Reference 32 ;
(3) Clinker Coolers +
(1) Gravel Bed Filter

Data Rating A

TEST REPORT
STACK ANALYSIS
FOR
PARTICULATE EMISSION

Clinker Coolers/Gravel Bed Filter

Client: Rexnord
Air Pollution Division
P.O. Box 99611
Louisville, Kentucky

Testing Firm: Mease Engineering Associates
P.O. Box 51
Port Matilda, PA

Source category: Portland Cement
Plant name : Oklahoma Cement
Test date : 3/25/80
Process : dry

Date: 01/15/93
Location: Pryor, OK
Ref. No.: 15
Basis for process rate : feed/production
Ratio: 1.78

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
clinker cooler	gravel bed filter	BASED ON KILN FEED RATE							
		filt. PM	1	14.8	148.8	0.0497	0.0995		
		filt. PM	2	13.6	148.8	0.0457	0.0914		
		filt. PM	3	12.9	148.8	0.0433	0.0867		
					average	0.0463	0.0925	Rating:	A
		con. inorg. PM	1	0.4	148.8	0.00134	0.00269		
		con. inorg. PM	2	1.2	148.8	0.00403	0.00806		
		con. inorg. PM	3	1.0	148.8	0.00336	0.00672		
					average	0.00291	0.00582	Rating:	A
clinker cooler	gravel bed filter	BASED ON CLINKER PRODUCTION RATE							
		filt. PM	1	14.8	83.8	0.0883	0.177		
		filt. PM	2	13.6	83.8	0.0811	0.162		
		filt. PM	3	12.9	83.8	0.0770	0.154		
					average	0.0821	0.164	Rating:	A
		con. inorg. PM	1	0.4	83.8	0.00239	0.00477		
		con. inorg. PM	2	1.2	83.8	0.00716	0.0143		
		con. inorg. PM	3	1.0	83.8	0.00597	0.0119		
					average	0.00517	0.0103	Rating:	A

CLIENT: Rexnord
Air Pollution Division
P.O. Box 99611
Louisville, Kentucky 40299

TEST LOCATION: Oklahoma Cement
Pryor, Oklahoma

UNIT TESTED: Gravel Bed Filter and Clinker Coolers

TEST PURPOSE: Determine the compliance nature of the process with applicable State of Oklahoma and Environmental Protection Agency Particulate Emission Requirements.

TEST EQUIPMENT: Research Appliance Company "STAKSAMPLR" Portable Gas Sampler, Model #2343.

TEST METHOD: Environmental Protection Agency Method 5-Determination of Particulate Emissions from Stationary Sources, as described in the Federal Register, Vol. 42, No. 160, August 18, 1977, and as modified by the state of Oklahoma.

TESTS PERFORMED:
1. Air Volumes and Temperatures
2. Particulate Emission Rates

TESTING ENGINEER: Michael J. Mease
Michael J. Mease

TESTING FIRM: Mease Engineering Associates
P.O. Box 51
Port Matilda, Pennsylvania 16870

SUMMARY TEST DATA

Process: Gravel Bed Filter/Clinker Coolers

	Run #1	Run #2	Run #3
Test Dates and Time	3/25/80 11:43am-1:15pm	3/25/80 2:02-3:26pm	3/25/80 4:02-6:06pm
Stack Diameter, Inches	107.56	107.56	107.56
Sampling Nozzle Diameter, Inches	0.250	0.250	0.250
Testing Time, Minutes	72	72	72
Stack Gas Temperature, ^{o}F	296	298	304
Stack Gas Moisture Content,%	1.61	1.25	1.04
Stack Gas Volume Sampled, $Ft.^3$	54.418	54.831	54.519
Stack Gas Volume Sampled, SCF @ $70^{o}F$,dry,29.92 in.Hg.	53.6	53.2	53.0
Stack Gas Molecular Weight	28.7	28.7	28.7
Stack Gas Velocity, Ft./Sec.	55.0	54.5	54.3
Stack Gas Flowrate, ACFM	208,000	206,000	205,000
Stack Gas Flowrate, SCFM @ $70^{o}F$,dry,29.92 in.Hg.	143,000	142,000	140,000
Particulate Captured, Grams (Front Half of Train)	0.0419	0.0386	0.0368
Particulate Captured, Grams (Entire Sampling Train)	0.0431	0.0421	0.0396
Percent Isokinetic of Test	96.4	96.5	97.0

EMISSIONS SUMMARY

	Run #1	Run #2	Run #3
Kiln Feed Rate, Tons/Hour	148.8	148.8	148.8
Clinker Feed Rate, Tons/Hour	83.8	83.8	83.8
Allowable Emission Rate, Lb./Hr. (EPA Regulations)	14.9	14.9	14.9
Allowable Emission Rate, Lb./Hr. (State of Oklahoma Regulation)	117.7	117.7	117.7
Actual Emission Rate, Lb./Hr. (Front Half of Train)	14.8	13.6	12.9
Actual Emission Rate, Lb./Hr. (Entire Sampling Train)	15.2	14.8	13.9
Particulate Concentration, Grains/SCF (Front Half of Train)	0.012	0.011	0.011
Particulate Concentration, Grains/SCF (Entire Sampling Train)	0.012	0.012	0.012
Particulate Concentration, Grains/ACF (Front Half of Train)	0.008	0.008	0.007
Particulate Concentration, Grains/ACF (Entire Sampling Train)	0.009	0.008	0.008

SAMPLING PORT LOCATION

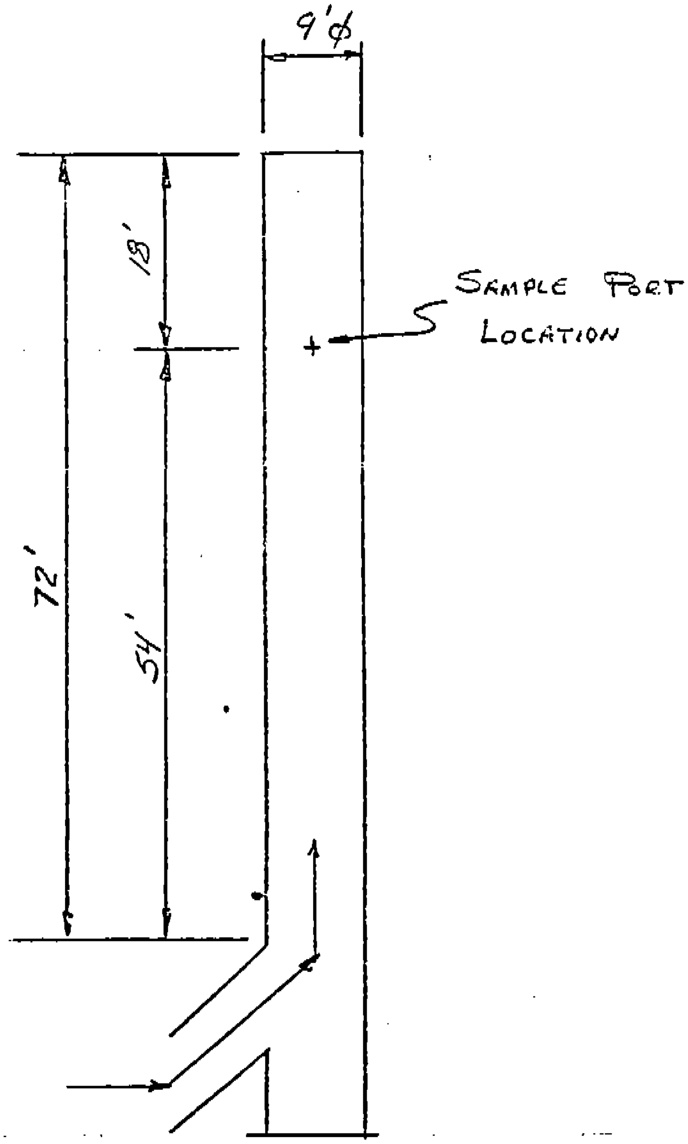
The two sampling ports were located approximately fifty-four feet downstream of the fan inlet and eighteen feet upstream of the top of the stack. The two ports were located 90° apart. The stack diameter was determined to be 107.56 inches. Two separate traverses of twelve points each were conducted for a total of twenty-four sampling points. Each point was sampled for a period of three minutes, for a total test time of seventy-two minutes. The sampling points were located at the following distances from the stack wall (in inches): 2.26, 7.21, 12.69, 19.04, 26.89, 38.29, 69.27, 80.67, 88.52, 94.87, 100.36, and 105.30.

Prior to beginning the tests, it was noted that two crossing support struts were located approximately ten inches below the sampling ports. A check of the sampling points revealed that the sampling nozzle was always at least fourteen inches away from the struts. The velocity check and angle flow check further showed that there was no flow interference from the struts. This was discussed prior to the test with Mr. Patrick Ford and Mr. Richard Graziano of the GCA Corporation, who were representing EPA. It was decided that no flow interference was evident.

