestos covered nichrome wire. Rheostat controlled and capable of maintaining a minimum temperature of 250°F.

3. Pitot - Type "S" attached to the probe.

4. Filter Holder - Pyrex glass with fritted glass filter support.

5. Impingers - Four impingers connected in series with glass ball joint fittings. The first, third and fourth impingers are the modified Greenburg-Smith design. The second impinger is the Greenburg-Smith design with a standard tip.

6. Filter/Impinger Box - Aluminum module with heating system for maintaining the filter holder at a minimum temperature of 225°F for particulate sampling and an area for the impingers to be placed in an ice bath.

7. Control Box - Module containing vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within ±5°, dry gas meter with a minimum of 2 percent accuracy, valves and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

8. Barometer - Aneroid type to measure atmospheric pressure to ±0.1 inches Hg.

A schematic of the sampling train is shown in Figure 3.

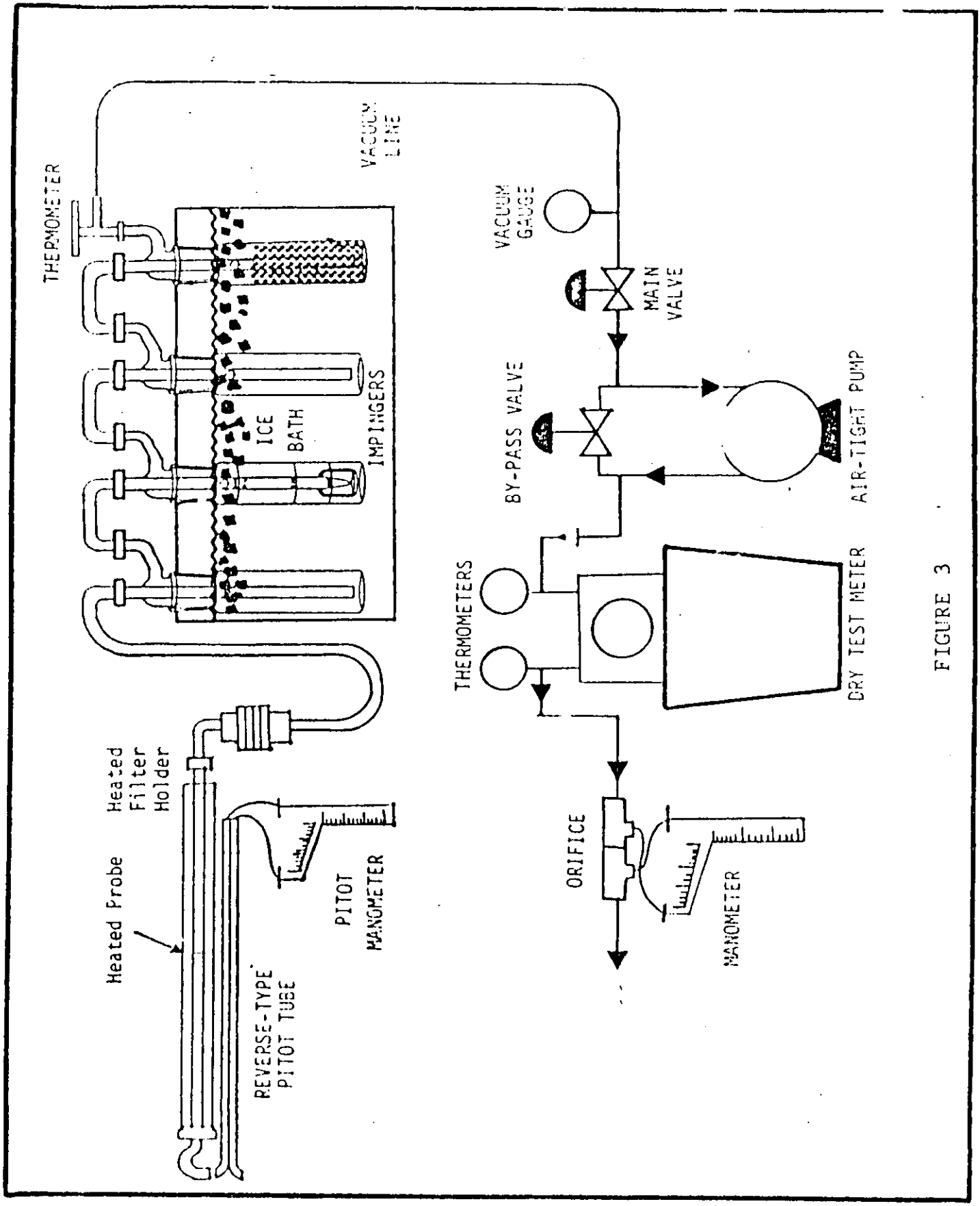

THERMOMETER
VACUUM LINE
ICE BATH
IMPINGERS
VACUUM GAUGE
MAIN VALVE
BY-PASS VALVE
AIR-TIGHT PUMP
THERMOMETERS
DRY TEST METER
Heated Probe
Heated Filter Holder
REVERSE-TYPE PITOT TUBE
PITOT MANOMETER
ORIFICE
MANOMETER

FIGURE 3

11

Prior to leaving the laboratory, glass fiber filters (type MSA 1106 BH) had been numbered for identification, desiccated for at least 24 hours, and preweighed to the nearest 0.1 mg. Silica gel (indicating type, 6-16 Mesh) had also been preweighed to approximately 200 grams after drying at 175°F for 2 hours.

The sample train was prepared in the following manner: 100 ml of distilled water was added to each of the first two impingers. The third impinger was left empty to act as a moisture trap, and the preweighed silica gel was added to the fourth impinger. After assembling the train with the probe as shown in the schematic, the system was leak checked by plugging the inlet to the probe nozzle and pulling a 15-inch Hg vacuum. A leakage rate not in excess of 0.02 cfm was considered acceptable.

