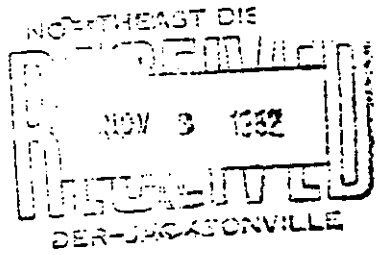
AP42 Section:	11.20
Reference:	11
Title:	Summary Of Particulate Matter Emission Measurements, No. 5 Kiln Outlet, Florida Solite Corporation, Green Cove Springs, Florida, Sholtes and Koogler Environmental Consultants, Gainesville, FL, September 3, 1982.

AP-42 Section 11.20
Reference 11
Report Sect. 4
Reference 11



SUMMARY OF PARTICULATE MATTER EMISSION MEASUREMENTS

NO. 5 KILN OUTLET

FLORIDA SOLITE CORPORATION
GREEN COVE SPRINGS, FLORIDA

SEPTEMBER 3, 1982

SHOLTES & KOOGLER
ENVIRONMENTAL CONSULTANTS, INC.
1213 NW 6TH STREET
GAINESVILLE, FLORIDA 32601
(904) 377-5822

SHOLTES & KOOGLER

To the best of my knowledge, all applicable field and analytical procedures comply with FDER requirements and all test data and plant operating data are true and correct.

Signature

10-13-82
Date

TABLE OF CONTENTS

1.0 INTRODUCTION

The Florida Solite Corporation owns and operates a mining and mineral processing facility located near Green Cove Springs, Florida. The material that is mined is a clay mineral which is dried into a lightweight, very strong aggregate called solite.

On September 3, 1982, Sholtes & Koogler, Environmental Consultants, Inc. (SKEC) of Gainesville, Florida conducted particulate matter emission measurements on the No. 5 kiln dryer scrubber outlet. The purpose of the testing was to satisfy provisos attached to the Air Pollution Operating Permit for this source. These provisos state that this source shall be tested annually for particulate matter emissions.

Prior to the test date, the regional office of the Florida Department of Environmental Regulation in Jacksonville, Florida was notified of the test schedule. Officials of that office were at the plant site to witness the testing and the plant operations. The method of testing and analyses for the particulate matter was EPA Method 5 as described in Title 40, Chapter 1, Part 60, Code of Federal Regulations, U.S. Environmental Protection Agency.

During the period of testing, the process weight rate of the dryer was approximately 21,000 pounds per hour output at zero percent moisture. Table 1 of this report shows the input and output rates of the No. 5 kiln. The allowable particulate matter mass emission rate corresponding

to this process weight rate (Chapter 17-2, Florida Administrative Code) is 15.4 pounds per hour. The actual average mass emission rate of particulate matter is 14.3 pounds per hour. Thus, it can be noted that during the period of testing, this plant meets the requirements set forth by FDER and the Florida Administrative Code.

2.0 PROCESS DESCRIPTION

Clay is mined mechanically and transported to the process site utilizing earthmovers. The clay is then mechanically transported to the rotary type kilns where it is expended by burning coal, coke or oil to form a strong lightweight aggregate. The aggregate is used in building construction and septic tank base throughout the southeast.

Particulate matter emissions from the kiln consist of small particles being carried by the combustion gases as they are exhausted from the dryer. The gases leaving the dryer pass through a two stage mechanical collector, then through a wet scrubber, separator, and are then discharged to the atmosphere through a 36 inch diameter stack with a height of approximately 100 feet above grade.

TABLE 1

PROCESS WEIGHT DETERMINATION
NO. 5 KILN

FLORIDA SOLITE CORPORATION

SEPTEMBER 3, 1982

30,850 pounds of material/hour to dryer at 32.0 percent H_2O

Product contains 0 percent H_2O

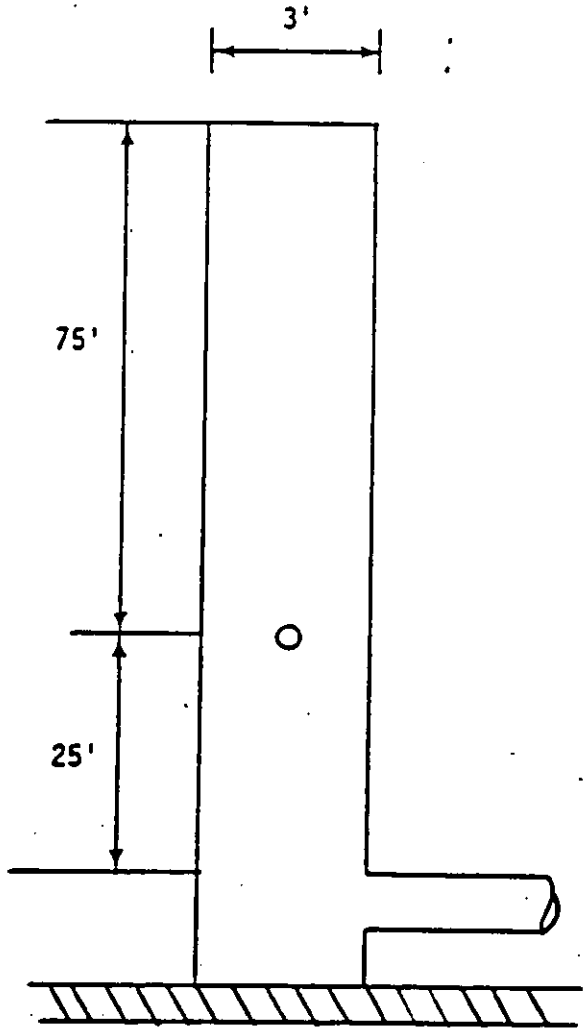
30,850 x 0.680 = 20,978 92% of AOP rate

TOTAL FEED - 29,978 pounds per hour 10.489 ton/hr

0

3.0 SAMPLING POINT LOCATION

Two sampling ports are located in the 36 inch diameter stack 25 feet above the duct leading from the separator to the stack and approximately 75 feet below the outlet of the stack. The two points are 90 degrees adjacent to one another. Using criteria established by FDER, it was determined that a minimum of number of points be sampled, thus, 12 total points or 6 on each traverse. Figure 1 is a schematic diagram of a sampling point location and a table of sampling point distances.