TEST PROCEDURE SUMMARY

The test procedure employed was principally the Environmental Agency Method 5. The principal modification was an analysis of the impinger train, as required by the state of Oklahoma. The impinger train was rinsed with distilled water and then with acetone. The particulate weights from the impinger catch are reported separately. The stack gas molecular weight was determined with grab samples and a Fyrite Analyzer. Three grab samples were conducted during each test. In all nine cases, the results were: 21.0 % O_2, 0.0 % CO_2.

Tests #1 and #2 were conducted without interruption. Test #3 was interrupted three times to correct a faulty sampling box heater. The interruptions occurred at 39, 42, and 48 minutes into the test. The interruptions did not affect the test results.



SCHEMATIC OF SAMPLE PORT LOCATION

Rexnord
Air Pollution Control Division

SUBJECT PRE-TEST PLAN SCHEMATIC
ACCEPTANCE TESTING @ OKC, PRYOR, OK

BY NDK DATE 1-21-90

CHECKED ______ DATE ______ JOB No PC-1046

SHEET No 1 OF 1 REVISION ______

OKLAHOMA CEMENT
DESCRIPTION OF PROCESS OPERATIONS

Description of Process Operations

The process used to describe the manufacturing of Portland Cement is divided into three process classifications termed wet, semi-dry and dry. The difference being in the amount of water used in the grinding of raw materials. At Oklahoma Cement the dry process system is used.

Raw materials used to manufacture cement at Oklahoma Cement are limestone, shale and iron ore. After these materials have been crushed to a minimum size they are fed proportionally to a dry process ball mill. In this mill they are blended and ground to a fine uniform powdered mixture which is called raw mix. As the raw mix is discharged from the mill it is pumped to the raw mix blend silos. Once these materials have been blended and the mixture is of the desired chemical composition to produce quality cement clinker, the material becomes kiln feed and is transferred to the kiln silos.

From the kiln feed silos the material is fed to a coal fired rotary kiln. Inside the kiln there are four main processes taking place at temperatures varying from 900°F at the feed end to 2800°F at the firing end. These processes are drying, calcination or decarbonation of limestone, clinkering-liquid formation to form cement compounds and finally the cooling of clinker. The liquid, upon cooling, forms hard masses 1/8 inch to 1½ inch in size. These hard masses are called clinker and when cooled by passing through a clinker cooler, they are conveyed to a storage area. These hard masses are eventually transferred to a ball mill where they are ground to a fine powder called cement. Exhibit "A" presents a flow diagram of the Pryor plant.

Process Weight

During the past several years a considerable amount of production - process data has been compiled and summarized which enables us to predict and verify production capacities of the various process units.

Under our present method of operation, kiln production is obtained by methods (2) and (3) listed below and may be cross-checked by methods (1) and (4). These are:

(1) Inventory measurements of raw materials in the blend silos and kiln feed silos.
(2) Number of crane buckets of clinker removed from the kiln discharge area. Crane buckets have been calibrated to contain X number of tons of clinker.
(3) Speed of kiln feed screw - and raw weigh feeder - each RPM feeds X number of tons of raw material to the kiln.
(4) Inventory measurement of clinker storage area.

During the course of emission sampling for this period, kiln and feeder data were obtained. From this kiln feed and clinker production were calculated. These data are presented in the attached Table, PROCESS DATA.

OKLAHOMA PROCESS DATA

FOR

REXNORD GRAVEL BED

	KILN #1	KILN #2	KILN #3	TOTAL KILN FEED RATE
Raw Feed Tons/Hr	40.2	40.9	51.9	133.0
Coal Feed Tons/Hr	4.5	5.1	6.2	15.8
TOTAL FEED RATE	44.7	46.0	58.1	148.8
Clinker Prod. Tons	25.3	25.8	32.7	83.8
Cooler Feed Rate Okla.				
Allowable Emissions Clinker Cooler EPA 0.1 Lb/Ton kiln Feed with Coal				14.9 lbs/hr
Oklahoma Allowable Process Wt. Table Clinker Production 83.8 Tons/Hr	38.4	38.6	40.7	117.7 lbs/hr

Production rates are during time of testing 11 a.m. to 6 p.m. 3/25, 1980. Representatives present during time of test were - GCA representing EPA, Dr. Joyce Sheedy, Oklahoma Air Control, Chris Rayner, Kaiser Engineers.

PRODUCTION DATA FACTORS

Production Rates - For Seven Hours Operation

#1 Kiln Factor

9839 x 0.02857 = 281.1 Tons Raw, Ton/Hr. = 40.15
40.15 x 0.63 = Clk Tons/Hr = 25.3

#2 Kiln

7069 x 0.0405 = 286.3 Tons Raw, Tons/Hr 40.9 PHR
40.9 Tons Hr x 0.63 = Clk Tons/Hr = 25.8

#3 Kiln

362.99 ÷ 7 = 51.9 Tons Raw Per Hour
51.9 Tons/Hr x 0.63 = Clk Tons/Hr = 32.7

Identity of Emissions

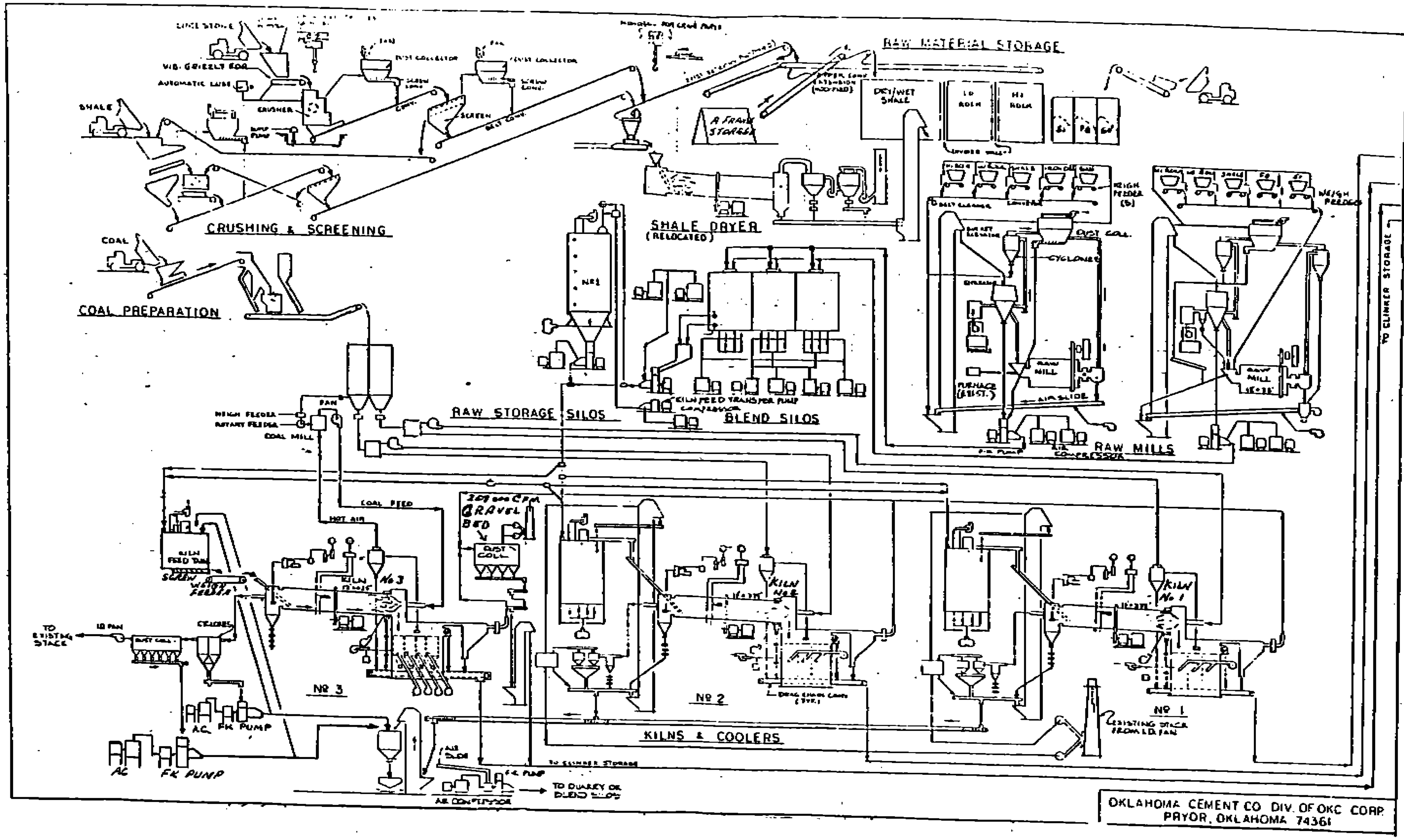
Emissions from the process are fine particles and combustion gases. Combustion gases are a mixture of water vapor, oxygen, nitrogen, carbon dioxide and sulphur dioxide.

Plant Operation - Variation during routine operations

A. Variation in operating conditions could be from one or a combination of the following:

1. Problems with raw feed
   a. Not feeding uniformly
   b. Loss of feed
   c. Change in chemical composition
   d. Ring formations, mud or clinker
   e. Excessive coating
   f. Coating falling out
2. Fuel Conditions
   a. Inconsistent coal feed
   b. Improper draft on cooler
   c. Backend temperatures
   d. O_2 low in exit gases
3. Kiln Conditions
   a. Problems during startup and shutdown
   b. Electrical or mechanical equipment failures
   c. Low backend draft
   d. Favoring kiln because of hot spots on kiln shell

B. Operating conditions during test
During the time emission tests were being performed on the gravel bed, the kilns and coolers operated normally except for the last 20 to 30 minutes of No. 3 test. At this time a large clinker ring fell into the No. 3 cooler causing a minor upset condition.


