AP42 Section:	11.25
Background Chapter	4
Reference:	4
Title:	*Emission Test Report: Plant A*, Confidential Business Information files, Document No. C-3-1, ESD Project No. 81/08, U. S. Environmental Protection Agency, Research Triangle Park, NC, October, 1983.

Section 4 Reference 4
AP-42 Reference ___

Process Data CBI.

Emission Test Report Review Checklist--Short Form

Reviewer: Brian Shrager
Review Date: 4/26/93

PLANT J1 IN CALCINERS AND DRYERS

A. Background Information

1. Facility name: [redacted] Company
   Location: [redacted]
2. Source category: Clay Processing (Kaolin)
3. Test date: Week of September 26, 1983
4. Test sponsor: EPA
5. Testing contractor: Engineering Science
6. Purpose of test: NSPS for Calciners and Dryers
7. Pollutants measured (include test method and indicate if valid): PM - EPA Method 5
   Particle Size
   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: Uncontrolled	Emissions tested: Controlled	APCD (controlled emissions only)
1	Herreschoff Furnace / Kaolin cooling conveyor	A	✓		ID: Z Type: Baghouse Model #:
2	Herreschoff Furnace / Kaolin cooling conveyor	A		✓	ID: Z Type: Baghouse Model #:
3	Herreschoff (multiple hearth) Furnace	A B	✓		ID: ? Type: Model #:
4	Herreschoff (multiple hearth) Furnace	A B		✓	ID: Y Type: Venturi Scrubber Model #:
5	Flash Calciner	B C	✓		
6	Flash Calciner	B C		✓	ID: X TYPE: Baghouse Model #:

Add emissions to get total uncontrolled number.

Add emissions to get total controlled number.

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.)

- o PM concentrations, PM mass emission rates, and particle size determinations were performed at the bagouse inlet and outlet on the Flash Calciner.

- o VE observations were taken at the cooler (serpentine pipe) inlet and the baghouse exhaust stack.

- o Grab samples of the feed material were collected for particle size sieve and moisture analysis. Grab samples of the product material (a mixture of material collected by cyclones and a baghouse) were also collected for particle size sieve and moisture analysis.

Table 4.1 presents the tests conducted at this plant.