Sampling Point Distances

Point No.	Inches Inside Stack Wall
1	1.6
2	5.3
3	10.6
4	25.4
5	30.7
6	34.4

FIGURE 1

SAMPLING POINT LOCATIONS
NO. 5 KILN OUTLET
FLORIDA SOLITE CORPORATION
GREEN COVE SPRINGS, FLORIDA

4.0 FIELD AND ANALYTICAL PROCEDURES

Particulate matter samples were collected by the particulate matter emission measurement method adopted by the FDER in October 1980. A schematic diagram of the sampling train used is shown in Figure 2. All particulate matter captured from the nozzle to and including the filter was included in the calculation of the emission rate of particulate matter.

Preparation of Equipment

1. Filters - Gelman type "A" filters were placed in a drying oven for two hours at 105°C, removed, and placed in a standard glass desiccator containing indicating silica gel and allowed to cool for two hours, and then weighed to the nearest 0.1 mg.

2. Nozzle, Filter Holder and Sampling Probe - The nozzle, filter holder and sampling probe were washed vigorously with soapy water and brushes, then rinsed with acetone and distilled water and dried prior to the test program. All openings on the sampling equipment were sealed while in transit to the test site.

3. Impingers - The Greenburg-Smith impingers were cleaned with a warm soapy water solution and brushes, then were rinsed with distilled water and acetone and dried. The impingers were sealed tightly during transit.

Test Procedure

Prior to performing the actual particulate matter sample runs, certain stack and stack gas parameters had to be determined. These preliminary data included the average temperature, velocity head, and moisture content, plus the stack dimensions at the point where the tests were being performed.

The stack gas temperature was determined by using an electronic thermocouple with instant readout.

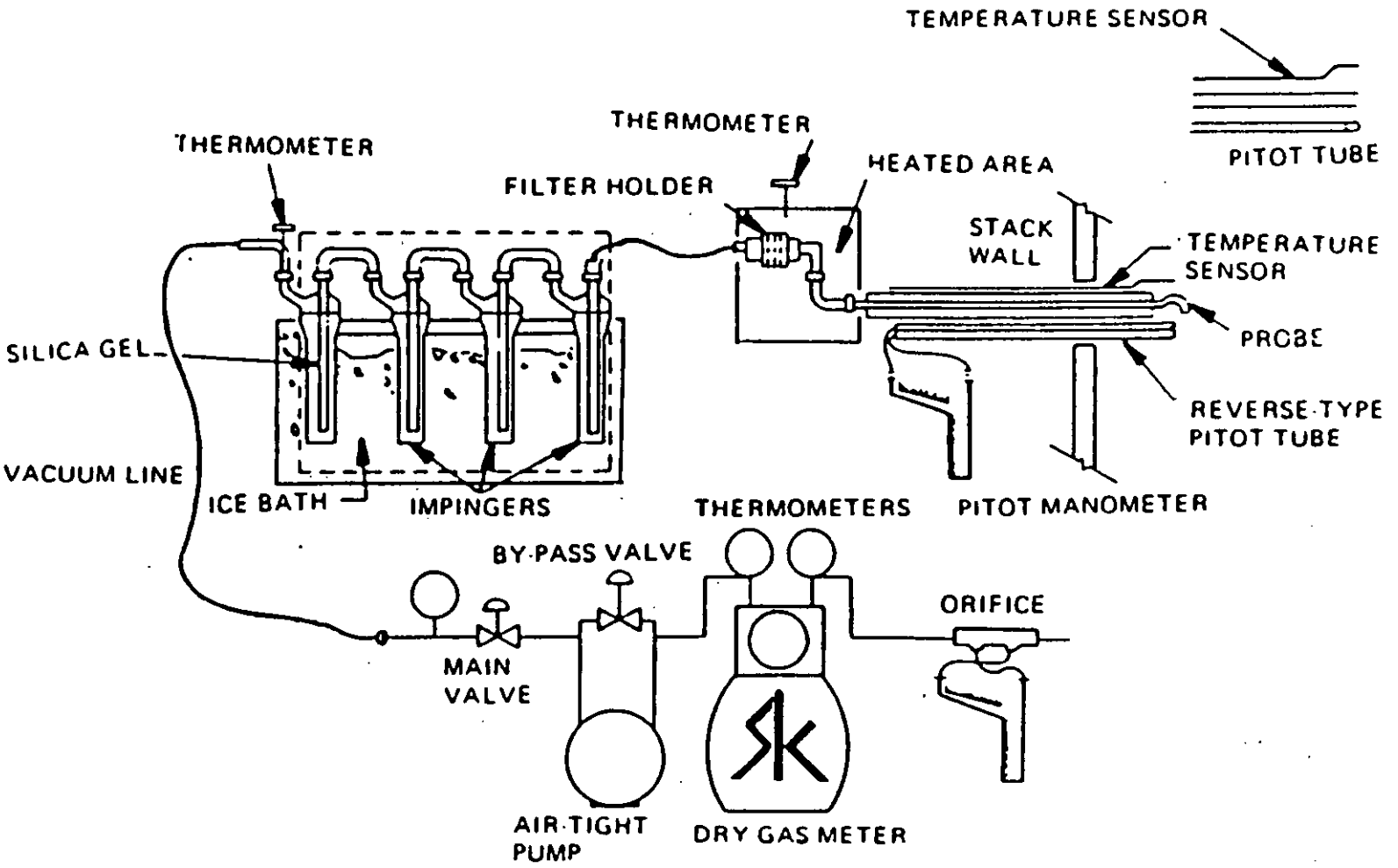


FIGURE 2

FDER PARTICULATE MATTER SAMPLING TRAIN

Velocity head measurements were determined across the stack by using a calibrated type "S" pitot tube with an inclined manometer.

The sampling traverse points were selected so that a representative sample could be extracted from the gas stream. The traverse points were located in the center of equal areas, which were dependent upon equivalent duct diameters downstream from flow disturbances.

One particulate test run consisted of sampling for a specified time at each traverse point. The type "S" pitot tube was connected adjacent to the sample probe so that an instantaneous velocity head measurement could be determined at each traverse point while making the test run. The stack gas temperature was also measured throughout each test. Nomographs were used to calculate the isokinetic sampling rate for each traverse point during each test run.

The gases sampled were collected through the following components: a stainless steel nozzle and probe; a glass fiber filter; two impingers with 100 ml of distilled water; one impinger dry; one impinger with 180 grams of silica gel (the second impinger had a standard tip, while the first, third and fourth impingers had modified tips with 1/2-inch I.D. openings); a flexible sample line; an air-tight pump; a dry test meter; and, finally, a calibrated orifice.