RAW MATERIAL STORAGE
CRUSHING & SCREENING
COAL PREPARATION
SHALE DRYER
(RELOCATED)
RAW STORAGE SILOS
BLEND SILOS
RAW MILLS
KILNS & COOLERS
LIMESTONE
SHALE
COAL
VIB. GRIZZLY FDR.
AUTOMATIC LUBE
CRUSHER
FAN
DUST COLLECTOR
SCREW CONV.
SCREEN
BELT CONV.
A FRAME STORAGE
DRY/WET SHALE
LO ROCK
HI ROCK
WEIGH FEEDER
CYCLONES
DUST COLL.
RAW MILL
FURNACE (EXIST.)
AIR SLIDE
AIR COMPRESSOR
KILN FEED TRANSFER PUMP
No 1
No 2
No 3
KILN No 1
KILN No 2
KILN No 3
COAL FEED
HOT AIR
WEIGH FEEDER
ROTARY FEEDER
COAL MILL
200,000 CFM GRAVEL BED
KILN FEED TANK
SCREW
WEIGH FEEDER
CYCLONES
ID FAN
TO EXISTING STACK
A.C.
FK PUMP
AC
FK PUMP
EXISTING STACK FROM I.D. FAN
TO CLINKER STORAGE
TO QUARRY OR BLEND SILOS
AIR COMPRESSOR
OKLAHOMA CEMENT CO DIV. OF OKC CORP.
PRYOR, OKLAHOMA 74361

Mease Engineering Associates

Environmental Consultants

LABORATORY WORKSHEET

Client: Pennwood/OKC Run No. & Date: /

Process: GRAVEL BED Sample Box No.: /

Filter Analysis:

- Filter Wt.,grams 0.6306
- Filter Tare,gms 0.6095
- Part.Increase,gm. 0.0211

Impinger Water Increase:

Silica Gel Impinger (#4):

- Final Wt.,gms 207.3
- Tare Wt.,gms 191.6
- H_2O Increase 15.7

Total Water Volume Increase:

- Impinger #1 2 ml
- Impinger #2 1 ml
- Impinger #3 0 ml
- Impinger #4 15.7 ml
- TOTAL INCREASE 18.7 ml

Impinger Analysis:

- Wash Bottle No. /
- Filter Wt.,gms
- Filter Tare,gms
- Total Insoluble
- Final Beaker Wt. 144.4622
- Tare Wt. (No. 6) 144.4611
- Total Soluble 0.0011

Particulate Weight Summary:

- Filter 0.0211
- Probe Wash 0.0259
- Impingers (Sol.) 0.0011
- Impingers (~~Insol.~~ Ac.) 0.0001
- Total (w/imp.) 0.0431 grams
- Total (w/o imp.) 0.0419 grams

Signature: Michael J. Mease

Date: 4/4/80

Probe Wash Analysis:

- Wash Volume,ml. 358
- Acetone Density,mg/ml 782.7
- Blank Volume,ml 400
- Blank Residue
  - Final Wt. 142.7732
  - Tare Wt. 142.7732
  - Part.Wt. 0.0
- Wash Analysis, Bottle No.
  - Beaker Wt.,gms 145.534
  - Tare Wt.(No.13) 145.514
  - Part.Wt.,gms 0.020

Impingers:
Acetone Wash

Final Wt. 147.2881
Beaker #17 147.2880
Part. gain: 0.0001 grams

Mease Engineering Associates

Environmental Consultants

LABORATORY WORKSHEET

Client: REXNORD/OKC   Run No. & Date: 2

Process: GRAVELBED   Sample Box No.: 2

Filter Analysis:
- Filter Wt., grams 0.6270
- Filter Tare, gms 0.6080
- Part. Increase, gm. 0.0190

Probe Wash Analysis:
- Wash Volume, ml. 370
- Acetone Density, mg/ml 782.7
- Blank Volume, ml 400
- Blank Residue
  - Final Wt. 142.7732
  - Tare Wt. 142.7732
  - Part. Wt. 0.0
- Wash Analysis, Bottle No. ___
  - Beaker Wt., gms 144.3[illegible]
  - Tare Wt. (No. 18) 140.3[illegible]
  - Part. Wt., gms 0.0196

Impinger Water Increase:
- Silica Gel Impinger (#4):
  - Final Wt., gms 236.6
  - Tare Wt., gms 223.3
  - H_2O Increase 13.3

Total Water Volume Increase:

Impinger #1	-2	ml
Impinger #2	3	ml
Impinger #3	0	ml
Impinger #4	13.3	ml
TOTAL INCREASE	14.3	ml

Impinger Analysis:
- Wash Bottle No. 2 ___
- Filter Wt., gms ___
- Filter Tare, gms ___
- Total Insoluble ___
- Final Beaker Wt. 144.0030
- Tare Wt. (No. 15) 141.0014
- Total Soluble 0.0016

Impingers Acetone Wash:

Final Beaker Wt. 142.9876

Beaker # 7 142.9857

Part. gain: 0.0019 grams

Particulate Weight Summary:

Filter	0.0190
Probe Wash	0.0196
Impingers (Sol.)	0.0016
Impingers (~~Insol.~~)	0.0019
Total (w/imp.)	0.0421 grams
Total (w/o imp.)	0.0386 grams

Signature: Michael J. Mease

Date: 4/4/80

Mease Engineering Associates

Environmental Consultants

LABORATORY WORKSHEET

Client: REXNORD/OKC Run No. & Date: 3

Process: GRAVEL BED Sample Box No.: 5

Filter Analysis:
- Filter Wt., grams 0.6320
- Filter Tare, gms 0.6090
- Part. Increase, gm. 0.0230

Impinger Water Increase:
- Silica Gel Impinger (#4):
  - Final Wt., gms 287.2
  - Tare Wt., gms 281.4
  - H_2O Increase 5.8

Total Water Volume Increase:
- Impinger #1 +3 ml
- Impinger #2 3 ml
- Impinger #3 0 ml
- Impinger #4 5.8 ml
- TOTAL INCREASE 11.8 ml

Impinger Analysis:
- Wash Bottle No. 3
- Filter Wt., gms
- Filter Tare, gms
- Total Insoluble
- Final Beaker Wt. 139.1571
- Tare Wt. (No. 2) 139.1545
- Total Soluble 0.0026

Final Weight 140.8218
Beaker # 99 140.8216
part. gain: 0.0002 grams

Particulate Weight Summary:
- Filter 0.0230
- Probe Wash 0.0138
- Impingers (Sol.) 0.0026
- Impingers (Insol.) 0.0002
- Total (w/imp.) 0.0396 grams
- Total (w/o imp.) 0.0368 grams

Probe Wash Analysis:
- Wash Volume, ml. 360
- Acetone Density, mg/ml 782.7
- Blank Volume, ml 400
- Blank Residue
  - Final Wt. 142.7732
  - Tare Wt. 142.7732
  - Part. Wt. 0.0
- Wash Analysis, Bottle No.
  - Beaker Wt., gms 138.452
  - Tare Wt. (No. 42) 138.438
  - Part. Wt., gms 0.0138

Impingers: Acetone Wash

Signature: Michael J. Moore

Date: 4/4/80

(1) Leak rate 0.01 (probe) 4.1" IM
(2) 0.005

MEASE ENGINEERING ASSOCIATES
ENVIRONMENTAL CONSULTANTS

PARTICULATE FIELD DATA

%CO2	%O2
0	21.0
0	21.0
0	21.0
	21.0 AVG.