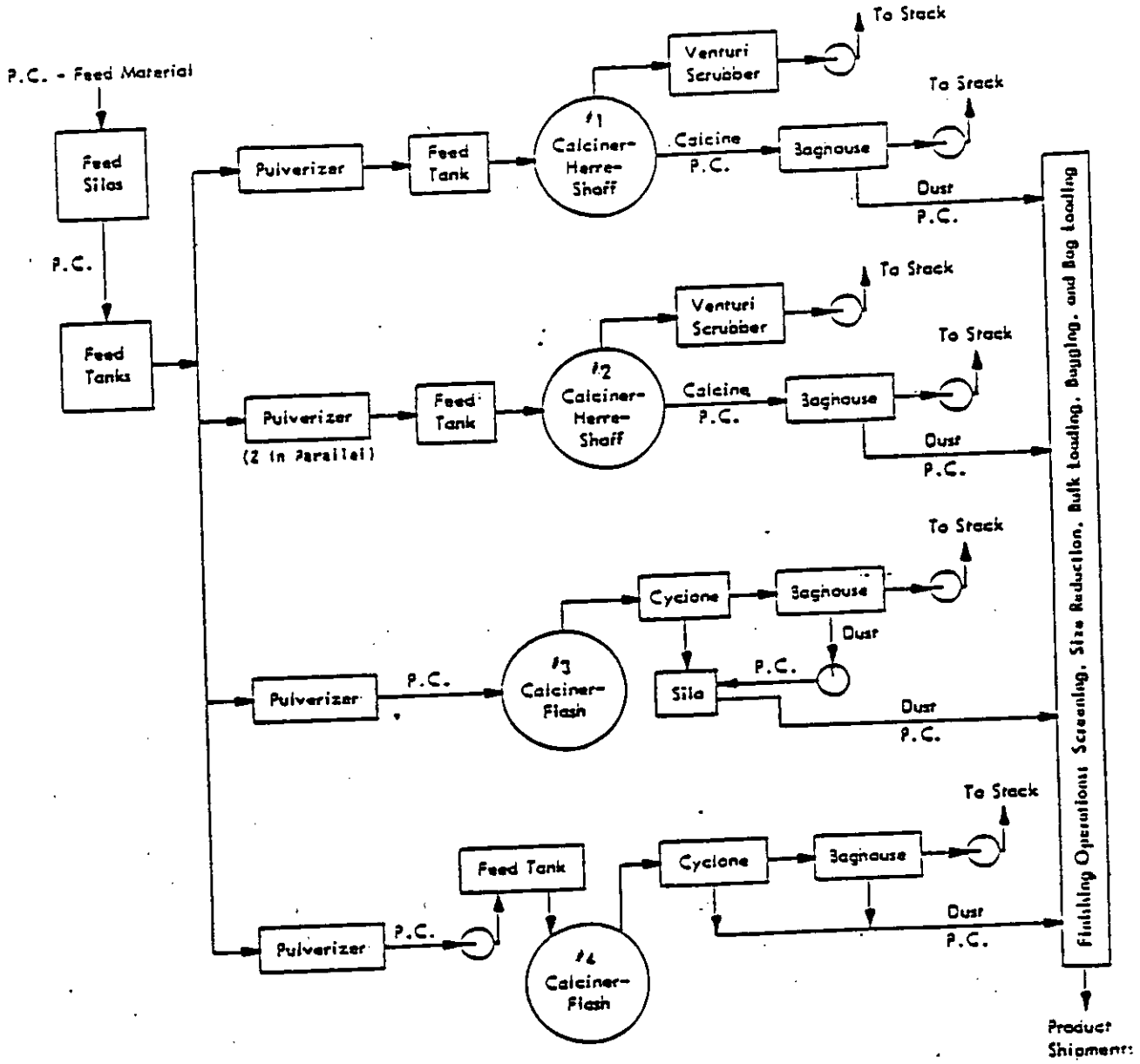
PROCESS DESCRIPTION

This plant operates continuously except for breakdowns, 24 hours per day and 7 days per week. A simplified process schematic is presented in Figure 4.1. There are four separate process lines which produce calcined kaolin. Lines 1 and 2 use multiple hearth (Herreschoff) furnaces, while lines 3 and 4 use Flash Calciners. Raw material is withdrawn from feed silos and pneumatically conveyed to feed tanks. Kaolin is conveyed from the feed tanks and used as feed material for each of the four processing lines.