The inside dimensions of each stack were measured and recorded. The number of sampling points and the location of these points on a traverse were determined by the guidelines set forth in the Federal Register, Vol. 36, No. 247, Sec. 60.85, Method 1. These points were then marked on the probe for easy visibility.

A preliminary traverse was conducted to determine the range of velocity head and the pressure of the stack. A wet bulb and a dry bulb temperature were taken to determine stack temperature and moisture. From this data, the correct nozzle size and the nomograph correction factor were determined.

The probe was attached and the heater was adjusted to provide a gas temperature of approximately 250°F. The filter heating system was turned on (during particulate sampling) and crushed ice was placed around the impingers. After a suitable warm-up period, the nozzle was placed on the first traverse point with the tip pointing directly into the gas stream. The pump was started immediately and the flow was adjusted to isokinetic conditions. After the required time interval had elapsed, the probe was repositioned to the next traverse point and isokinetic sampling was re-established. This was done for each point on the traverse until the run was completed. Readings were taken at least every five minutes or when significant changes in stack conditions necessitated additional adjustments in flow rate. At the conclusion of each run, the pump was turned off and the final readings were recorded. A final leak check of the system was performed as previously described.

Particulate Sample Recovery

Care was exercised in moving the collection train to the sample recovery area to minimize the loss of collected sample or the gain of extraneous particulate matter. The volume of water in the first three impingers was measured and recorded on the field data sheet. The probe, nozzle, and all sample-exposed surfaces were washed with reagent grade acetone and put into a clean sample bottle marked "prefilter." A brush was used to loosen any adhering particulate matter and subsequent washings were put into the "prefilter" container. The filter was carefully removed from the fritted glass support and placed in a clean Petri dish marked "filter". The silica gel was removed from the fourth impinger and transferred to its original container. A sample of the acetone used in washing the probe was saved for a blank laboratory analysis.

Particulate Analytical Procedures

The filter and any loose particulate matter were transferred from the sample bottle to a clean, tared glass weighing dish. The filter was placed in a desiccator for at least 24 hours, dried to a constant weight and then weighed. The original weight of the filter was deducted and the weight gain was recorded to the nearest 0.1 mg.

The "prefilter" solution was transferred to a clean, tared beaker. The solution was evaporated to dryness, desiccated to a constant weight and the weight gain was recorded to the nearest 0.1 mg. The silica gel was weighed and the weight gain was recorded to the nearest 0.1 gram.

APPENDIX A

COMPLETE EMISSION DATA

SOURCE SAMPLING NOMENCLATURE SHEET

PB - Barometric pressure, inches Hg
PS - Stack pressure, inches Hg
AS - Effective area of positive stack gas flow, sq.ft.
As - Stack area, sq. ft.
NPTS - Number of traverse points where the pitot velocity head was greater than zero.
TS - Stack temperature, ^{o}R
TM - Meter temperature, ^{o}R
$\overline{H}$ - Average velocity head, inches H_2O
$\overline{\Delta H}$ - Average meter orifice pressure differential, inches H_2O
AN - Sampling nozzle area, square feet
CP - S-type pitot tube correction factor
VM - Recorded meter volume sample, cubic feet (meter conditions)
VC - Condensate and silica gel increase in impingers, milliliters
Po - Pressure at the dry test meter orifice, $\left[PB + \frac{H}{13.6}\right]$ inches Hg.
STP - Standard conditions, dry, $68^{o}F$, 29.92 inches Hg.

VWV - Conversion of condensate in milliliters to water vapor in cubic feet (STP)
VSTPD - Volume sampled, cubic feet (STP)
VT - Total water vapor volume and dry gas volume sampled, cubic feet (STP)
W - Moisture fraction of stack gas
FDA - Dry gas fraction
MD - Molecular weight of stack gas, lbs/lb-mole (dry conditions)
MS - Molecular weight of stack gas, lbs/lb-mole (Stack conditions)
GS - Specific gravity of stack gas, referred to air
EA - Excess air, %
$\sqrt{\overline{H}xTS}$ - Average square root of velocity head times stack temperature
U - Stack gas velocity, feet per minute
QS - Stack gas flow rate, cubic feet per minute (stack conditions)
QD - Stack gas flow rate, cubic feet per minute (dry conditions)
QSTPD - Stack gas flow rate, cubic feet per minute (STP)
PISO - Percent isokinetic volume sampled (method described in Federal Register)
ESTP - Particulate concentration at standard and dry conditions, grains/scf
E_{12} - ESTP corrected to 12% CO_2, grains/scf
E_{50} - ESTP corrected to 50% excess air, grains/scf
EM - Mass emission rate, lbs/hr

EQUATIONS FOR CALCULATING PARTICULATE EMISSIONS

$$VWV = (0.0472) \times (VC)$$

$$VSTPD = (17.65) \times (VM) \times \left(PB + \frac{\Delta H}{13.6}\right) \div TM$$

$$VT = (VWV) + (VSTPD)$$

$$W = (VWV) \div (VT)$$

$$FDA = (1.0) - (W)$$

FMOIST = Assumed moisture fraction

$$MD = (0.44 \times \%\ CO_2) + (0.32 \times \%\ O_2) + (0.28 \times \%\ N_2) + (0.28 \times \%\ CO)$$

$$MS = (MD \times FDA) + (18 \times W)$$

$$GS = (MS) \div (28.99)$$

$$EA = \left[(100) \times \left(\%\ O_2 - \frac{\%\ CO}{2}\right)\right] \div \left[(0.266 \times \%\ N_2) - \left(O_2 - \frac{\%\ CO}{2}\right)\right]$$

$$\underline{U} = (174) \times (CP) \times \sqrt{(\underline{H})} \times \sqrt{(TS \times 29.92) \div (GS \times PS)}$$

$$QS = (\underline{U}) \times (AS)$$

$$QD = (QS) \times (FDA)$$

$$QSTPD = (528) \times (QD) \times (PS) \div TS \div 29.92$$

$$PISO = \left[(0.00267 \times VC \times TS) + (P_Q \times TS \times VM \div TM)\right] \div \left[(Time \times \underline{U} \times PS \times AN)\right]$$

$$ESTP = \frac{\left(\frac{15.43\ grains}{gram}\right)(y)}{VSTPD}$$

$$E_{12} = \frac{(ESTP)\ (12)}{(CO_2\ \%)}$$

$$E50 = \frac{(ESTP)\ (100 + EA)}{150}$$

$$EM = (ESTP)\ (QSTPD)\ \left(60\ \frac{min}{hr}\right)\ \left(\frac{1b}{7000\ grains}\right)$$