RUN No. 1
LOCATION OKC
DATE 3/25/80
OPERATOR MEASE
SAMPLE BOX No. 1

TIME, START 11:43 am
TIME, FINISH 1:15 pm
WASH BOTTLE No. 1
STACK DIMEN. 107.56
SAMPLE BOX TEMP. °F 250
STACK PRESS., In. H_2O -0.21

AMBIENT TEMP. °F 45
BAR. PRESS. "Hg. 29.82
ASSUMED MOISTURE % 2-2.5
HEATER BOX SETTING, °F 250
PROBE TIP DIA., 0.250 " No.
PROBE LENGTH 10' No.
PROBE HEATER SETTING 50%

INITIAL DRY GAS METER READING 985.933

POINT	CLOCK TIME	DRY GAS METER, CF	PITOT In. H_2O ΔP	ORIFICE ΔH In. H_2O DESIRED	ORIFICE ΔH In. H_2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM In. Hg. GAUGE	IMPINGER TEMP. °F	STACK TEMP. °F
1	4.3	988.377	0.86	2.36	2.36	62	63	11.0	58	315
2	3	991.037	0.99	2.80	2.80	68	64	13.0	58	309
3	3	993.617	0.87	2.46	2.46	75	65	12.0	60	303
4	3	996.128	0.82	2.34	2.34	80	66	11.0	62	298
5	3	998.463	0.70	2.01	2.01	84	66	10.0	64	298
6	3	.683	0.61	1.78	1.78	86	69	8.0	64	300
7	3	2.850	0.64	1.88	1.88	88	70	8.0	64	297
8	3	5.123	0.68	2.01	2.01	90	71	9.0		292
9	3	7.411	0.68	2.01	2.01	91	72	10.0	66	288
10	3	9.640	0.61	1.86	1.86	92	74	9.0		275
11	3		0.57	1.77	1.77	93	75	8.5		265
12	3	13.753	0.43	1.32	1.32	93	76	8.0	60	260
		13.920								
13	3	16.246	0.73	2.18	2.18	74	73	10.0	58	285
14	3	18.600	0.72	2.13	2.13	77	74	10.0	58	291
15	3	20.943	0.72	2.13	2.13	79	74	10.0	60	301
16	3	23.200	0.65	1.92	1.92	82	73	10.0	62	307
17	3	25.410	0.62	1.81	1.81	83	73	9.0	62	310
18	3	27.4-	0.53	1.54	1.54	87	73	9.0	64	308
19	3	29.628	0.60	1.75	1.75	89	74	9.0	64	310
20	3	31.823	.65	1.89	1.89	90	75	9.0	64	310
21	3	34.1-	0.67	1.96	1.96	92	76	9.0	65	305
22	3	36.362	0.67	1.96	1.96	94	77	9.0	62	305
23	3	38.531	0.61	1.78	1.78	95	78	8.5	60	292
24	3	40.518	0.48	1.43	1.43	95	79	8.0	60	280
24	TOTAL 72	TOTAL 54.418	AVG. 0.816	AVG. 1.9617	AVG. 1.9617	78.52	TOTAL AVG. 578.52	X	X	AVG. 296 756

(2) leakage .0007 % CO2 ...

0 21.0
0 21.0
21.0
21.0

MEASE ENGINEERING ASSOCIATES
ENVIRONMENTAL CONSULTANTS

PARTICULATE FIELD DATA

RUN No. 2
LOCATION
DATE 3/25/80
OPERATOR MEASE
SAMPLE BOX No. 2

TIME, START 2:02 pm
TIME, FINISH 3:26 pm
WASH BOTTLE No. 2
STACK DIMEN. 107.56" ⌀
SAMPLE BOX TEMP. °F 250
STACK PRESS., In. H_2O -0.21

AMBIENT TEMP. °F 50
BAR. PRESS. "Hg. 29.82
ASSUMED MOISTURE % 2-3
HEATER BOX SETTING, °F 250
PROBE TIP DIA., " No.
PROBE LENGTH 10' No.
PROBE HEATER SETTING 50%

INITIAL DRY GAS METER READING 40.840

POINT	CLOCK TIME	DRY GAS METER, CF	PITOT In. H_2O ΔP	ORIFICE ΔH In. H_2O DESIRED	ORIFICE ΔH In. H_2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM In. Hg. GAUGE	IMPINGER TEMP. °F	STACK TEMP. °F
1	3	43.140	0.71	2.09	2.09	68	70	6.0	62	285
2	3	45.570	0.78	2.30	2.30	74	72	7.0	62	292
3	3	47.947	0.73	2.15	2.15	80	72	8.0	62	293
4	3	50.201	0.63	1.89	1.89	85	72	8.0	60	285
5	3	52.377	0.58	1.75	1.75	88	74	8.0	58	282
6	3	54.5	0.52	1.58	1.58	90	74	7.0	58	282
7	3	56.588	0.56	1.70	1.70	90	76	8.0	55	282
8	3	58.806	0.60	1.83	1.83	90	76	8.0	55	284
9	3	61.093	0.65	1.96	1.96	92	76	8.0	57	290
10	3	63.347	0.65	1.96	1.96	92	78	8.0	55	298
11	3	65.[illegible]	0.58	1.72	1.72	95	79	8.0	55	306
12	3	67.571	0.50	1.48	1.48	94	80	8.0	60	290
		67.633								
13	3	70.333	0.91	2.66	2.66	87	78	10.0	60	308
14	3	73.150	1.03	2.89	2.89	88	80	10.0	60	340
15	3	75.860	0.94	2.66	2.66	92	79	10.0	55	340
16	3	78.477	0.87	2.46	2.46	95	80	9.5	57	334
17	3	80.775	0.68	1.96	1.96	96	80	9.0	57	325
18	3	82.911	0.58	1.69	1.69	95	80	9.0	62	318
19	3	85.171	0.60	1.77	1.77	93	80	9.0	62	308
20	3	87.[illegible]	0.57	1.69	1.69	92	80	9.0	60	300
21	3	89.450	0.60	1.77	1.77	92	80	9.0	60	285
22	3	91.700	0.60	1.83	1.83	92	80	9.0	60	287
23	3	93.758	0.57	1.58	1.58	94	80	9.0	62	274
24	3	95.733	0.45	1.40	1.40	92	80	8.0	60	270
24	TOTAL 72	TOTAL 54.831	AVG. .8079	AVG. 1.949	AVG. 1.149	83.29 TOTAL	AVG. 543.29			AVG 298.125

758.125

Heater [illegible] 2085 Leak [illegible] 0.006 %CO2 %O2
Leak [illegible] 0.008 0 21.0
0 21.0
0 21.0
0 21.0

MEASE ENGINEERING ASSOCIATES
ENVIRONMENTAL CONSULTANTS

* stopped due to box heater shutdown

PARTICULATE FIELD DATA

RUN No. 3
LOCATION OKC - GRAVEL BED
DATE 3/25/80
OPERATOR MEASE
SAMPLE BOX No. 5

TIME, START 4:02 pm
TIME, FINISH 6:06 pm
WASH BOTTLE No. 5
STACK DIMEN. 107.56" ø
SAMPLE BOX TEMP. °F 250
STACK PRESS., In. H_2O -0.21

AMBIENT TEMP. °F 45
BAR. PRESS. "Hg. 29.82
ASSUMED MOISTURE %
HEATER BOX SETTING, °F 250
PROBE TIP DIA., " No.
PROBE LENGTH No.
PROBE HEATER SETTING

INITIAL DRY GAS METER READING 96.139

POINT	CLOCK TIME	DRY GAS METER, CF	PITOT In. H_2O ΔP	ORIFICE ΔH In. H_2O DESIRED	ORIFICE ΔH In. H_2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM In. Hg. GAUGE	IMPINGER TEMP. °F	STACK TEMP. °F
1	4	98.665	0.78	2.43	2.43	69	71	12.5	48	245
2	3	101.291	0.84	2.62	2.62	75	72	15.0	50	245
3	3	103.952	0.84	2.62	2.62	80	73	15.0	50	250
4	3	106.—	0.71	2.21	2.21	86	73	13.0	50	255
5	3	108.762	0.67	2.07	2.07	90	74	11.0	54	269
6	3	111.0	0.53	1.64	1.64	92	75	10.0	55	282
7	3	113.058	0.57	1.71	1.71	92	76	11.0	55	295
8	3	115.235	0.57	1.71	1.71	93	77	11.0	58	310
9	3	117.406	0.59	1.73	1.73	95	78	11.0	58	324
10	3	119.582	0.59	1.73	1.73	96	78	11.0	58	[illegible]
11	3	121.748	0.59	1.71	1.71	96	80	11.0	58	327
12	3	123.812	0.49	1.47	1.47	97	81	10.0	58	300
		123.887								
13	3 *	126.137	0.68	1.94	1.94	80	77	13.0	62	321
14	3 *	128.566	0.75	2.17	2.17	71	73	13.0	58	300
15	3	130.936	0.75	2.17	2.17	77	74	13.0	52	300
16	3 *	133.253	0.68	1.99	1.99	84	75	13.0	49	307
17	3	135.436	0.60	1.75	1.75	84	75	12.0	58	309
18	3	137.561	0.53	1.55	1.55	88	76	12.0	48	308
19	3	139.744	0.62	1.82	1.82	91	78	11.0	54	321
20	3	142.073	0.72	2.05	2.05	95	78	12.0	54	335
21	3	144.417	0.72	2.05	2.05	97	80	12.0	56	344
22	3	146.674	0.67	1.87	1.87	100	80	12.0	56	355
23	3	148.914	0.67	1.87	1.87	101	81	12.0	56	353
24	3	150.518	0.38	1.10	1.10	102	83	10.0	56	340
24	TOTAL 72	TOTAL 54.519	AVG. .8017	AVG. 1.9158	AVG. 1.158	82.75 TOTAL	AVG. 82.75			AVG. 304.04