Herreschoff Furnace 2

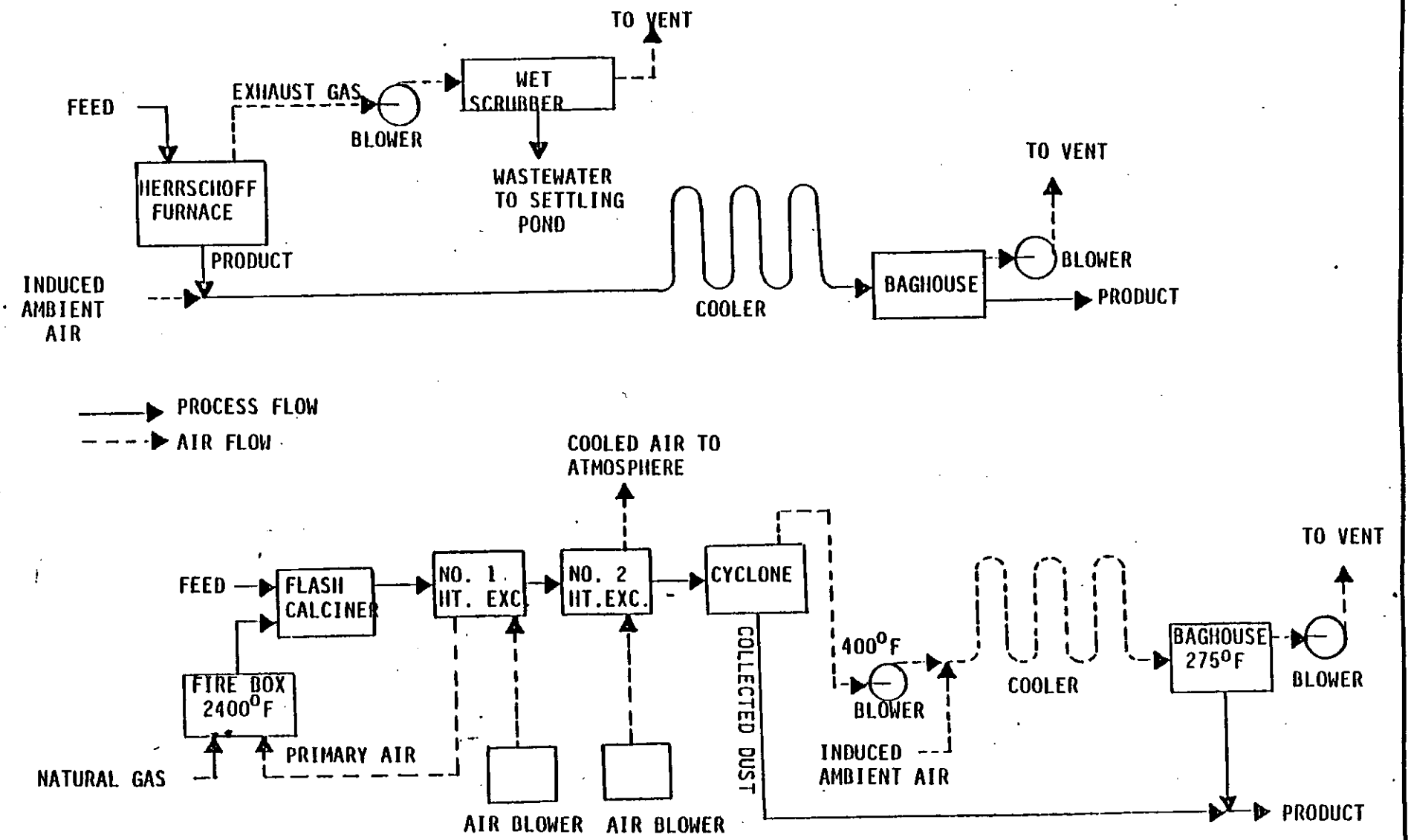
A simplified flow diagram that shows the emission control systems for the Herreschoff Furnace lines is shown in Figure 4.2. The feed material is discharged to the top of the Herreschoff by an enclosed screw conveyor. The exhaust gas from the Herreschoff is controlled by a venturi scrubber. The cleaned gas stream leaving the scrubber passes through a fan to a vent stack. Calcined kaolin is discharged at the bottom of the furnace into a pneumatic conveying line (serpentine cooler) that cools the material. This conveying stream leads through a baghouse and a fan to a stack. All of the calcined product is collected in this baghouse. From the baghouse the calcined kaolin is conveyed to finishing operation (see Figure 4.1), which include screening, size reduction, bulk loading, bagging, and bag loading.

Herreschoff Furnace 2 was manufactured by Nichols. This calciner is fired on natural gas, and the maximum calcining temperature is 1093°C (2000°F). The calciner has a retention time of about 30 minutes. The kaolin processed contains less than 1% surface moisture before calcining. The calciner removes the small amount of surface moisture and approximately 14% chemically bound water in the material. Table 4.2 presents the design and operating parameters for Herreschoff Furnace 2. Table 4.3 presents the design and operating parameters for the venturi scrubber and the baghouse.



Note: P.C. = Pneumatically Conveyed

Simplified process flow diagram for [redacted].



FLOW DIAGRAM FOR EMISSION CONTROL SYSTEMS FOR CALCINERS AT
PURGESS PIGMENT COMPANY, SANDERSVILLE, GEORGIA

FIGURE 4.