TEL. (904) 353-5761

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PLANT- WAVERLY MINERAL PRODUCTS, MEIGS, GA. DATE- 9/13/78
STACK- NO. 1 KILN OUTLET RUN 1 FROM 0955-1100
WEATHER CONDITIONS- CLEAR PB- 30.10 IN HG PS- 30.09 IN HG
AS'- 19.63 SQ. FEET TS- 610 °R TM- 550.4 °R
ΔH-0.267 IN H_2O ΔH- 1.30 IN H_2O AN-.000484 SQ.FT. CP- 0.84
VM- 39.082 CF VC- 234 ML TOTAL TIME- 60 MIN NPTS- 20
ORSAT: CO_2- 3 % O_2-17 % CO- 0 % N_2- 80 %

1.	Volume Water Vapor	1. 11.04	SCF
2.	Gas Volume Sampled - STPD	2. 37.84	SCFD
3.	Total Volume	3. 48.88	SCF
4.	Moisture in Stack Gas - Volume Fraction	4. 0.226	
5.	Dry Stack Gas - Volume Fraction	5. 0.774	
6.	Assumed Moisture in Stack Gas - Volume Fraction	6. 0.25	
7.	Molecular Weight of Stack Gas - Dry Basis	7. 29.16	
8.	Molecular Weight of Stack Gas - Stack Conditions	8. 26.64	
9.	Specific Gravity of Stack Gas Relative to Air	9. 0.919	
10.	Excess Air - Percent	10. 413	%
11.	Average of Factor ($\sqrt{H} \times TS$)	11. 12.76	
12.	Average Stack Velocity	12. 1940	FPM
13.	Actual Stack Gas Flow Rate	13. 38087	ACFM
14.	Actual Stack Gas Flow Rate Dry	14. 29480	CFMD
15.	Stack Gas Flow Rate - STPD	15. 25662	SCFMD
16.	Percent Ioskinetic	16. 99.7	%

	MG	GR/SCF	GR/ACF	LBS/HR
Filter	112.1	0.0457	0.0308	10.05
Prefilter	25.3	0.0129	0.0069	2.27
Total	137.4	0.0560	0.0377	12.32

Comments:

Tests Conducted by:

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1037 STOCKTON STREET
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JACKSONVILLE, FLORIDA 32201

PLANT- WAVERLY MINERALS PRODUCTS, MEIGS, GEORGIA DATE- 9/13/78
STACK- NO. 1 KILN OUTLET RUN 2 FROM 1307-1409
WEATHER CONDITIONS- CLEAR PB- 30.10 IN HG PS- 30.09 IN HG
AS'- 19.63 SQ. FEET TS- 614.4 °R TM- 563.0 °R
H- 0.256 IN H_2O ΔH- 1.25 IN H_2O AN- 000484 SQ.FT. CP- 0.84
VM- 39.903 CF VC- 263 ML TOTAL TIME- 60 MIN NPTS-
ORSAT: CO_2- 3 % O_2- 17 % CO- 0 % N_2- 80 %

1.	Volume Water Vapor	1. 12.41	SCF
2.	Gas Volume Sampled - STPD	2. 37.77	SCFD
3.	Total Volume	3. 50.18	SCF
4.	Moisture in Stack Gas - Volume Fraction	4. 0.247	
5.	Dry Stack Gas - Volume Fraction	5. 0.753	
6.	Assumed Moisture in Stack Gas - Volume Fraction	6. 0.25	
7.	Molecular Weight of Stack Gas - Dry Basis	7. 29.16	
8.	Molecular Weight of Stack Gas - Stack Conditions	8. 26.41	
9.	Specific Gravity of Stack Gas Relative to Air	9. 0.911	
10.	Excess Air - Percent	10. 413	%
11.	Average of Factor ($\sqrt{H} \times TS$)	11. 12.54	
12.	Average Stack Velocity	12. 1915	FPM
13.	Actual Stack Gas Flow Rate	13. 37593	ACFM
14.	Actual Stack Gas Flow Rate Dry	14. 28307	CFMD
15.	Stack Gas Flow Rate - STPD	15. 24465	SCFMD
16.	Percent Ioskinetic	16. 104.4	%

	MG	GR/SCF	GR/ACF	LBS/HR
Filter	131.5	0.0537	0.0350	11.25
Prefilter	13.2	0.0054	0.0035	1.13
Total	144.7	0.0591	0.0385	12.38

Comments: _____

Tests Conducted by: _____

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Air and Water Pollution Sampling, Surveys, Testing and Analytical Services

103-7 STOCKTON STREET
P. O. BOX 52329
JACKSONVILLE, FLORIDA 32201

PLANT- WAVERLY MINERAL PRODUCTS, MEIGS, GEORGIA DATE- 9/13/78
STACK- NO. 1. KILN OUTLET RUN 3 FROM 1533-1637
WEATHER CONDITIONS- CLEAR PB- 30.10 IN HG PS- 30.09 IN HG
AS'-19.63 SQ. FEET TS- 624.2°R TM-570.13°R
H-0.266 IN H_2O ΔH- 1.29 IN H_2O AN-.000484 SQ.FT. CP- 0.84
VM-38.035 CF VC- 263 ML TOTAL TIME- 60 MIN NPTS- 20
ORSAT: CO_2- 3 % O_2- 17 % CO- 0 % N_2- 80 %