764.04

the Willis & Paul Corporation WORK SHEET

Page ___ Of ___

CUSTOMER: ______ PROPOSAL NO. ______ DATE: 3/24/80

PROJECT: ______ JOB NO.: ______ BY: M. Mease

Preliminary Data

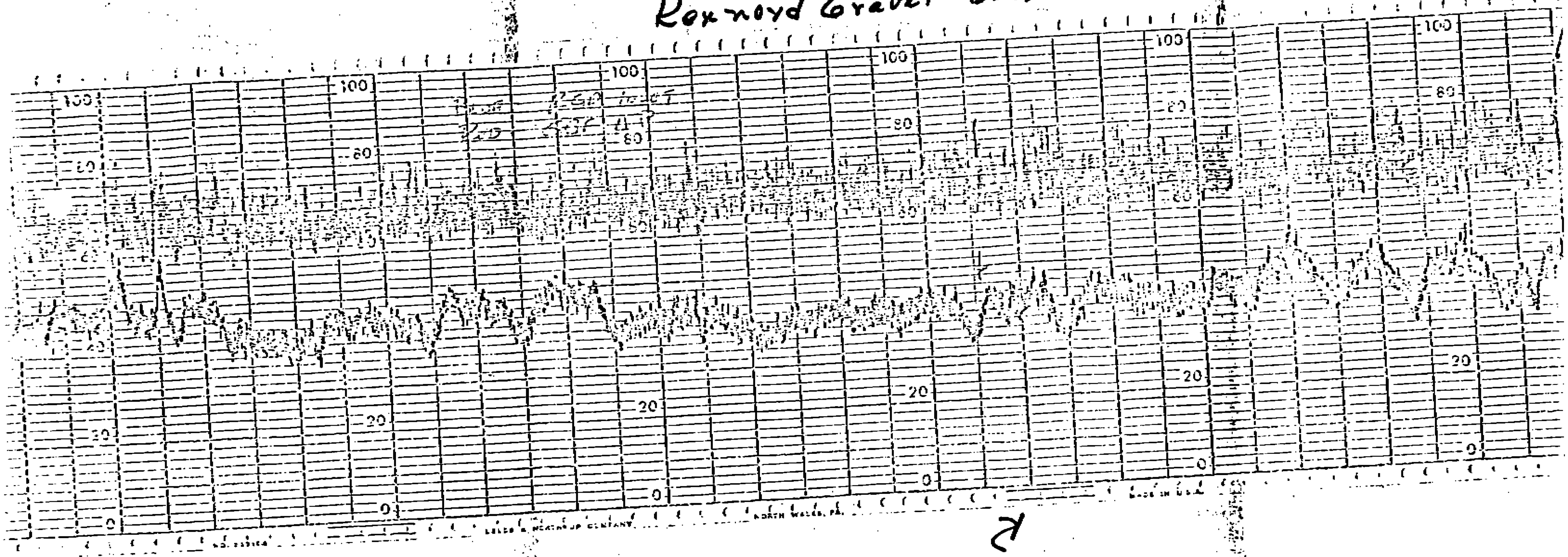
dia₁ = 108 1/4" d_2 = 106 7/8 d_{avg} = 107.56

Sampling Points	%	Point	Point + 2 1/8	ΔP_{NS}	ΔP_{EW}	ANGLE$_{NS}$	ANGLE$_{EW}$
1	2.1	2.26	4.385	.63	.51	0	1
2	6.7	7.21	9.335	.64	.55	0	1
3	11.8	12.69	14.815	.61	.55	2	1
4	17.7	19.04	21.165	↓	↓	1	0
5	25.0	26.89	29.02	.55	.49	1	0
6	35.6	38.29	40.42	↓	.47	2	1
7	64.4	69.27	71.395	.42		0	3
8	75.0	80.67	82.8			1	2
9	82.3	88.52	90.65			2	1
10	88.2	94.87	97.0			1	2
11	93.3	100.36	102.48	↓		0	2
12	97.9	105.30	107.43		.50	2	1

T_s ~ 280-300°F

Roxnord Gravel Bed.

3
01



OKLAHOMA CEMENT COMPANY

DAILY METER READINGS

No. 1 KILN

Burner
Date 3-25-80
Shift

Hour								
	12	1	2	3	4	5	6	7
	8	9	10	11	12	1	2	3
	4	5	6	7	8	9	10	11
Coal Mill Inlet Press								
Fan Outlet Pressure								
Coal Air Temp								
Mill Inlet Damp Posit								
Hot Air Temp								
Hot Air Damp Posit								
Mill Inlet Temp								
Coal Feeder Tons/Hour	4.8	4.8	4.7	4.6	4.6	4.6	4.4	4.4
Coal Mill Amps								
Feed Screw RPM								
Primary Air Damp Posit								
Gas Press At Pipe								
Gas Turbine Reading								
Gas Chart Reading								
Kiln Feeder Revolutions	301540	303096	304371	305804	307159	309610	310052	311379
Kiln Revolutions								
Coal Totalizer Reading	363585	364355	364815	365260	365720	366161	366614	367033
Coal — 200								
Liter Weights								
Alkalies								
Cooler Speed								
Cooler Vent Damper								
Undergrate Damper								
Hood Press								
	11AM	12N	1PM	2PM	3PM	4PM	5PM	6PM

Coal TPH – 4.5 Kiln Feed Rate 40TPH Total 44.5 T/H. C/C 25.3TPH

Hour								
	12	1	2	3	4	5	6	7
	8	9	10	11	12	1	2	3
	4	5	6	7	8	9	10	11
Mid Kiln Temp								
Kiln Exit Temp								
Kiln Speed	57				57			57
Feeder Speed	23½				23½			23½
Buell Temp								
Buell Damp Position								
Paddle — Wheel RPM								
Oxygen Analyzer								
Outer Shell Temp								
Footage								
Cooler Blower Amps								
Cooler Stack Fan Amps								
Cooler Grate RPM								
Clinker Breaker Amps								
Clinker Elev Amps								
I.D. Fan Amps								
Kiln Drive Amps								
2nd Compt Blower Amps								
1st Compt Blower Amps								
I. D. Fan Speed								
Diff. Press								
No. 5 Temp								
Water Spray Valve Posit								
Chain Inlet Temp								
Dust Chamb Temp								
Buell Dischg Temp								
I.D. Fan Inlet Temp								
Bleed Air Damp Posit								
	11AM	12N	1PM	2PM	3PM	4PM	5PM	6PM

REMARKS:

OP-10

OP-10

OKLAHOMA CEMENT COMPANY

DAILY METER READINGS

No. 4 2 KILN

Burner: Jack
Date: March 25, 1980
Shift: Day 8-4

Hour	12 8 4	1 9 5	2 10 6	3 11 7	4 12 8	5 1 9	6 2 10	7 3 11
Coal Mill Inlet Press								
Fan Outlet Pressure								
Coal Air Temp								
Mill Inlet Damp Posit								
Hot Air Temp								
Hot Air Damp Posit								
Mill Inlet Temp								
Coal Feeder Tons/Hour	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
Coal Mill Amps								
Feed Screw RPM								
Primary Air Damp Posit								
Gas Press At Pipe								
Gas Turbine Reading								
Gas Chart Reading								
Kiln Feeder Revolutions	291054	292170	293118	294179	295058	296072	297132	298123
Kiln Revolutions								
Coal Totalizer Reading	377735							381311
Coal - 200								
Liter Weights								
Alkalies								
Cooler Speed								
Cooler Vent Damper								
Undergrate Damper								
Hood Press								
	11AM	12N	1PM	2PM	3PM	4PM	5PM	6PM

Coal TPH = 5.17TPH Kiln Feed Rate 40.9 TPH Total Kiln Feed 46.0TPH

Hour	12 8 4	1 9 5	2 10 6	3 11 7	4 12 8	5 1 9	6 2 10	7 3 11
Mid Kiln Temp								
Kiln Exit Temp								
Kiln Speed	57				57			57
Feeder Speed	17½	17½	17½	17½	17½	17½	17½	17½
Buell Temp								
Buell Damp Position								
Paddle-Wheel RPM								
Oxygen Analyzer								
Outer Shell Temp								
Footage								
Cooler Blower Amps								
Cooler Stack Fan Amps								
Cooler Grate RPM								
Clinker Breaker Amps								
Clinker Elev Amps								
I.D. Fan Amps								
Kiln Drive Amps								
2nd Compt Blower Amps								
1st Compt Blower Amps								
I.D. Fan Speed								
Diff. Press								
No. 5 Temp								
Water Spray Valve Posit								
Chain Inlet Temp								
Dust Chamb Temp								
Buell Dischg Temp								
I.D. Fan Inlet Temp								
Bleed Air Damp Posit								
	11AM	12N	1PM	2PM	3PM	4PM	5PM	6PM

REMARKS:

OKLAHOMA CEMENT COMPANY

DAILY METER READINGS

No. 03 KILN

Burner: *Jack*
Date: *March 25, 1980*
Shift: *Day 8-4*

Hour	12 / 8 / 4	1 / 9 / 5	2 / 10 / 6	3 / 11 / 7	4 / 12 / 8	5 / 1 / 9	6 / 2 / 10	7 / 3 / 11
Coal Mill Inlet Press								
Fan Outlet Pressure								
Coal Air Temp								
Mill Inlet Damp Posit								
Hot Air Temp								
Hot Air Damp Posit								
Mill Inlet Temp								
Coal Feeder Tons/Hour	6.3	6.1	6.1	6.1	6.0	6.2	6.0	5.9
Coal Mill Amps								
Feed Screw RPM								
Primary Air Damp Posit								
Gas Press At Pipe								
Gas Turbine Reading								
Gas Chart Reading								
Kiln Feeder Revolutions	235531	241113	248159	251159	252291	261604	266841	271830
Kiln Revolutions								
Coal Totalizer Reading	824496	825116	825736	826356	826976	827631	828240	828825
Coal − 200								
Liter Weights								
Alkalies								
Cooler Speed								
Cooler Vent Damper								
Undergrate Damper								
Hood Press								
	11 AM	*12 N*	*1 PM*	*2 PM*	*3 PM*	*4 PM*	*5 PM*	*6 PM*