Flash Calciner 4

A simplified flow diagram that shows the emission control systems for the Flash Calciner lines is shown in Figure 4.2. The feed material is pneumatically conveyed to the calciner. Exhaust gas from the calciner is passed through two heat exchangers (gas-to-gas) to a cylcone that removes a portion of the product. Heat exchanger 2 was not operating during the tests. Following the cyclone, the gas stream passes through a pneumatic conveying line (serpentine cooler) to a baghouse and an induced draft fan and is then vented through a discharge stack. Calcined product, collected in both the cyclone and the baghouse, is then conveyed to finishing operations.

The normal feed rate for Flash Calciner 4 is 3.6 Mg (4 tons) per hour. The calciner is fired on natural gas and the maximum calcining temperature is 1371°C (2500°F). The calciner has a retention time of 0.5 to 2 seconds. The kaolin processed contains about 1% surface moisture before calcining. The calcincer removes the small amount of surface moisture and about 14% of the chemically bound moisture in the material. Tables 4.2 and 4.3 present the design and operating parameters for the Flash Calciner and its baghouse, respectively.

PROCESS CONDITIONS DURING TESTING

Note: Tables 4.4, 4.5, and 4.6 and Tables 4.10, 4.11, and 4.12, process data for the Herreschoff Furnace 2 and Flash Calciner 4, respectively, have been deleted from this report for confidentiality purposes, at [redacted] request, and will be stored under lock and key pending a review by the Administrator as to the legitimacy of Burgess' claim on confidentiality.

Herreschoff Furnace 2

All process conditions were normal during the testing, except the Herreschoff was shut down for a period of 8 minutes during Run 2 due to problems with the product screw conveyor. Testing was discontinued for this period. Temperatures at various hearths in the Herreschoff were monitored from a control panel. The fuel consumption was monitored by reading a natural gas meter. The feed rate was measured several times during each test by manually collecting the feed in a bag for 10 seconds and then weighing the collected feed. Tables 4.4, 4.5, and 4.6 present the process data recorded during the tests (see Confidential Addendum). A shown in these tables, the process parameters were faily uniform during the tests, and therefore process conditions were normal. The feed rate and temperatures were close to design.

The venturi scrubber operation was monitored by reading the pressure drop across the venturi, the pump inlet vacuum, the pump outlet pressure, and the pump power consumption. A flow meter was installed on September 27, 1983, to monitor scrubber water flow rate during Runs 2 and 3. The baghouse operation was monitored by reading pressure drop across the baghouse and observing pressure columns that reflect cleaning mechanisms of individual compartments. Tables 4.7, 4.8 and 4.9 present the control equipment data recorded during the test.

Flash Calciner 4

The No. 2 heat exchanger is old and will be replaced in 1984. The product was pneumatically conveyed through the No. 2 heat exchanger even though it was not operating during all three runs. The product quality and the overall process were not affected because heat exchanger 1 was operating during all three runs.

During Run 1, excessive visible emissions were noted by ground observers from the baghouse exhaust stack. The certified recorder read predominantly 0% from the top of a silo. Plant personnel felt that the baghouse was not operating correctly and volunteered to shut down the process and to inspect the baghouse prior to Run 2. The baghouse was checked the next morning and two bags were found loose. The problem in the baghouse was corrected prior to Runs 2 and 3. All processes were operated normally during Runs 2 and 3.

The calciner operation was monitored from a control panel that contains temperature gauges for precombustion air, calciner inlet, calciner outlet, No. 1 heat exchanger outlet, No. 2 heat exchanger outlet, and baghouse inlet. Production rate was monitored by measuring product silo levels. Feed rotary valve rpm and feel blower pressure were monitored from the control panel. The fuel consumption was monitored by reading a natural gas meter. Tables 4.10, 4.11, and 4.12 present the process data recorded during the tests (see Confidential Addendum).