1.	Volume Water Vapor	1. 12.41	SCF
2.	Gas Volume Sampled - STPD	2. 35.55	SCFD
3.	Total Volume	3. 47.96	SCF
4.	Moisture in Stack Gas - Volume Fraction	4. 0.258	
5.	Dry Stack Gas - Volume Fraction	5. 0.741	
6.	Assumed Moisture in Stack Gas - Volume Fraction	6. 0.250	
7.	Molecular Weight of Stack Gas - Dry Basis	7. 29.16	
8.	Molecular Weight of Stack Gas - Stack Conditions	8. 26.26	
9.	Specific Gravity of Stack Gas Relative to Air	9. 0.906	
10.	Excess Air - Percent	10. 413	%
11.	Average of Factor ($\sqrt{H} \times TS$)	11. 12.89	
12.	Average Stack Velocity	12. 1973	FPM
13.	Actual Stack Gas Flow Rate	13. 38731	ACFM
14.	Actual Stack Gas Flow Rate Dry	14. 28700	CFMD
15.	Stack Gas Flow Rate - STPD	15. 24414	SCFMD
16.	Percent Ioskinetic	16. 98.4	%

	MG	GR/SCF	GR/ACF	LBS/HR
Filter	104.3	0.0453	0.0285	9.48
Prefilter	17:5	0.0076	0.0048	1.59
Totals	121.8	0.0529	0.0333	11.07

Comments: _____

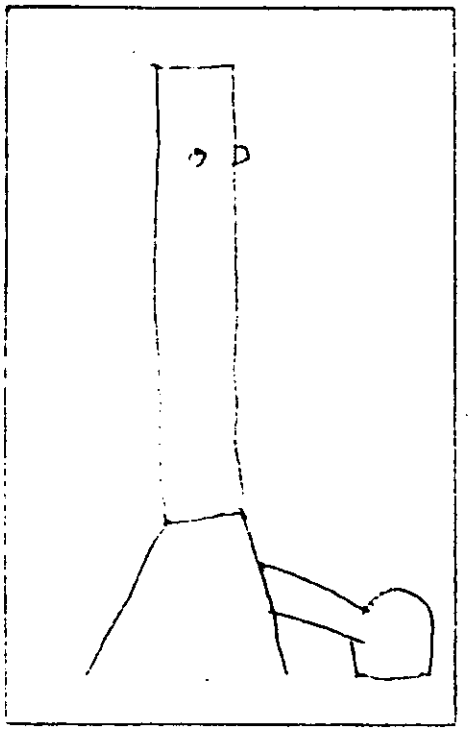
Tests Conducted by: _____

APPENDIX B

FIELD DATA SHEETS

SOURCE SAMPLING FIELD DATA SHEET

Plant WAVERLY MINERALS - MEIGS, GA.
Sample Location No. 1 SCRUBBER OUTLET
Control Device WET SCRUBBER
Type of Samples PARTICULATE
Date 9-13-78 Run No. 1
Moisture 25 %, FDA ____, Gas Density Factor ____
Barometric Press 30.10 "Hg, Stack Press ____ "Hg
Weather CLEAR
Temp. ____ °F, W/D ____, W/S ____
Sample Box No. ____ Meter Box No. 1
Meter ΔH@ 1.82 Pitot Corr. Factor .84
Nozzle Dia. .298 in., Probe Length 7 ft
Probe Heater Setting ____
Stack Dimensions: Inside Diameter 60 in
Inside Area ____ ft²
Height ____ ft
Effective Stack Area ____ ft² 20 pts. @ 3 min/pt = 60 min.



Time Start 0955
Time End 1100

Mat'l Processing Rate ____
Final Gas Meter Reading 787.700 ft³
Initial Gas Meter Reading 748.618 ft³
Total Condensate in Impingers 0.2# ml
Moisture in Silica Gel ____ gm
Silica Gel Container No. ____ Filter No. ____
Orsat: CO_2 3%
O_2 17%
CO ____
N_2 ____
Excess Air ____
Test Conducted by: NEICK BEARTON
Leak Rate 0.0" END CFM @ ~~15~~ 7.5 "Hg
Remarks: 2" ΔP

PORT AND TRAVERSE POINT NO.	INCHES INSIDE STACK WALL	CLOCK TIME	GAS METER READING (FT^3)	STACK VELOCITY HEAD ("H2O)	("H2O) ORIFICE PRESS. DROP CALC	ACTUAL	STACK GAS TEMP. (°F)	METER TEMPERATURE IN	OUT	FILTER TEMP. (°F)	LAST IMPINGER TEMP. (°F)	VACUUM ("HG)
	1.5	0958	~~744.54~~	.14	.68	.68	150	78	78	250	65	2
	4.92		~~750.67~~	.24	1.17	1.17	150	80	78	250		
	8.76		---	.21	1.41	1.41	150	83	77	270		2.5
	13.56		756.03	.34	1.65	1.65	150	90	79	270		
	20.52		758.22	.35	1.70	1.70	150	94	80	270		3.0
	39.48		761.31	.30	1.46	1.46	150	96	81	270		
	46.68		762.38	.29	1.41	1.41	150	97	81	270		
	51.24		764.31	.25	1.22	1.22	150	98	82	270		
	55.08		766.65	.21	1.02	1.02	150	99	83	270		
	58.5	1025	767.70	.21	1.02	1.02	150	100	83	270		