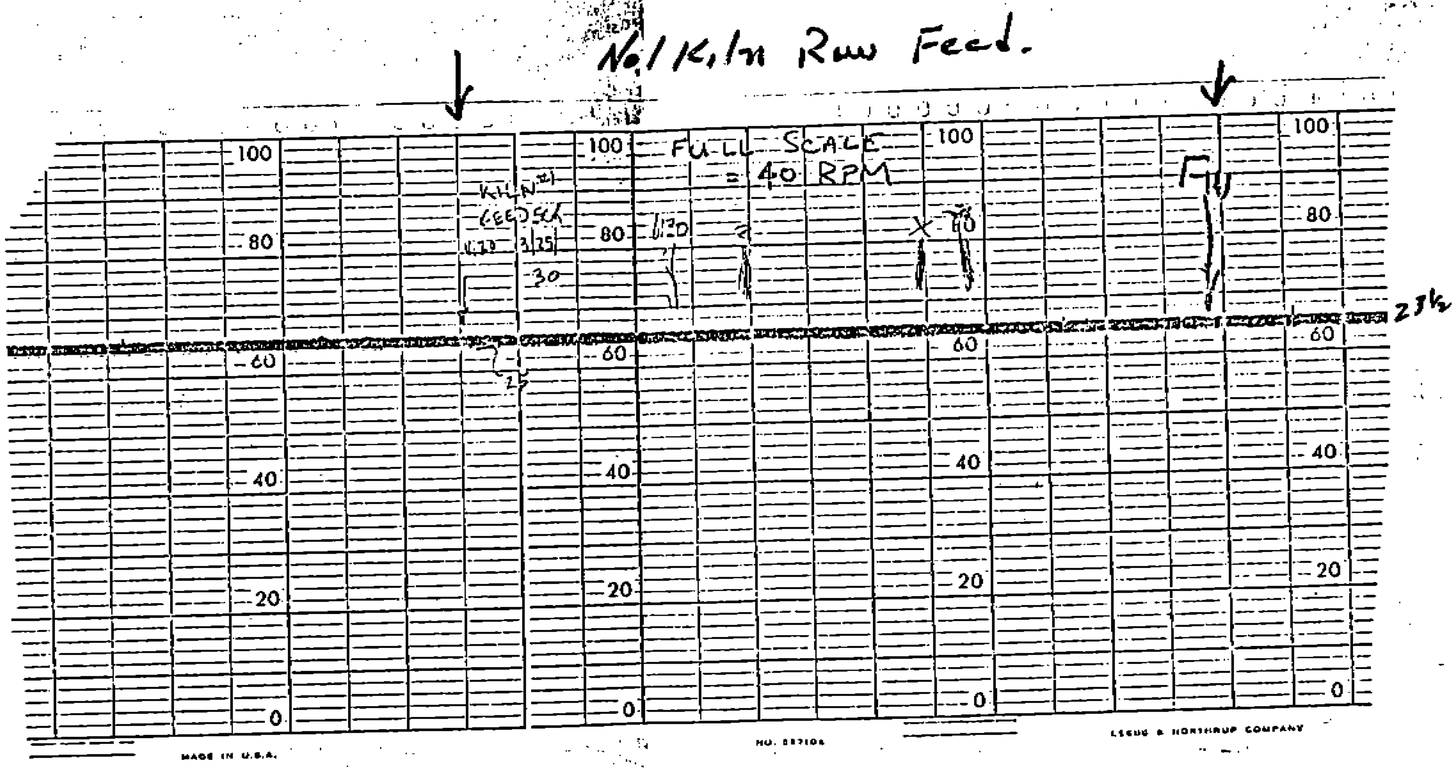
Clk 32.7 TPH
Total Kiln Feed 58.1 TPH
Avg Kiln Feed 51.9 TPH
Avg Coal Feed 6.18 TPH

Hour	12 / 8 / 4	1 / 9 / 5	2 / 10 / 6	3 / 11 / 7	4 / 12 / 8	5 / 1 / 9	6 / 2 / 10	7 / 3 / 11
Mid Kiln Temp								
Kiln Exit Temp								
Kiln Speed	62	62	62	62	62	62	62	62
Feeder Speed	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2
Buell Temp								
Buell Damp Position								
Paddle — Wheel RPM								
Oxygen Analyzer	1.6	2.0	1.3	2.2	1.5	1.3	1.5	2.2
Outer Shell Temp								
Footage								
Cooler Blower Amps								
Cooler Stack Fan Amps								
Cooler Grate RPM								
Clinker Breaker Amps								
Clinker Elev Amps								
I. D. Fan Amps								
Kiln Drive Amps								
2nd Compt Blower Amps								
1st Compt Blower Amps								
I. D. Fan Speed								
Diff. Press								
No. 5 Temp								
Water Spray Valve Posit								
Chain Inlet Temp								
Dust Chamb Temp								
Buell Dischg Temp								
I. D. Fan Inlet Temp								
Bleed Air Damp Posit								
	11	*12*	*1 PM*	*2 PM*	*3 PM*	*4 PM*	*5 PM*	*6 PM*

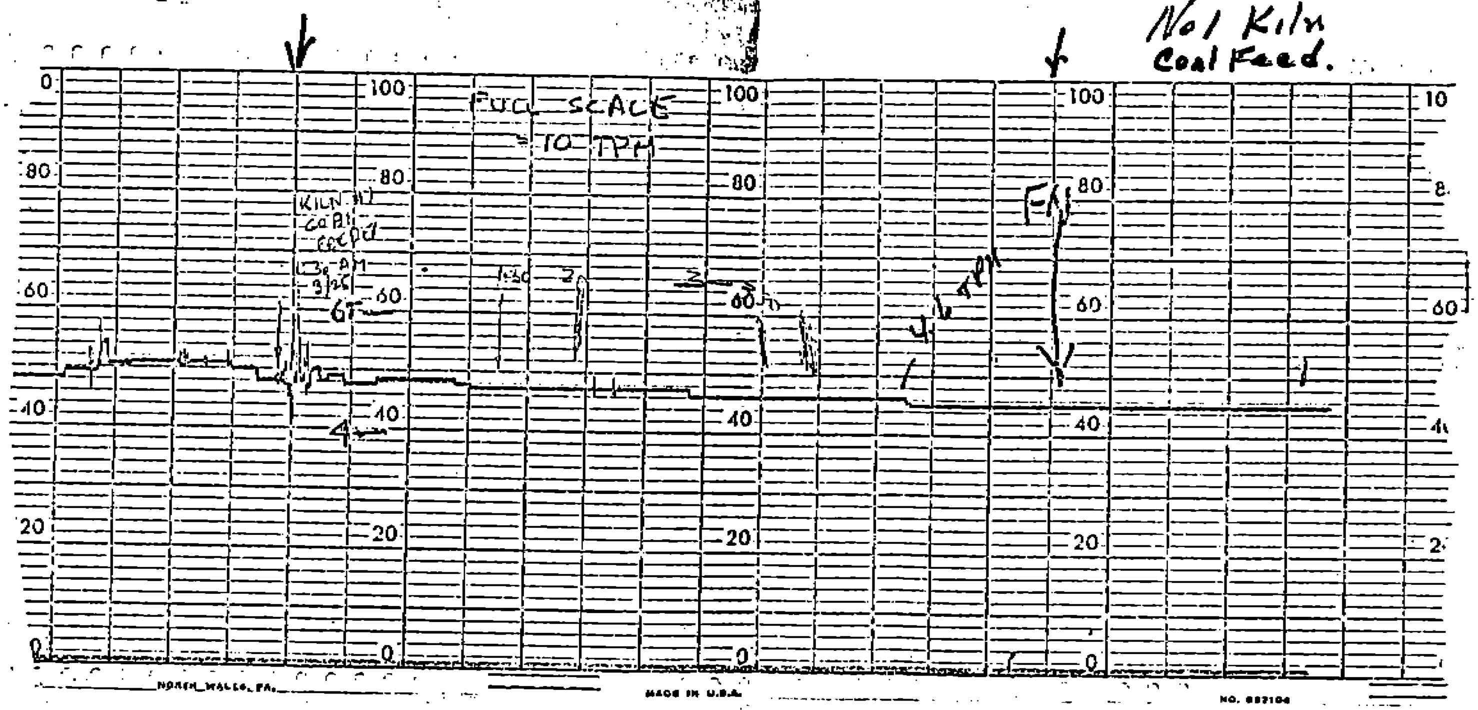
REMARKS: *Kiln ring fell into cooler around 5:10 approximately 20 minutes before completing No 3 Gravel Bed emission Test.*