The baghouse operation was monitored by measuring pressures at main fan intake and serpentine pipe outlet. The difference in these pressures indicate pressure drop across the baghouse. Tables 4.13, 4.14, and 4.15 present the control equipment data recorded during the tests.

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	Deg C	79	78	81	
furnace	Moisture	%	0.7	1.8	3.4	
baghouse	Oxygen	%	20.9	20.9	20.9	
inlet	Volumetric flow, actual	m ^ 3/min	747	691	735	
	Volumetric flow, standard	DNm ^ 3/mi	597	547	568	
	Isokinetic variation	%	101.8	106.4	100.3	
Circle: Production or feed rate Capacity:						
	Pollutant concentrations:					
	Filterable PM	mg/DNm ^ 3	87464.9	83911.7	101430.6	
	CO2	%	0	0	0	
	Pollutant mass flux rates:					
	Filterable PM	kg/hr	3137.9	2754.6	3458.6	
	Emission factors:					
	Filterable PM					

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg C	64	58	67	
furnace	Moisture	%	0.9	0.3	1	
baghouse	Oxygen	%	20.9	20.9	20.9	
outlet	Volumetric flow, actual	m ^ 3/min	956	941	953	
	Volumetric flow, standard	DNm ^ 3/mi	813	819	802	
	Isokinetic variation	%	99.8	99.9	100.5	
Circle: Production or feed rate Capacity:						
	Pollutant concentrations:					
	Filterable PM	mg/DNm ^ 3	2.6	1.5	0.5	
	CO2	%	0	0	0	
	Pollutant mass flux rates:					
	Filterable PM	kg/hr	0.127	0.074	0.024	
	Emission factors:					
	Filterable PM					

$Nm^3/min \times$

$= \frac{Kg\,m/s^2 \times m^3}{60\,s} = \frac{Kg\,m^4}{s} \times 60$

$1\ lbf = 4.4482\ N$

$.1149\ lbm/ft^3 = \frac{.1149 \times 1\ lbf}{32.174\ ft/s^2} = 3.5712 \times 10^{-3}\ \frac{lbf\,s^2}{ft} \times \frac{4.4482\ N}{lbf} \times \frac{1\ ft}{0.3048\ m} = 0.05212\ \frac{N\,s^2}{m}$

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
3	Stack temperature	Deg C	301	294	290	
furnace	Moisture	%	17.1	17.2	15.5	
scrubber	Oxygen	%	12.6	13.7	14.4	
inlet	Volumetric flow, actual	m ^ 3/min	299	312	315	
	Volumetric flow, standard	DNm ^ 3/mi	125	132	137	
	Isokinetic variation	%	111.7	103	101.3	
Circle: Production or feed rate Capacity:						
	Pollutant concentrations:					
	Filterable PM	mg/DNm ^ 3	8435.5	8151.2	9140.8	
	CO2	%	4.7	3.8	3.7	
	Pollutant mass flux rates:					
	Filterable PM	kg/hr	63.2	64.4	74.9	
	Emission factors:					
	Filterable PM					

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
4	Stack temperature	Deg C	56	55	56	
furnace	Moisture	%	18.9	17.6	15.7	
scrubber	Oxygen	%	14.9	15.6	15.6	
outlet	Volumetric flow, actual	m ^ 3/min	216	231	220	
	Volumetric flow, standard	DNm ^ 3/mi	155	168	164	
	Isokinetic variation	%	109.5	107	105.3	
Circle: Production or feed rate Capacity:						
	Pollutant concentrations:					
	Filterable PM	mg/DNm ^ 3	56	38.5	46.9	
	CO2	%	3	2.8	2.8	
	Pollutant mass flux rates:					
	Filterable PM	kg/hr	0.521	0.388	0.461	
	Emission factors:					
	Filterable PM					