PORT AND TRAVERSE POINT NO.	INCHES INSIDE STACK WALL	CLOCK TIME	GAS METER READING (FT3)	STACK VELOCITY HEAD ("H20)	("H20) ORIFICE PRESS. DROP		STACK GAS TEMP. (°F)	METER TEMPERATURE		FILTER TEMP. (°F)	LAST IMPINGER TEMP. (°F)	VAC ("
					CALC.	ACTUAL		IN	OUT			
2-1		1030	~~H 30~~ 769.16	.17	.83	.83	150	97	85	270	65	2
2			771.05	.23	1.12	1.12	150	98	86	270		
3			773.00	.28	1.36	1.36	150	100	86	270		
4			775.11	.33	1.60	1.60	150	101	87	270		4
5			777.27	.33	1.60	1.60	150	103	87	270		4
6			779.54	.30	1.46	1.46	150	105	88	270		
7				.30	1.46	1.46	150	104	89	270		
8			783.75	.30	1.46	1.46	150	103	90	270		
9			785.76	.28	1.36	1.36	150	103	90	270		
10		1100	787.70	.26	1.27	1.27	150	102	91	270		

SOURCE SAMPLING FIELD DATA SHEET

Plant WAVERLY MINERAL PRODUCTS - MEIGS, GA.
Sample Location No 1 KILN OUTLET
Control Device WET SCRUBBER
Type of Samples PARTICULATE
Date 9-13-78 Run No. 2
Moisture 25 %, FDA ____, Gas Density Factor ____
Barometric Press ____ "Hg, Stack Press ____ "H2O ____ "Hg
Weather CLEAR
Temp. ____ °F, W/D ____, W/S ____
Sample Box No. ____ Meter Box No. 1
Meter ΔH@ 1.82 Pitot Corr. Factor .84
Nozzle Dia. .28 in., Probe Length 7 ft
Probe Heater Setting ____
Stack Dimensions: Inside Diameter 60 in
Inside Area ____ ft²
Height ____ ft
Effective Stack Area ____ ft² 30 pts. @ 3 min/pt= 60 min.

Time Start 1307
Time End 1409

Mat'l Processing Rate ____
Final Gas Meter Reading 827.835 ft
Initial Gas Meter Reading 787.932
Total Condensate in Impingers 250 ml
Moisture in Silica Gel ____ gm
Silica Gel Container No. ____ Filter No. ____
Orsat: CO_2 ____
O_2 ____
CO ____
N_2 ____
Excess Air ____
Test Conducted by: NECK / MCKEE
Leak Rate 0.0 @ 5" H_2O CFM @ 15" Hg
Remarks: ____

PORT AND TRAVERSE POINT NO.	INCHES INSIDE STACK WALL	CLOCK TIME	GAS METER READING (FT3)	STACK VELOCITY HEAD ("H2O)	("H2O) ORIFICE PRESS. DROP CALC.	ACTUAL	STACK GAS TEMP. (°F)	METER TEMPERATURE IN	OUT	FILTER TEMP. (°F)	LAST IMPINGER TEMP. (°F)	VACUUM ("HG.
2-1		1310	789.52	.18	.87	.87	153	94	93	270	65	2
2			791.26	.21	1.02	1.02	153	96	93	270		2.5
3			793.20	.27	1.31	1.31	153	97	92	270		
4			795.26	.30	1.46	1.46	153	101	93	270		3.5
5			—	.33	1.60	1.60	153	104	93	270		4.5
6			799.66	.33	1.65	1.65	153	106	94	270		
7			801.80	.30	1.46	1.46	155	109	95	270		
8			803.93	.30	1.46	1.46	155	110	95	270		
9			806.04	.30	1.46	1.46	155	111	96	270		4.5
10		1337	808.11	.22	1.07	1.07	155	112	96	270		

PORT AND TRAVERSE POINT NO.	INCHES INSIDE STACK WALL	CLOCK TIME	GAS METER READING (FT3)	STACK VELOCITY HEAD ("H2O)	("H2O) ORIFICE PRESS. DROP CALC.	ACTUAL	STACK GAS TEMP. (°F)	METER TEMPERATURE IN	OUT	FILTER TEMP. (°F)	LAST IMPINGER TEMP. (°F)	VACUUM ("HG)
1-1		1342	[illegible]	.11	.53	.53	155	110	98	270	65	2.5
2			—	.21	1.02	1.02	155	110	98	270		3.0
3			813.24	.29	1.41	1.41	155	112	99	270		5.
4			815.41	.32	1.55	1.55	155	112	99	270		
5			817.70	.33	1.60	1.60	155	114	100	270		5.
6			819.86	.31	1.50	1.50	155	114	100	270		
7			—	.29	1.41	1.41	155	115	101	270		
8			824.12	.24	1.16	1.16	155	117	102	270		5.0
9			826.—	.20	.97	.97	155	117	102	270		
10		1409	~~1469~~ 827.55	.17	.82	.82	155	117	102	270		

SOURCE SAMPLING FIELD DATA SHEET

Plant WAVERLY MINERAL PRODUCTS
MEIGS, GA.
Sample Location No. 1 KILN
Control Device WET SCRUBBER
Type of Samples · PARTICULATE
Date 9-13-78 Run No. 3
Moisture 25 %, FDA ____, Gas Density Factor ____
Barometric Press 30.10 "Hg, Stack Press 30.09 "Hg
Weather CLEAR
Temp. ____ °F, W/D ____, W/S ____
Sample Box No. ____ Meter Box No. 1
Meter ΔH@ 1.82 Pitot Corr. Factor .84
Nozzle Dia. .298 in., Probe Length 7 ft
Probe Heater Setting ____
Stack Dimensions: Inside Diameter 60 in
Inside Area ____ ft²
Height ____ ft
Effective Stack Area ____ ft² 20 pts. @ 3 min/pt = 60 min.