OP-10

3-25-80
OKLAHOMA CEMENT

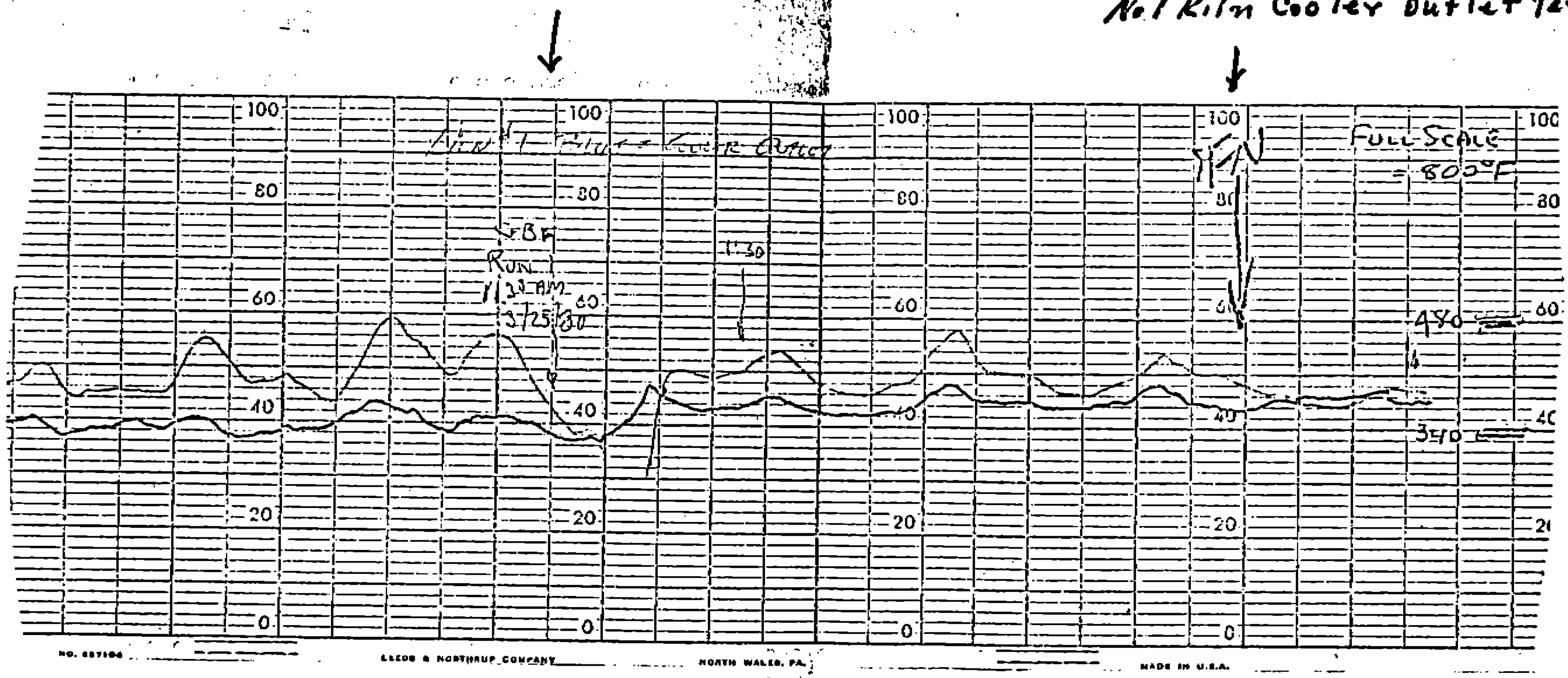


3-25-80
OKLAHOMA CEMENT



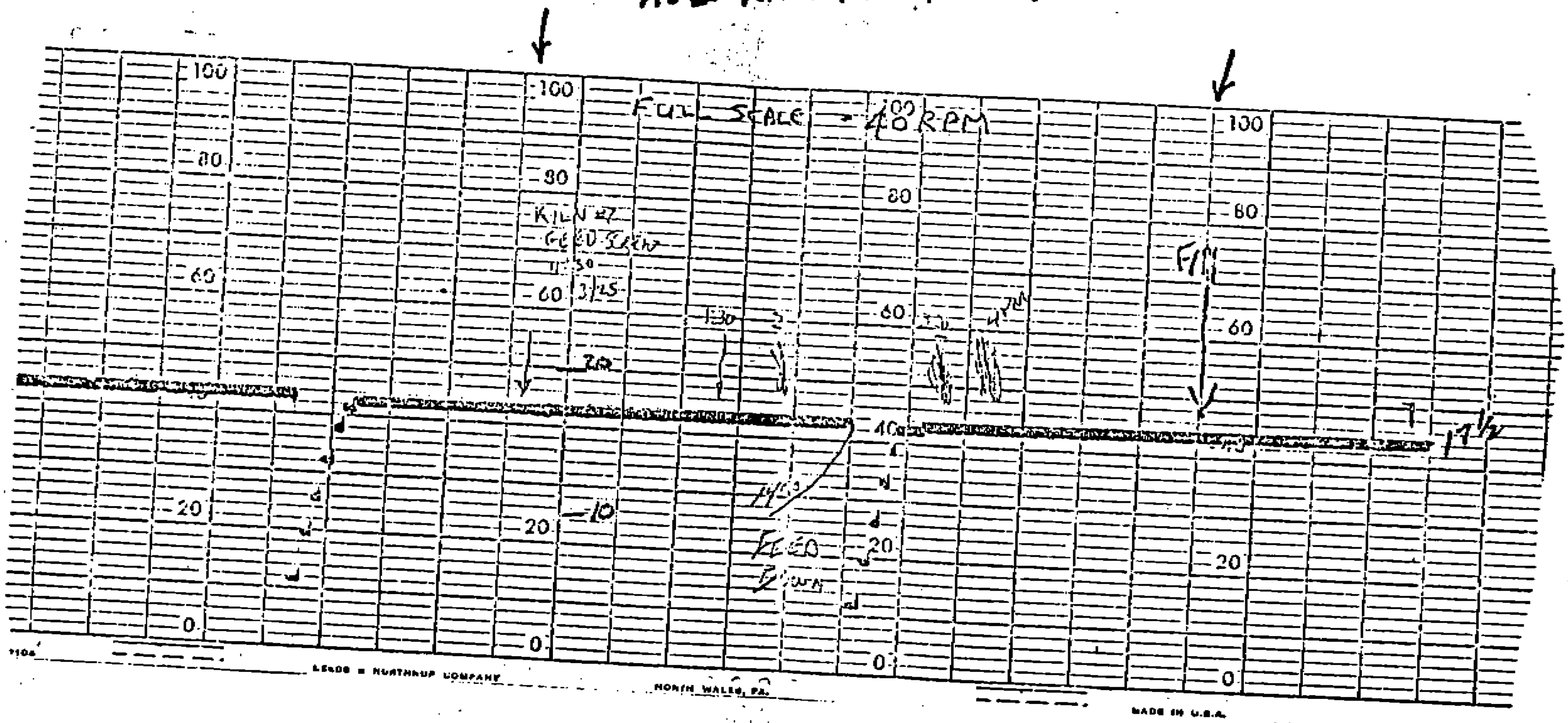
3-25-80
OKLAHOMA CEMENT

No 1 Kiln Cooler outlet Temp.

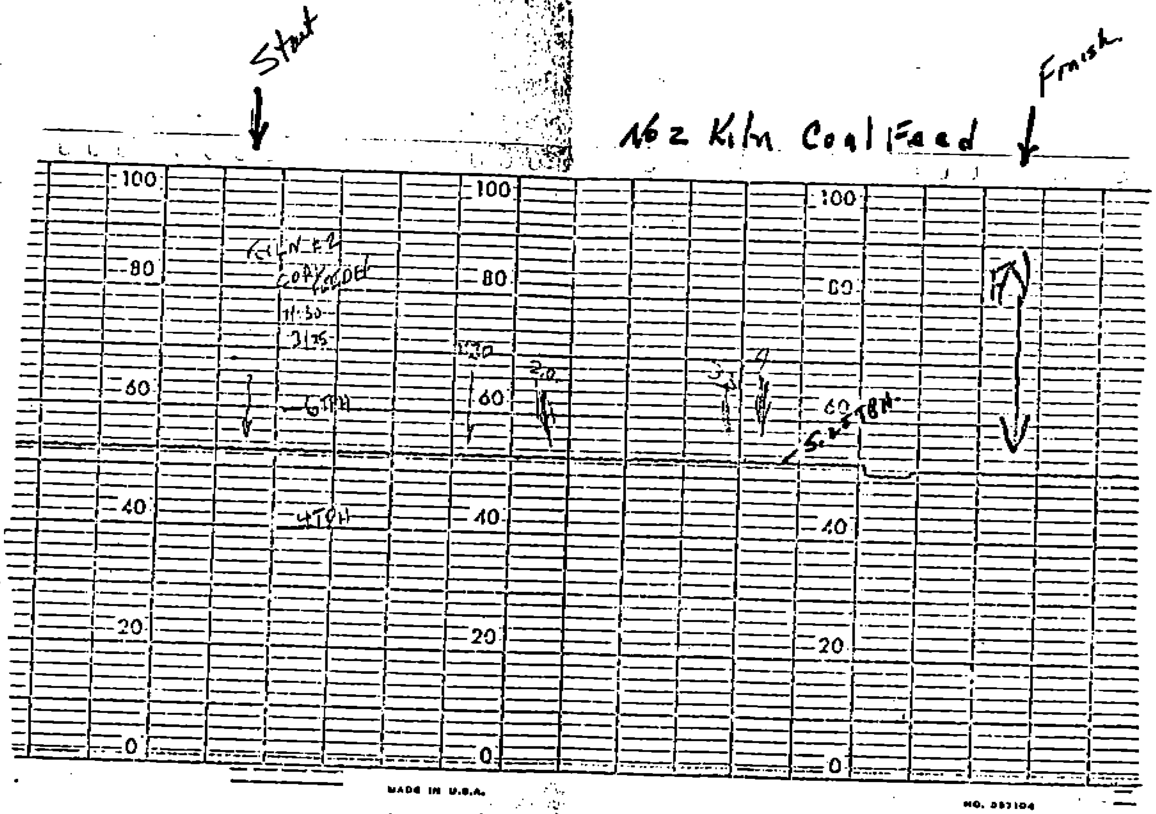


3-25-80
OKLAHOMA CEMENT

No 2 Kiln Raw Feed.