Sample recovery was accomplished by the following procedures:

1. The pretared filter was removed from its holder and placed in Container 1 and sealed.

2. All sample-exposed surfaces prior to the filter were washed with acetone and placed into Container 2.

3. The volume of water from the first three impingers was measured for the purpose of calculating the moisture in the stack gas, then discarded.

4. The used silica gel from the fourth impinger was transferred to the original tared container and sealed.

Laboratory Analysis

The two sample containers from each sample run were analyzed according to the following procedures:

1. The contents of Container 1 were transferred to a tared glass weighing dish, dried, and desiccated to a constant weight.

2. The acetone from Container 2 was transferred to a tared beaker and evaporated to dryness at 212°F. It was then desiccated to a constant weight.

The used silica gel in its tared container was weighed to the nearest gram.

The total sample weight included the weight of material collected on the filter plus the weight of material collected in the nozzle, sampling probe, and front half of the filter holder.

Data

The field data sheets, calculation sheets, and nomenclature definitions are included in the appendix of this report.

5.0 SUMMARY OF RESULTS

Summarized results of the particulate matter mass emission measurements conducted on September 3, 1982 are presented in Table 1. Complete emission data, including all gas flow data, are included in the Appendix of this report.

The mass emission rate of particulate matter ranged from 12.2 to 17.5 pounds per hour with an overall average of 14.3 pounds per hour. The corresponding concentration in the stack gas was 0.0985 grains per standard cubic foot. The stack gas flow rate averaged 16,845 SCFMD. The stack gas temperature averaged 177°F and contained 24.5 percent moisture.

During the period of testing, the process weight rate of the dryer was 21,000 pounds per hour. The allowable particulate matter mass emission rate corresponding with the process weight rate (Chapter 17-2, Florida Administrative Code) is 15.4 pounds per hour.

Utilizing the above data, it can be determined that during the period of testing, this source meet requirements set forth by FDER and the Florida Administrative Code.

Complete emission data along with equation for calculating emission rates and source sampling nomenclature, field and analytical data sheets, necessary calibrations and a list of project participants are included in the Appendix of this report.

SUMMARY OF PARTICULATE MATTER EMISSIONS

NO. 5 KILN SCRUBBER OUTLET

FLORIDA SOLITE CORPORATION
GREEN COVE SPRINGS, FLORIDA

SEPTEMBER 3, 1982

Run No.	Process Weight Rate (Lbs/Hr)	Stack Gas Flow Rate (SCFMD)	Stack Gas Temperature (°F)	Stack Gas Moisture (%)	Particulate Matter Emissions	
					Concentration (gr/SCF)	Mass Emission Rate (lbs/hr)
1	20,978	16,602	175	23.6	0.0858	12.21
2	20,978	16,687	185	25.1	0.0918	13.13
3	20,978	17,246	171	24.9	0.1180	17.45
Average	20,978	16,845	177	24.5	0.0985	14.26

*Allowable particulate matter emission rate (Chapter 17-2, Florida Administrative Code) = 15.4 lbs/hr.

APPENDIX

SOURCE SAMPLING NOMENCLATURE SHEET

PB - Barometric pressure, inches Hg
PS - Stack pressure, inches Hg
As - Stack area, sq. ft.
AS'- Effective area of positive stack gas flow, sq. ft.
NPTS - Number of traverse points where the pitot velocity head was greater than zero
TSTD - Standard temperature, °R
TS - Stack temperature, °R
TM - Meter temperature, °R
H - Average square root of velocity head, $\sqrt{\text{inches } H_2O}$
$\overline{H}$ - 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, $\left[PB + \frac{\Delta H}{13.6}\right]$ inches Hg
STP - Standard conditions

VWV - Converstion of condensate in milliliters to water vapor in cubic feet (STP)
VSTPD - Volume sampled, cubic feet (STP)
VT - Tctal 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, %
$\sqrt{H \times TS}$ - Average square root of velocity head times stack temperature
$\overline{U}$ - 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)
QSTDP - 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

• - Stack Gas Saturated

EQUATIONS FOR CALCULATING PARTICULATE EMISSIONS

$$VWV = 0.0000893(TSTD)(VC)$$

$$VSTPD = (VM)(PB + \frac{\Delta H}{13.6})(\frac{TSTD}{TM})(\frac{1}{29.92})$$

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

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

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

$$FMOIST = \text{Assumed moisture fraction}$$

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

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

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

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

$$\underline{U} = 4{,}006(CP)\sqrt{H}\sqrt{(\frac{TS}{TSTD})(\frac{29.92}{PS})(\frac{1}{GS})}$$

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

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

$$QSTPD = TSTD(QD)(PS) \div [TS(29.92)]$$

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

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

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

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

$$EM = (ESTP)\ (QSTPD)\ (60\ \frac{min}{hr})\ (\frac{lb}{7000\ grains})$$

COMPUTER PRINT-OUTS

SHOLTES AND KOOGLER ENVIRONMENTAL CONSULTANTS

Source Sampling Calculations

Plant: SOLITE GREEN COVE SPRINGS, FL. Date: 9-3-82
Stack: NO. 5 KILN Run 2 from 1148-1250
Weather conditions: CLEAR Pb= 30 In.Hg Ps= 30.07 In.Hg
As= 7.07 Sq.Ft. Ts= 184.7 Deg. F Tm= 113.9 Deg. F
H= 0.983 In.H2O Del H= 2.38 In.H2O An= 0.000341 Sq.Ft. Cp= 0.84
Vm= 51.907 cf Vc= 342 ml Total time: 60 Minutes

1.	Volume Water Vapor	16.108	SCF
2.	Gas Volume Sampled - STPD	48.163	SCFD
3.	Total Volume	64.271	SCF
4.	Moisture in Stack Gas - Volume Fraction	0.251	
5.	Dry Stack Gas - Volume Fraction	0.749	
6.	Molecular Weight of Stack Gas - Dry Basis	29	
7.	Molecular Weight of Stack Gas - Stack Conditions	26.24	
8.	Specific Gravity of Stack Gas Relative to Air	0.9	
9.	Excess Air - Percent		
10.	Average Stack Velocity	3826.7	FPM
11.	Average Stack Gas Flow Rate	27055	ACFM
12.	Actual Stack Gas Flow Rate Dry	20274	CFMD
13.	Stack Gas Flow Rate STPD	16687	SCFMD
14.	Percent Isokinetic	99.6	%