Time Start 1533
Time End 1637

Mat'l Processing Rate ____
Final Gas Meter Reading 865.135 ft³
Initial Gas Meter Reading 827.100 ft³
Total Condensate in Impingers 252 ml
Moisture in Silica Gel ____ gm
Silica Gel Container No. ____ Filter No. ____
Orsat: CO_2 ____
O_2 ____
CO ____
N_2 ____
Excess Air ____
Test Conducted by: NEGUS
McKEE
Leak Rate 0.00 at 5" Hg CFM @ 15" Hg
Remarks: −10.5" ΔP INLET STATIC

PORT AND TRAVERSE POINT NO.	INCHES INSIDE STACK WALL	CLOCK TIME	GAS METER READING (FT³)	STACK VELOCITY HEAD ("H2O)	("H2O) ORIFICE PRESS. DROP CALC	ACTUAL	STACK GAS TEMP. (°F)	METER TEMPERATURE IN	OUT	FILTER TEMP. (°F)	LAST IMPINGER TEMP. (°F)	VACUUM ("HG)
1-1			828.57	.15	0.73	.73	163	102	100	275	65	2
			830.41	.25	1.22	1.22	163	103	100	275		
			832.36	.28	1.36	1.36	163	105	101	275		
			834.47	.33	1.60	1.60	163	107	101	275		
			836.57	.33	1.60	1.60	163	109	102	275		
			838.68	.33	1.60	1.60	163	111	102	275		4
			840.63	.28	1.36	1.36	163	113	103	275		
			842.47	.25	1.22	1.22	163	115	104	275		
			844.14	.20	0.97	0.97	163	116	105	275		
			845.81	.20	0.97	0.97	163	117	100	275		

PORT AND TRAVERSE POINT NO.	INCHES INSIDE STACK WALL	CLOCK TIME	GAS METER READING (FT3)	STACK VELOCITY HEAD ("H20)	("H20) ORIFICE PRESS. DROP		STACK GAS TEMP. (°F)	METER TEMPERATURE		FILTER TEMP. (°F)	LAST IMPINGER TEMP. (°F)	VAC ("
					CALC.	ACTUAL		IN	OUT			
2-1			847.35	.17	0.83	0.83	163	116	107	275	65	3
			849.13	.23	1.12	1.12	163	117	108	275		
			851.15	.30	1.46	1.46	166	118	109	275		
			853.16	.30	1.46	1.46	166	118	109	275		
			855.27	.33	1.60	1.60	166	120	109	275		4
			857.29	.30	1.46	1.46	166	120	110	275		
			859.30	.30	1.46	1.46	166	120	110	275		
			861.16	.30	1.46	1.46	166	120	110	275		1
			863.14	.29	1.41	1.41	166	121	110	275		
			865.135	.25	1.22	1.22	166	121	110	275		

APPENDIX C

PROCESS RATE DETERMINATION

PROCESS INPUT WEIGHT RATE FOR KILN AND COOLER #1

Procedure:

The Process Input Weight Rate for the Kiln and Cooler #1 was obtained by measuring the tons of raw clay being fed into the Kiln and Cooler #1 by conveyor C-3, minus the weight of the free moisture contained in the raw clay.

The tons per hour on conveyor C-3 was obtained by calculating the speed of the conveyor belt on C-3 and by determining the pounds of raw clay per foot on conveyor C-3.

To determine the speed of conveyor C-3, a twenty foot (20' - 0") section of conveyor frame was marked and the time required for a designated point on the conveyor belt to travel the designated twenty feet (20' - 0") of conveyor frame was measured. For accuracy, cumulative time of (5) tests or one hundred feet (100' - 0") was used.

Distance of belt travel = 100 feet
Time required to travel distance = 2.27 minutes
C-3 F. P. M. = 100 ÷ 2.27
C-3 F. P. M. = 44

To determine the pounds per foot on C-3 conveyor belt, the conveyor was stopped and the raw clay in a five foot (5' - 0") section on the conveyor belt was placed in a container. For accuracy, this was done three (3) times to obtain one (1) weight during a ten (10) minute interval after each compliance test run had been completed.

First tonnage check:

186 lbs./15' - 0" conveyor belt length (3 separate 5' - 0" sections combined)
C-3 ft./min. = 44
Tons/hour = (186 ÷ 15) X (44 X 60) ÷ 2000
Tons/hour = 16.37

Second tonnage check:

295.5 lbs./15' - 0" conveyor belt length (3 separate 5' - 0" sections combined)
C-3 ft./min. = 44
Tons/hour = 295.5 ÷ 15) X (44 X 60) ÷ 2000
Tons/hour = 26.00

Third tonnage check:

271.5 lbs./15' - 0" conveyor belt length (3 separate 5' - 0" sections combined)
C-3 ft./min. = 44
Tons/hour = (271.5 ÷ 15) X (44 X 60) ÷ 2000
Tons/hour = 23.89

Samples of raw clay to be used in determining the free moisture content of the raw clay on conveyor C-3, were collected as the C-3 tonnage tests were taken. Each of these samples were analyzed by the lab to determine it's free moisture content.

To determine the percent free moisture in the raw clay, a fifty (50) gram sample of material from conveyor C-3 was balanced on an Ohaus, Harvard Trip, Double Beam Balance. A two hundred and fifty (250) watt Heat Ray infrared heat lamp was placed directly above the fifty (50) gram sample. The drying process was maintained on a continuous basis with periodic rebalancing of the scale beam until the lowest constant weight was achieved.

First sample:

Grams of sample before drying	50.00
Grams of sample after drying	20.10
Grams of weight loss	29.90
% free moisture	59.80

Second sample:

Grams of sample before drying	50.00
Grams of sample after drying	20.85
Grams of weight loss	29.15
% free moisture	58.30

Third sample:

Grams of sample before drying	50.00
Grams of sample after drying	21.15
Grams of weight loss	28.85
% free moisture	57.70

To establish the Process Input Weight Rate of Kiln and Cooler #1, the average tons per hour on conveyor C-3 is multiplied by the average percent of free moisture for that sample and subtract the resultant weight of the free moisture from the average tons per hour on conveyor C-3, the final sums being averaged for the Process Input Weight Rate.