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
5	Stack temperature	Deg C	130	123	128	
flash	Moisture	%	7.1	8.9	5.5	
calciner	Oxygen	%	18.5	18.6	18.6	
baghouse	Volumetric flow, actual	m ^ 3/min	840	845	803	
inlet	Volumetric flow, standard	DNm ^ 3/mi	555	556	539	
	Isokinetic variation	%	101.7	101.6	100	
Circle: Production or feed rate Capacity:						
	Pollutant concentrations:					
	Filterable PM	mg/DNm ^ 3	49478.4	49128.9	48903.3	
	CO2	%	1.3	1.2	1.2	
	Pollutant mass flux rates:					
	Filterable PM	kg/hr	1646.9	1638.8	1582.4	
	CO2	kg/hr				
	Emission factors:					
	Filterable PM					

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
6	Stack temperature	Deg C	91	77	83	
flash	Moisture	%	5.9	5.7	5.1	
calciner	Oxygen	%	20.9	20.9	20.9	
baghouse	Volumetric flow, actual	m ^ 3/min	744	748	768	
outlet	Volumetric flow, standard	DNm ^ 3/mi	553	584	593	
	Isokinetic variation	%	101.7	102.5	101	
Circle: Production or feed rate Capacity:						
	Pollutant concentrations:					
	Filterable PM	mg/DNm ^ 3	35.8	2.7	2.2	
	CO2	%	0	0	0	
	Pollutant mass flux rates:					
	Filterable PM	kg/hr	1.188	0.095	0.078	
	Emission factors:					
	Filterable PM					

BAGS SLIPPED. VOID RUN!

Source category: Clay processing
Plant name : [redacted]
Test date : Sept. 83
Process : kaolin

Date: 08/25/93
Location:
Ref. No.: 4
Process rate basis: product

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Volumetric flow rate, DSCFM	Concen ppm
Furnace	none	filt. PM	1	139.0	4.1	17	34		
		filt. PM	2	141.7	4.7	15	30		
		filt. PM	3	164.8	4.2	20	39		
		AVERAGE				17	34	RATING:	A
		filt. PM-10	1	58.96	4.1	7.2	14		
		filt. PM-10	2	66.44	4.7	7.1	14		
		filt. PM-10	3	86.46	4.2	10	21		
		AVERAGE				8.2	16	RATING:	A
		CO2	1	1,424	4.1	174	347	4,414	4.7
		CO2	2	1,214	4.7	129	258	4,654	3.8
		CO2	3	1,225	4.2	146	292	4,825	3.7
		CO2	1	1,124	4.1	137	274	5,458	3.0
		CO2	2	1,141	4.7	121	243	5,935	2.8
		CO2	3	1,113	4.2	132	265	5,791	2.8
		AVERAGE				140	280	RATING:	A
Furnace	venturi scrubber	filt. PM	1	1.15	4.1	0.14	0.28		
		filt. PM	2	0.85	4.7	0.091	0.18		
		filt. PM	3	1.01	4.2	0.12	0.24		
		AVERAGE				0.12	0.23	RATING:	A
flash calciner	none	filt. PM	1	3623.2	2.9	625	1249		
		filt. PM	2	3605.4	3.6	501	1001		
		filt. PM	3	3481.3	3.3	527	1055		
		AVERAGE				551	1102	RATING:	A
		filt. PM-10	1	2363.46	2.9	407	815		
		filt. PM-10	2	1867.14	3.6	259	519		
		filt. PM-10	3	1089.88	3.3	165	330		
		AVERAGE				277	555	RATING:	A
		CO2	1	1,748	2.9	301	603	19,592	1.3
		CO2	2	1,617	3.6	225	449	19,634	1.2
		CO2	3	1,569	3.3	238	475	19,046	1.2
		AVERAGE				255	509	RATING:	A
flash calciner	fabric filter	filt. PM	2	0.21	3.6	0.029	0.058		
		filt. PM	3	0.17	3.3	0.026	0.052		
		AVERAGE				0.028	0.055	RATING:	B
		filt. PM-10	2	0.17	3.6	0.023	0.046		
		filt. PM-10	3	0.15	3.3	0.023	0.046		
		AVERAGE				0.023	0.046	RATING:	B