Probe Wash	109.6 Mg	0.0351 Gr/SCF	5.02 Lbs/Hr
Filter	177.20 Mg	0.0567 Gr/SCF	8.12 Lbs/Hr
TOTAL	286.8 Mg	0.0918 Gr/SCF	13.13 Lbs/Hr

SHOLTES AND KOOGLER ENVIRONMENTAL CONSULTANTS

Source Sampling Calculations

Plant: SOLITE GREEN COVE SPRINGS, FL. Date: 9-3-82
Stack: NO. 5 KILN Run 1 from 1015-1118
Weather conditions: CLEAR Pb= 30 In.Hg Ps= 30.07 In.Hg
As= 7.07 Sq.Ft. Ts= 174.8 Deg. F Tm= 100.3 Deg. F
H= 0.956 In.H2O Del H= 2.2 In.H2O An= 0.000341 Sq.Ft. Cp= 0.84
Vm= 48.612 cf Vc= 303.5 ml Total time: 60 Minutes

1.	Volume Water Vapor	14.295	SCF
2.	Gas Volume Sampled - STPD	46.18	SCFD
3.	Total Volume	60.475	SCF
4.	Moisture in Stack Gas - Volume Fraction	0.236	
5.	Dry Stack Gas - Volume Fraction	0.764	
6.	Molecular Weight of Stack Gas - Dry Basis	29	
7.	Molecular Weight of Stack Gas - Stack Conditions	26.4	
8.	Specific Gravity of Stack Gas Relative to Air	0.91	
9.	Excess Air - Percent		
10.	Average Stack Velocity	3678.7	FPM
11.	Average Stack Gas Flow Rate	26008	ACFM
12.	Actual Stack Gas Flow Rate Dry	19861	CFMD
13.	Stack Gas Flow Rate STPD	16602	SCFMD
14.	Percent Isokinetic	96	%

Probe Wash	91.8 Mg	0.0306 Gr/SCF	4.36 Lbs/Hr
Filter	165.10 Mg	0.0551 Gr/SCF	7.85 Lbs/Hr
TOTAL	256.9 Mg	0.0858 Gr/SCF	12.21 Lbs/Hr

SHOLTES AND KOOGLER ENVIRONMENTAL CONSULTANTS

Source Samplins Calculations

Plant: SOLITE GREEN COVE SPRINGS, FL. Date: 9-3-82
Stack: NO. 5 KILN Run 3 from 1310-1412
Weather conditions: CLEAR Pb= 30 In.Hg Ps= 30.07 In.Hg
As= 7.07 Sq.Ft. Ts= 170.8 Deg. F Tm= 119.3 Deg. F
H= 1.003 In.H2O Del H= 2.48 In.H2O An= 0.000341 Sq.Ft. Cp= 0.84
Vm= 52.787 cf Vc= 341.8 ml Total time: 60 Minutes

1.	Volume Water Vapor	16.099	SCF
2.	Gas Volume Sampled - STPD	48.534	SCFD
3.	Total Volume	64.633	SCF
4.	Moisture in Stack Gas - Volume Fraction	0.249	
5.	Dry Stack Gas - Volume Fraction	0.751	
6.	Molecular Weight of Stack Gas - Dry Basis	29	
7.	Molecular Weight of Stack Gas - Stack Conditions	26.26	
8.	Specific Gravity of Stack Gas Relative to Air	0.91	
9.	Excess Air - Percent		
10.	Average Stack Velocity	3861.5	FPM
11.	Average Stack Gas Flow Rate	27301	ACFM
12.	Actual Stack Gas Flow Rate Dry	20501	CFMD
13.	Stack Gas Flow Rate STPD	17246	SCFMD
14.	Percent Isokinetic	97.1	%

Probe Wash	188.6 Mg	0.0600 Gr/SCF	8.86 Lbs/Hr
Filter	182.70 Mg	0.0580 Gr/SCF	8.59 Lbs/Hr
TOTAL	371.3 Mg	0.1180 Gr/SCF	17.45 Lbs/Hr

q3
q3) Stack designation:
NO. 5 KILN
q4) Is source Combustion or Non-combustion? (c/n) n
q5) Date sampled: 9-3-82
q6) Weather conditions: CLEAR
q7) Run number: 1

q8) Time begin: 1015
q9) Time end: 1118
q10) Enter averages for: Stack Vel, Diff. Actual, Stack Temp, Meter Temp
.913 2.2 174.8 100.3
0.913 2.2 174.8 100.3
q11) Enter: Total sampling time, Barometric pressure, Stack pressure
60 30 30.07
60 30 30.07
q12) Enter: Stack area, Nozzle dia., Final meter, Init. meter, Cond vol.(ml)
7.07 .25 673.312 624.7 303.5
7.07 0.25 673.312 624.7 303.5
Has the lab work been completed? (Y/n) Y
Enter Scrubber weights in milligrams
0 165.1
0 165.1 0 0 0

```
Enter restart point or RETURN to end: 97
97) Run number: 2
98) Time begin: 114
8
99)   Time end: 1250
910) Enter averages for:  Stack Vel, Diff. Actual, Stack Temp, Meter Temp
     .967 2.38 184.7 113.9
0.967 2.38 184.7 113.9
911) Enter: Total sampling time, Barometric pressure, Stack pressure
     60 30 30.07
60 30 30.07
912) Enter: Stack area, Nozzle dia., Final meter, Init. meter, Cond vol.(ml)
     7.07 .25 726.107 674.2 342
7.07 0.25 726.107 674.2 342
Has the lab work been completed? (Y/n)  Y
Enter   Scrubber   weights in milligrams
0 177.2
0 177.2 0 0 0
```

```
Enter restart point or RETURN to end: q7
q7) Run number: 3
q8) Time begin: 1310
q9)   Time end: 1412
q10) Enter averages for:  Stack Vel, Diff. Actual, Stack Temp, Meter Temp
     1.007 2.48 170.8 119.3
1.007 2.48 170.8 119.3
q11) Enter: Total sampling time, Barometric pressure, Stack pressure
     60 30 30.07
60 30 30.07
q12) Enter: Stack area, Nozzle dia., Final meter, Init. meter, Cond vol.(ml)
     7.07 .25 779.387 726.6 341.8
7.07 0.25 779.387 726.6 341.8
Has the lab work been completed? (Y/n)  Y
Enter   Scrubber   weights in milligrams
0 182.7
0 182.7 0 0 0
```