Process Input Weight Rate For Kiln and Cooler #1 - Page 3

First tonnage check:

16.37 tons/hour - (16.37 X .5980) = 6.58 tons/hour

Second tonnage check:

26.00 tons/hour - (26.00 X .5830) = 10.84 tons/hour

Third tonnage check:

23.89 tons/hour - (23.89 x .5770) = 10.11 tons/hour

Process Input Weight Rate:

$$\frac{6.58 + 10.84 + 10.11}{3} = 9.18$$

Allowable Rate of Emission:

$$E = 4.1P^{0.67}$$

E = Allowable Emission Rate in pounds per hour

P = Process Input Weight Rate in tons per hour

$E = 4.1\ (9.18)^{0.67} = 18.11$ pounds/hour allowable

APPENDIX D

LABORATORY ANALYSIS

PLANT AND LOCATION Avery Mining, Ricigs, OK.

STACK #1 SCRUBBER OUTLET DATE ANALYST D. Williams

FILTERS LAB. NO: 26805	RUN 1	RUN 2	RUN 3
Sample No.	R1 FILTER	RV FILTER	R3 FILTER
Filter No.	54933	54961	54967
Beaker & Filter Weight	4.1200	4.0677	4.1114
Beaker Tare Weight	3.5997	3.5270	3.5975
Gross Gain	.5203	.5407	.5139
Filter Tare Weight	.4087	.4092	.4096
Net Gain (grams)	.1121	.1315	.1043

FILTERS			
Sample No.			
Filter No.			
Beaker & Filter Weight			
Beaker Tare Weight			
Gross Gain			
Filter Tare Weight			
Net Gain (grams)			

SAMPLE ID			
Sample No.	R1 PREFILTER	RV PREFILTER	R3 PREFILTER
Sample Volume	195	425	315
Aliquot	195	425	315
Factor	1	1	1
Final Weight	91.9316	98.1616	97.2206
Tare Weight	91.9063	98.1484	97.2031
Net Gain	.0253	.0132	.0175
Net Gain x Factor = Total (grams)	.0253	.0132	.0175

SAMPLE ID			
Sample No.			
Sample Volume			
Aliquot			
Factor			
Final Weight			
Tare Weight			
Net Gain x Factor = Total (grams)			

PLANT Waverly Mineral

LOCATION Meigs, GA.

STACK #1 SCRUBBER OUTLET

DATE SAMPLED 9/13

LAB. NUMBER	SAMPLE IDENTIFICATION	TEST	METHOD	RESULTS
26805				
	PREFILTER } RUN 1	PARTICULATE		.0253
	FILTER }	"		.1121
	PREFILTER } RUN 2	"		.0132
	FILTER }	"		.1315
	PREFILTER } RUN 3	"		.0175
	FILTER }	"		.1043
	SILICA GELS:			
	RUN 1			10 g
	RUN 2			13 g
	RUN 3			11 g

PLANT Waverly Mineral

LOCATION Meigs, GA.

STACK #1 SCRUBBER OUTLET

DATE SAMPLED 9/13

LAB. NUMBER	SAMPLE IDENTIFICATION	TEST	METHOD	RESULTS
26805				
	PREFILTER } RUN 1	PARTICULATE		.0253
	FILTER }	"		.1171
	PREFILTER } RUN 2	"		.0132
	FILTER }	"		.1315
	PREFILTER } RUN 3	"		.0175
	FILTER }	"		.1043
	SILICA GELS:			
	RUN 1			10 g
	RUN 2			13 g
	RUN 3			11 g

Fuller's Earth

REPORT REVIEW SUMMARY

Rev. (3) 10/77

COMPANY: Waverly Mineral Products

Meigs, Georgia

REPORT ISSUED: September, 1978

NAME OF SAMPLING FIRM: Technical Services, Inc.

	SOURCE DATA			
SOURCE TESTED:	No. 1 Kiln			
DATE(S) OF TESTS:	September 13, 1978			
POLLUTANT(S) DETERMINED:	Particulate			
CONTROL METHOD(S):	Wet Scrubber			
MAXIMUM EXPECTED OPERATING CAPACITY:	11.0 ton/hr.			
	TEST DATA			
TEST RUN:	Run #1	Run #2	Run #3	AVERAGE
OPERATING CAPACITY: (ton/hr.)	6.58	10.84	10.11	9.18
STACK TEMPERATURE: (°F)	150	154	164	156
GAS FLOW RATE, ACFM:	38,087	37,593	38,731	38,137
EMISSION RATES:	12.32	12.38	11.07	11.92
PERCENT OF ALLOWABLE:	66%			
OPACITY:	N/A			
ALLOWABLE EMISSION RATE:	18.1 lb./hr. (As per Georgia Regulations: 391-3-1-.02(2)(p)2(i)			

Note OTHER INFORMATION: All tests in this package were made using EPA Method 5 (with water wash instead of acetone). No impinger analysis was made.

Test Procedures Acceptable [xx] Test Procedures Not Acceptable [ ]

(Reasons for non-acceptability explained in narrative)

WAVERLY MINERAL PRODUCTS Co.