FIELD AND LAB DATA SHEETS

SHOLTES & KOOGLER ENVIRONMENTAL CONSULTANTS
GAINESVILLE, FLORIDA 32601
904-377-5822

SK

SOURCE SAMPLING FIELD DATA SHEET

Plant Solite Green Cove
Sampling Location #5 Kiln
Type of Control Scrubber
Type of Samples Part
Date 9-3-82 Run No. 1
Time Start 1015 Time End 1118
Sample Time 5 min/pt 60 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. 30.00 "Hg, Stack Press. 30.07 "Hg
Moisture 26 %, FDA ____, Gas Density Factor ____
Weather Clear
Temp. 80 °F, W/D Var., W/S 3-5
Sample Box No. Sb-1 Meter Box No. Sb-1
Meter ΔH@ 1.75 Pitot Corr. Factor 0.84
Nozzle Dia. 1/4 in., Probe Length Sb-61 ft
Probe Heater Setting ____ Nomograph C_p 2.337
Stack Dimensions 36" in
Stack Area 707 ft²
Effective Stack Area 707 ft²
Stack Height ____ ft

press 30.97
.5-1.0

Stack Dimensions

Mat'l Processing Rate ____
Final Gas Meter Reading 673.312 ft³
Initial Gas Meter Reading 624.700 ft³
Condensate Increase in Impingers 294 ml
Moisture in Silica Gel 9.5 gm
Silica Gel Container No. 29 Filter No. ____
Orsat: %CO_2 ____
%O_2 ____
%CO ____
%N_2 ____

Test Conducted By: R Paul
J Hulstrom
Stack Test Observers: ____

Leak Check
Meter Box Initial 0.0 cfm @ 15 in Hg
Final 0.0 cfm @ 8 in Hg

Pitot Tubes
Impact 3 in H_2O for 15 sec (Stable) Leak
Static 3 in H_2O for 15 sec (Stable) Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
				.113	Calc.	Actual	153	In	Out			
1			27.3	.43	1.02	1.02	161	92		261	63	4
2			31.0	.75	1.78	1.78	159	93		268	49	6
3			34.7	.94	2.23	2.23	171	95		269	51	7
4			39.3	1.1	2.62	2.62	176	97		278	52	7
5			43.3	0.93	2.21	2.21	174	98		268	55	7
6			47.5	0.95	2.26	2.26	178	100		262	56	7
1			51.5	0.95	2.26	2.26	180	103		264	59	7

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ($"H_2O$)	Meter Orifice Press. Diff. ($"H_2O$)		Stack Gas Temp. (°F)	Gas Sample Temp. @Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual		In	Out			
3			600	1.1	2.61	2.61	181	106		248	52	8
4			642	0.93	2.21	2.21	179	107		247	52	8
5			688	1.1	2.61	2.61	182	109		254	53	8
6				1.1	2.61	2.61	176	109		253	51	8

SHOLTES & KOOGLER ENVIRONMENTAL CONSULTANTS
GAINESVILLE, FLORIDA 32601
904-377-5822

SOURCE SAMPLING FIELD DATA SHEET

Plant Solite Group Corp
Sampling Location #5 Kiln
Type of Control Scrubber
Type of Samples Part
Date 9-3-82 Run No. 2
Time Start 1148 Time End 1250
Sample Time 5 min/pt 100 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. 30.00 "Hg, Stack Press. 30.07 "Hg
Moisture 23 %, FDA ____, Gas Density Factor ____
Weather Clear
Temp. 90 °F, W/D Vane, W/S 3-5
Sample Box No. Sbl Meter Box No. Sbl
Meter ΔH@ 1.75 Pitot Corr. Factor 0.80
Nozzle Dia. 1/4 in., Probe Length Stock ft
Probe Heater Setting ____ Nomograph C_f 2.455
Stack Dimensions 36" in
Stack Area 7.07 ft²
Effective Stack Area 7.07 ft²
Stack Height ____ ft

Stack Dimensions

Mat'l Processing Rate ____
Final Gas Meter Reading 726.107 ft³
Initial Gas Meter Reading 674.200 ft³
Condensate Increase in Impingers 330 ml
Moisture in Silica Gel 12.0 gm
Silica Gel Container No. 15 Filter No. ____
Orsat: %CO_2 ____
%O_2 ____
%CO ____
%N_2 ____

Test Conducted By: R Paul
J Hellstern
Stack Test Observers: ____

Leak Check
Meter Box Initial 00 cfm@ 15 in H_2
Final 00 cfm@ 9 in Hg

Pitot Tubes
Impact 3 in H_2O For 15 sec. (Stable) Leak
Static 3 in H_2O For 15 sec. (Stable) Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H_2O) .967	Meter Orifice Press. Diff. ("H_2O) Calc.	Actual	Stack Gas Temp. (°F) 1 1 1	Gas Sampl. Temp.@Dry Gas Meter (°F) In	Out	Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
1			74.2	.90	2.21	2.21	189	110		263	61	7
2			78.3	.97	2.38	2.38	188	111		268	52	7
3			82.3	1.1	2.7	2.7	179	111		260	53	8
4			86.9	0.84	2.06	2.06	187	112		262	54	7
5			91.2	1.1	2.7	2.7	182	112		255	53	8
6			95.4	1.1	2.7	2.7	184	113		257	51	8
1			0.0	1.0	2.46	2.46	187	115		253	56	8
2												

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Gas Sample Temp.@Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual		In	Out			
3			9.2	1.1	2.7	2.7	187	116		254	50	9
4			14.0	.90	2.21	2.21	188	117		255	48	8
5			18.0	.97	2.38	2.38	180	118		252	48	8
6			22.3	.67	1.64	1.64	177	117		250	47	7

SK

SHOLTES & KOOGLER ENVIRONMENTAL CONSULTANTS
GAINESVILLE, FLORIDA 32601
904-377-5822

SK

SOURCE SAMPLING FIELD DATA SHEET

Plant Solite Green Cove
Sampling Location #5 Kiln
Type of Control Scrubber
Type of Samples Point
Date 9-3-82 Run No. 3
Time Start 1310 Time End 1412
Sample Time 5 min/pt 60 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. 30.00 "Hg, Stack Press. 30.07 "Hg
Moisture 23 %, FDA ____, Gas Density Factor ____
Weather Partly Cloudy
Temp. 95 °F, W/D Var., W/S 3-5
Sample Box No. Sb-1 Meter Box No. Sb-1
Meter ΔH@ 1.75 Pitot Corr. Factor 0.84
Nozzle Dia. 1/4 in., Probe Length Sb-6-1 ft
Probe Heater Setting ____ Nomograph C_p 2.455
Stack Dimensions 36" in
Stack Area 7.07 ft^2
Effective Stack Area 7.07 ft^2
Stack Height ____ ft

Stack Dimensions

Mat'l Processing Rate ____
Final Gas Meter Reading 779.382 ft^3
Initial Gas Meter Reading 726.600 ft^3
Condensate Increase in Impingers 333 ml
Moisture in Silica Gel 8.8 gm
Silica Gel Container No. 7 Filter No. ____

Orsat: %CO_2 ____
%O_2 ____
%CO ____
%N_2 ____

Test Conducted By: R Paul
J Hillstrom
Stack Test Observers: ____

Leak Check
Meter Box Initial 0.0 cfm @ 15 In H_2
Final 0.0 cfm @ 11 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. Stable / Leak
Static 3 In H_2O for 15 sec. Stable / Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Gas Sampl. Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual		In	Out			
1			266	.85	2.09	2.09	160	116		261	64	7
2			30.5	.97	2.38	2.38	169	116		268	51	8
3			34.7	.93	2.28	2.28	172	116		265	51	8
4			39.0	.96	2.11	2.11	175	117		239	50	8
5			43.1	1.0	2.46	2.46	171	117		242	51	9
6			47.5	1.0	2.46	2.46	175	119		239	51	9
1			51.8	1.0	2.46	2.46	175	120		235	51	9

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ($"H_2O$)	Meter Orifice Press. Diff. ($"H_2O$)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual		In	Out			
3			60.8	1.1	2.7	2.7	171	121		239	49	10
4			63.4	1.1	2.7	2.7	171	122		231	50	11
5			70.0	1.1	2.7	2.7	171	123		235	48	11
6			74.7	1.1	2.7	2.7	166	124		242	51	11

SK

SHOLTES & KOOGLER, ENVIRONMENTAL CONSULTANTS

PARTICULATE LAB DATA SHEET

Date 9-3-82 Project No. SOLITE #5 KILN

	Run 1	Run 2	Run 3	Blank
Container No.	SK-39	SK-23	SK-44	SK-19
Total Volume (ml)	276	301	288	100
Aliquot Evaporated (ml)	276	301	288	100
Final Weight (g)	94.3344	91.4862	88.8340	94.4768
Tare Weight (g)	-94.2426	-91.3766	-88.6454	-94.4765
Gross Weight Gained (g)	.0918	.1096	.1886	.0003
Average Blank (g)	- —	- —	- —	-
Net Weight (g)	—	—	—	
Aliquot Factor	x 1.0	x 1.0	x 1.0	x 1.0
Total Net Weight (mg)	91.8	109.6	188.6	0.3

Container No.	1D	2D	3D	
Filter No.	4460	4461	4462	
Final Weight (g)	.5822	.5933	.5967	
Tare Weight (g)	-.4171	-.4161	-.4140	-
Gross Weight Gained (g)	.1651	.1772	.1827	
Average Blank	-	-	-	-
Total Net Weight (mg)	165.1	177.2	182.7	

Balance Check

0.5g 0.5000 50g 50.0000

10g 10.0000 100g 100.0000

Analyzed by: JG.

SHOLTES & KOOGLER

SAMPLE CHAIN OF CUSTODY

PLANT NAME: FL. SOLITE

SOURCE NAME: #5 KILN

DATE: 9-3-82 TYPE OF SAMPLE: PART

SAMPLE RECOVERY

CONTAINER NO.	DESCRIPTION
5-1	PROBE WASH (ACETONE) Run 1
5-2	" " Run 2
5-3	" " Run 3
Run 4	Filter Holder Run 1
Run 5	" " Run 2
Run 6	" " Run 3

Sample Recovered By: RCP & JH & DA.

Particulate Analysis By: DA.

CALIBRATIONS AND PROJECT PARTICIPANTS

CALIBRATION FORM

Date 8-30-82

Box No. SK-1

Barometric Pressure 30.14 inches Hg

ΔHT	ΔHD	Teledyne Mass Flow Meter		Gas Volume, Dry Gas Meter			Temp. Teledyne	Temp. of Dry Meter	Time Minutes
		Desired liters/min	Actual liters/min	Initial	Final	Actual ft.3			
0	0.88	15	15	27.2	29.870	2.686	68	80	5
0	1.65	20	20	1.0	4.582	3.582	68	80	5
0	2.45	25	25	6.0	10.468	4.468	68	80	5
0	3.70	30	30	12.0	17.352	5.352	68	80	5
0	4.85	35	34.8	20.0	26.179	6.179	68	80	5

GAS METER THERMOMETER CALIBRATION

N.B.S. °F	METER BOX
32	32
55	54
78	78
101	102
119	120

						--MEAN--
DELTA-H :	1.70	1.80	1.71	1.79	1.75	1.75
Y :	1.01	1.00	1.00	1.00	1.00	1.00
SCFM :	0.52	0.69	0.86	1.03	1.19	

Signature Henge F. Kabel

- C A L I B R A T I O N -

ATKINS NO. 1 THERMOCOUPLE

Date April 1, 1982

GLASS THEROMETER WITH NBS MERCURY (°F)	THERMOCOUPLE (°F)
32	32
130	131
212	212
320	321

Calibrated By: George F. Allen

Phone (904) 378-5555
CABLE ADDRESS: Atkins — Gainesville

Atkins Technical Incorporated
3401 S. W. 40TH BLVD., ARCHER INTERCHANGE (I-75) INDUSTRIAL AREA
GAINESVILLE, FLORIDA 32608 U.S.A.

Atkins
INSTRUMENTS & EQUIPMENT

CERTIFICATE OF COMPLIANCE, ACCURACY & CALIBRATION STATEMENT

We certify that the Atkins equipment supplied on the order referenced below has been tested and has fully met the Atkins published specifications applicable to the product(s).

We further certify that the instrumentation when specifically calibrated by Atkins Technical Inc. was done so by means of temperature standards traceable to the U.S. National Bureau of Standards, Gaithersburg, MD, and that the calibration was accomplished using generally accepted procedures.