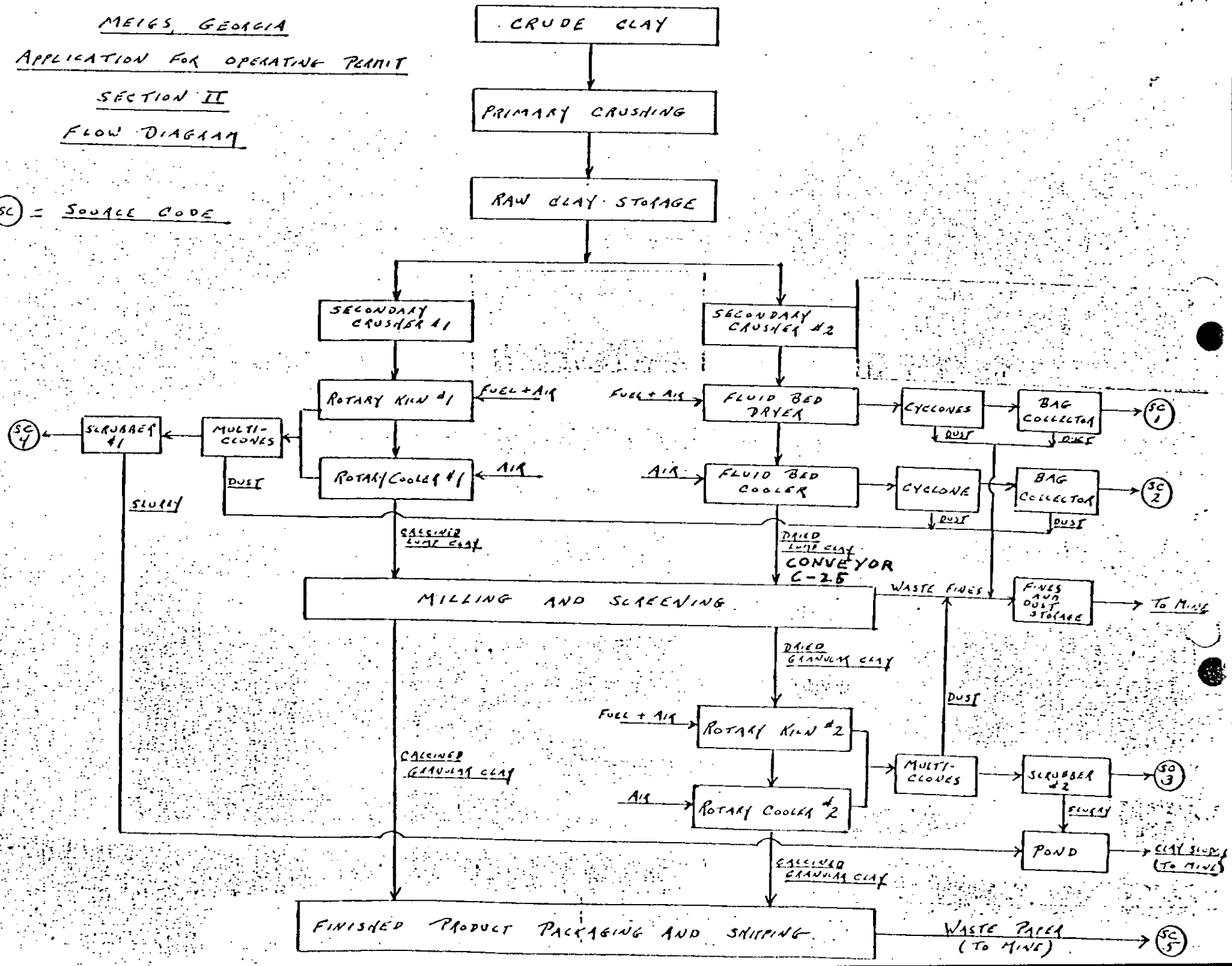
MEIGS, GEORGIA

APPLICATION FOR OPERATING PERMIT

SECTION II

FLOW DIAGRAM

(SC) = SOURCE CODE



36

REPORT LETTER SUMMARY — REV. (5) 10/77

COMPANY: Waverly Mineral Products

Meigs, Georgia

REPORT ISSUED: April, 1978

NAME OF SAMPLING FIRM: Technical Services, Inc.

	SOURCE DATA
SOURCE TESTED:	No. 2 Kiln
DATE(S) OF TESTS:	April 17, 1978
POLLUTANT(S) DETERMINED:	Particulate
CONTROL METHOD(S):	Multiclone Collector & Wet Scrubber
MAXIMUM EXPECTED OPERATING CAPACITY:	17.24 ton/hr.

	TEST DATA			
TEST RUN:	Run #1	Run #2	Run #3	AVERAGE
OPERATING CAPACITY: (ton/hr.)	—	—	—	17.24
STACK TEMPERATURE: (°F)	126	128	132	129
GAS FLOW RATE, ACFM:	36,631	35,101	36,891	36,208
EMISSION RATES: (lb./hr.)	27.89	23.26	18.17	22.94
PERCENT OF ALLOWABLE:	83%			
OPACITY:	N/A			
ALLOWABLE EMISSION RATE:	27.62 lb./hr. (As per Georgia Regulations: 391-3-1-.02-(2)-(p)-(2)-(i)			

OTHER INFORMATION:

Test Procedures Acceptable [xx] Test Procedures Not Acceptable [ ]

(Reasons for non-acceptability explained in narrative)

REPORT REVIEW SUMMARY

	Waverly Mineral Products Company
	Meigs, Georgia
ORT ISSUED:	Not reported
OF SAMPLING FIRM:	Technical Services Inc.

	SOURCE DATA			
SOURCE TESTED:	#2 Kiln Scrubber			
DATE(S) OF TESTS:	February 1, 1979			
POLLUTANT(S) DETERMINED:	Particulate			
CONTROL METHOD(S):	Medium energy scrubber - Δp = 15", 300 gpm			
MAXIMUM EXPECTED OPERATING CAPACITY:	24 tons/hr.			
	TEST DATA			
TEST RUN:	Run #1	Run #2	Run #3	AVERAGE
OPERATING CAPACITY: (tons/hr.)	22.46	18.15	18.68	19.76
STACK TEMPERATURE: (°F)	106.5	106.0	107.0	
GAS FLOW RATE, ACFM:	31530	29682	31247	
EMISSION RATES: (lb./hr.)	12.88	10.98	13.66	12.51
PERCENT OF ALLOWABLE:	41.3%			
OPACITY:	Not reported			
ALLOWABLE EMISSION RATE:	30.27 lb./hr. (As per Georgia Regulations: 391-3-1-.02(2)(e)(i)			

OTHER INFORMATION:

Test Procedures Acceptable [xx] Test Procedures Not Acceptable [ ]

(Reasons for non-acceptability explained in narrative)