Date: 2/26/82

ATKINS TECHNICAL INC.

by Robert M Atkins

Reference: 49000-J-Stoltz+Hooper
Verbal Purchase Order of 2/26/82

SK-61

PITOT TUBE CALIBRATION MEASUREMENTS

DATE CALIBRATED 5-11-82

Pitot tube assembly level? X yes _____ no

Pitot tube openings damaged? _____ yes (explain below) X no

α_1 = 3.0 ° (<10°), α_2 = 2.5 ° (<10°), β_1 = 3.0 ° (<5°),
β_2 = 2.5 ° (<5°)

γ = 3.5 °, θ = 2.0 °, A = .966 in. = (Pa + Pb)

z = A sin γ = 0.059 in. ; <0.32 <1/8 in.

w = A sin θ = 0.034 in. ; <0.08 <1/32 in.

P_A .485 in. P_b .481 in.

D_t = .402

Comments: _____

_____

_____

Calibration required? _____ yes X no

Calibrated by George F. Gabel

NOZZLE CALIBRATION

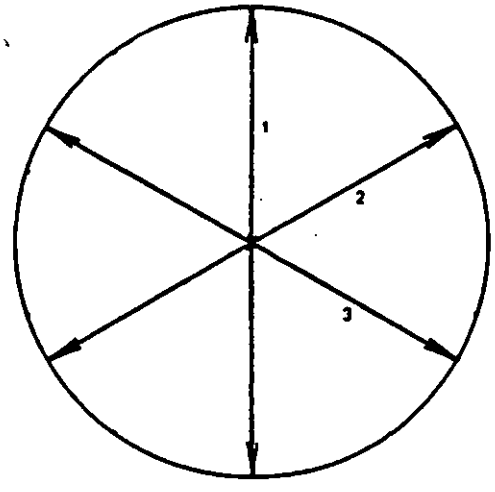
Nozzle 1/4 Date 9-3-82

Measurement No.	Inside Diameter (inches)
1	0.249
2	0.251
3	0.250

Average 0.250

Area of Nozzle 0.000341 Ft^2

Calibrated by: RCP



Nozzle X-section

METER ORIFICE CHECK

Meter Box No. 16-1 Δ Ha of Box 1.75

Date 9-3-82

Time for 10 ft^3 = 13 min. 21 sec.

10 ÷ 13.35 total minutes = 0.74906 Δ Ha_2

$\frac{0.75}{\Delta Ha_2}$ = 1.001 x 100 = 100.1

Rodney C. Paul
Signature

Procedure: Set flow rate of meter box at ΔHa of meter box--measure the amount of time required to sample 10.00 ft^3.

Note: If answer is within 5 percent meter is o.k. If not, recalibrate meter.

SAMPLING RATE CALCULATIONS

S & K NOMOGRAPH

ΔH = ORIFICE READING (INCHES H_2O)
D_N = NOZZLE DIA. (INCHES)
$\Delta H@$ = METER BOX CONSTANT
B_W = MOISTURE FRACTION
T_M = METER TEMP (°F)
T_S = STACK TEMP (°F)
M_S = WET MOLECULAR WEIGHT OF STACK GAS (FROM TABLE)
ΔP = PITOT READING (INCHES H_2O

$$\left[\frac{T_M + 460}{M_S(T_S + 460)}(1 - B_W)^2 \Delta H@ (D_n)^4 17741\right]\Delta P = \Delta H$$

MOISTURE FRACTION	M_S
0.0	29.0
0.05	28.5
0.10	27.9
0.15	27.4
0.20	26.8
0.25	26.2
0.30	25.7
0.35	25.2
0.40	24.6

$$\frac{560}{26.2\,(613)\,160660.6}$$

$$\frac{575}{26.5\,(635)\,168275}$$

	RUN 1		RUN 2		RUN 3	
$\frac{T_M + 460}{M_S(T_S + 460)}$ =	0.03487		0.03417			
× $(1 - B_W)^2$ =	0.5625		0.5929			
× $\Delta H@$ =	1.75		1.75			
× $(D_n)^4$ =	0.003906		0.003906			
× 17741 =	17741		17741			
× ΔP =	2.377		2.455			

PROJECT PARTICIPANTS

John B. Koogler, Ph.D., P.E.	Project Advisor
George F. Allen	Project Manager
George F. Gabel	Field Test Crew
Rodney C. Paul	Field Test Crew
Joshua K. Hellstrom	Field Test Crew

DRAFT/WP
d3006-4/971130
03/30/92 1

DATA RATING: B
REF 11 (AP-42)
REF 4-11

Emission Test Report
Review Checklist

Reviewer: R. MARINGHAM
Review Date: 11/17/92

A. Background Information

1. Facility name: FLORIDA SOLITE CORP.
   Location: GREEN COVE SPRING, FL
2. Source category: LIGHTWEIGHT AGGREGATE
3. Test date: 9/3/82
4. Test sponsor: PLANT
5. Testing contractor: SHOLTES & ROOGLER ENVIR. CONS., INC
6. Purpose of test: COMPLIANCE
7. Pollutants measured

   (PM) PM-10 CO SO_2 NO_x VOC Pb CO_2

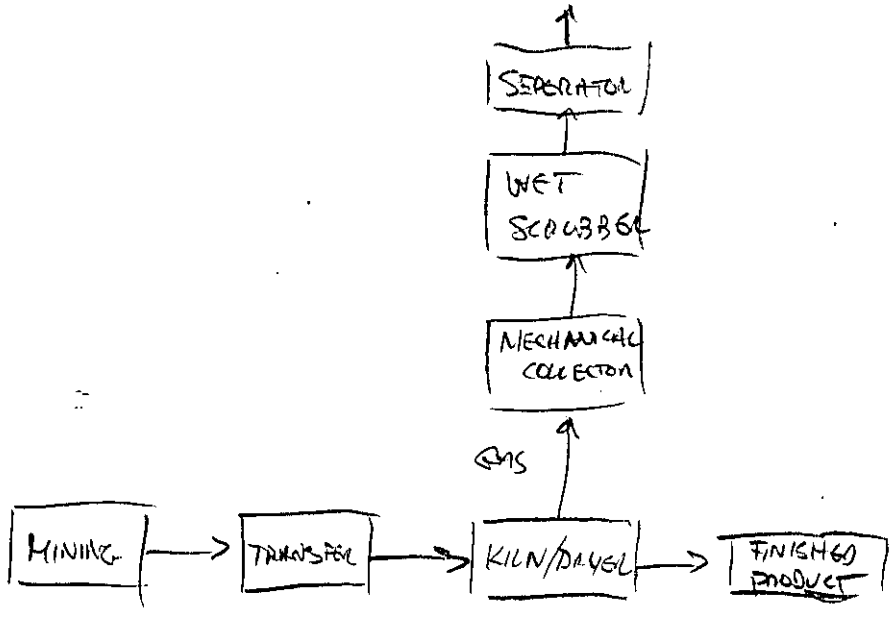
   Others (list):
8. Process overview: On an attached page provide a block diagram of the unit operations and associated air pollution control systems at the facility. Identify process tested with letters from the beginning of the alphabet (A, B, C, etc.) and APC systems with letters from end of alphabet (V, W, X, etc.). Also identify test locations with Arabic numerals (1,2,3, ...). Using the ID symbols from that sketch complete the table below that identifies processes or unit operations tested.

Test ID	Process	Process ID	Emissions tested		APCD (controlled emissions only)
			Uncontrolled	Controlled	
1	KILN (COKE)	A		✓	SCRUBBER

B. Process Information

1. Provide a brief narrative description of the process. With as much detail as possible, (e.g., if a furnace or conveyor system is used, identify the type of unit) describe the equipment used for those operations tested. (Note: If process description provided in test report is adequate, attach copy or reproduce here.)

The Florida Solite Corporation owns and operates a mining and mineral processing facility located near Green Cove Springs, Florida. The material that is mined is a clay mineral which is dried into a light-weight, very strong aggregate called solite.



2. For each process tested list feedstock materials and products. Indicate if activity factors are for feed (F) rate or product (P) rate.

Process ID	Feedstock materials	Products	Basis for activity factor	F/P
A	CLAY, COKE	LWA	TOTAL FEED RATE	F

Basis for data: PG. 3
(Indicate page/table Nos. in test report)

3. For each process or operation tested and each test run note process capacity and operating rate during test.

Process ID	Capacity	Units	Test run	Process rate	Units
			1	10.49	TONS/HR
			2	10.49	
			3	10.49	
			4		
			1		
			2		
			3		
			4		
			1		
			2		
			3		
			4		
			1		
			2		
			3		
			4		
			1		
			2		
			3		
			4		

+4.5 TONS/HR (COKE)
"
"

Basis for data: PG. 4

C. Air Pollution Control Systems Tested

1. For each air pollution control system pollution control system identified in A.8, note the following

ID	Type of APCD	Manufacturer	Model No.
	WET SCRUBBER		

Note: Be as specific as possible in identifying APCD. For example, indicate "pulse jet fabric filter" rather than simply "fabric filter."

NO DATE

2. For each system identified above, provide a narrative description. For fugitive systems describe capture techniques as well as the removal techniques (use a separate page if necessary)

3. Using the attached parameter list for guidance complete the table below. (Use additional pages as needed.)

APCD ID	Parameter	Units	Readings			
			Run 1	Run 2	Run 3	Run 4
Type of APCD:						
Type of APCD:						
Type of APCD:						

D. Sampling and Analysis Methods

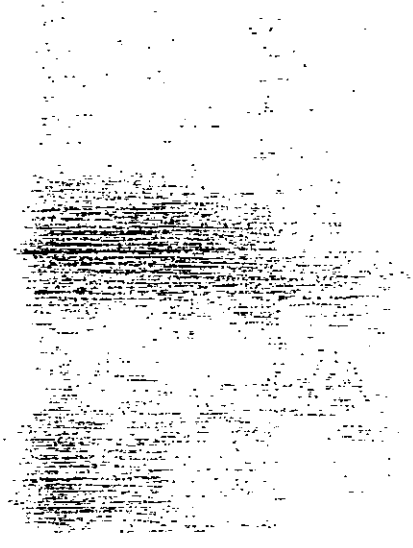
1. Complete the following table

Test location	Pollutant	S & A method	Reference/ conditional method	Deviations noted
1	PM	5	Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N

2. If a method used was not a reference or conditional method, provide a narrative discussion including any data manipulation needed to make results correspond to reference or conditional method results.

3. Describe any deviations identified above.

NONE RELATED



E. Emission Data Documentation

1. Tabulate the following stack gas data from the test report. (Use additional pages as needed.)

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
	Stack temperature	°F	175	185	171	
	Moisture	%	23.6	25.1	24.9	
	Oxygen					
	Volumetric flow, actual		27055	26008	27301	
	Volumetric flow, standard	DSCFM	16602	16687	17246	
	Percent isokinetic	%	99.6	96	97.1	
	Pollutant concentration:					
	PM	gr/SCF	0.0858	0.0918	0.1180	
	Stack temperature					
	Moisture					
	Oxygen					
	Volumetric flow, actual					
	Volumetric flow, standard					
	Percent isokinetic					
	Pollutant concentration:					
	Stack temperature					
	Moisture					
	Oxygen					
	Volumetric flow, actual					
	Volumetric flow, standard					
	Percent isokinetic					
	Pollutant concentration:					

2. Tabulate pollutant mass flux rates

			Mass flux rates			
Test ID	Pollutant	Units	Run 1	Run 2	Run 3	Run 4
1	PM (FILT)	lbs/hr	12.21	13.13	17.45	

3. Present example emission factor calculations below.

12.21/10.49 = 1.16 lb/ton
13.13/10.49 = 1.25
17.45/10.49 = 2.92

AVERAGE 1.78

4. Tabulate emission factors

Process	Pollutant	Units	Average emission factor	
			Uncontrolled	Controlled
1	PM (ALT.	lbs/ton		1.78

ATTACHMENT A
APCD PARAMETERS

Type of APCD	Parameters
Fabric filter	Cleaning mechanism Bag type Cleaning frequency Air to cloth ratio (A/C) Pressure drop Inlet temperature
ESP	Type (wet or dry) Number of fields Rapping cycle (if dry) Specific Collection Area (SCA) Particulate resistivity (if known) Spark rate Current and power levels
Venturi (or other high energy) scrubber	Pressure drop Liquid/gas (L/G) ratio Mist eliminator type
Packed-bed scrubber	Packing depth L/G ratio Caustic use (Y/N) pH Mist eliminator type
Carbon absorber	Bed depth Superficial gas velocity Bed temperature Desorption mechanism (media) Flue-gas moisture Cycle length Time-on-line after breakthrough