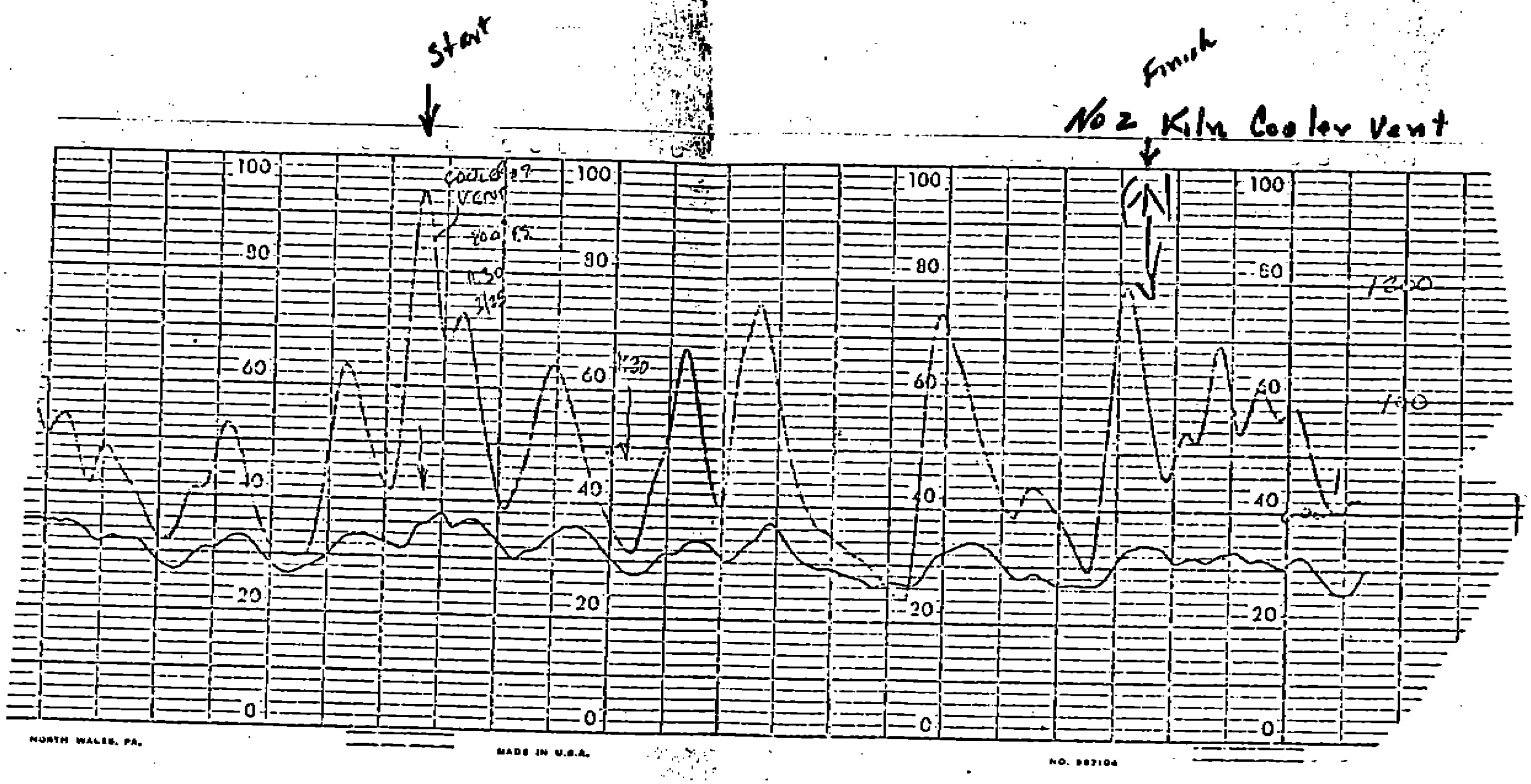


3-25-80
OKLAHOMA CEMENT



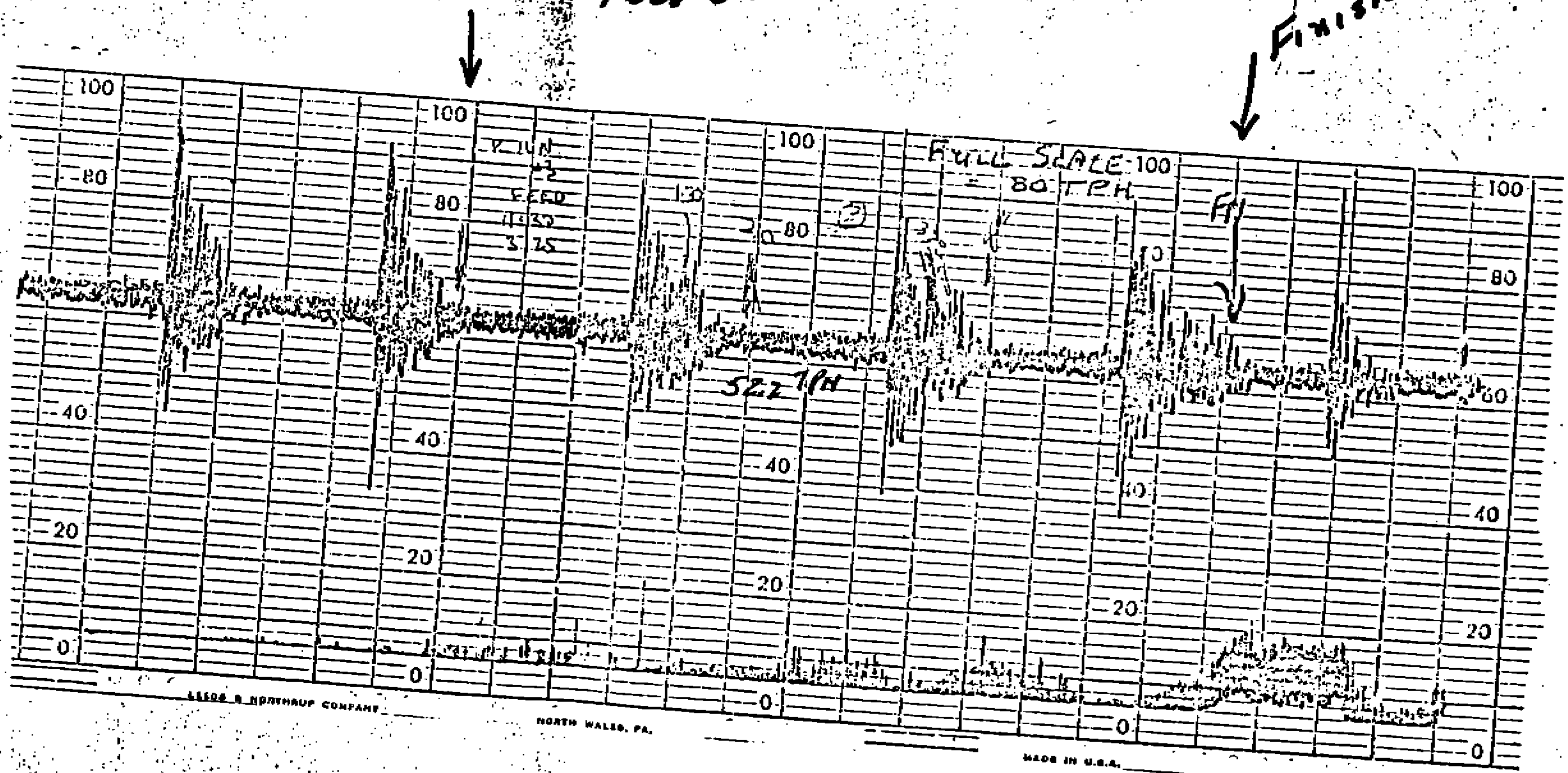
3-25-80
OKLAHOMA CEMENT

No 2 Kiln Cooler Vent

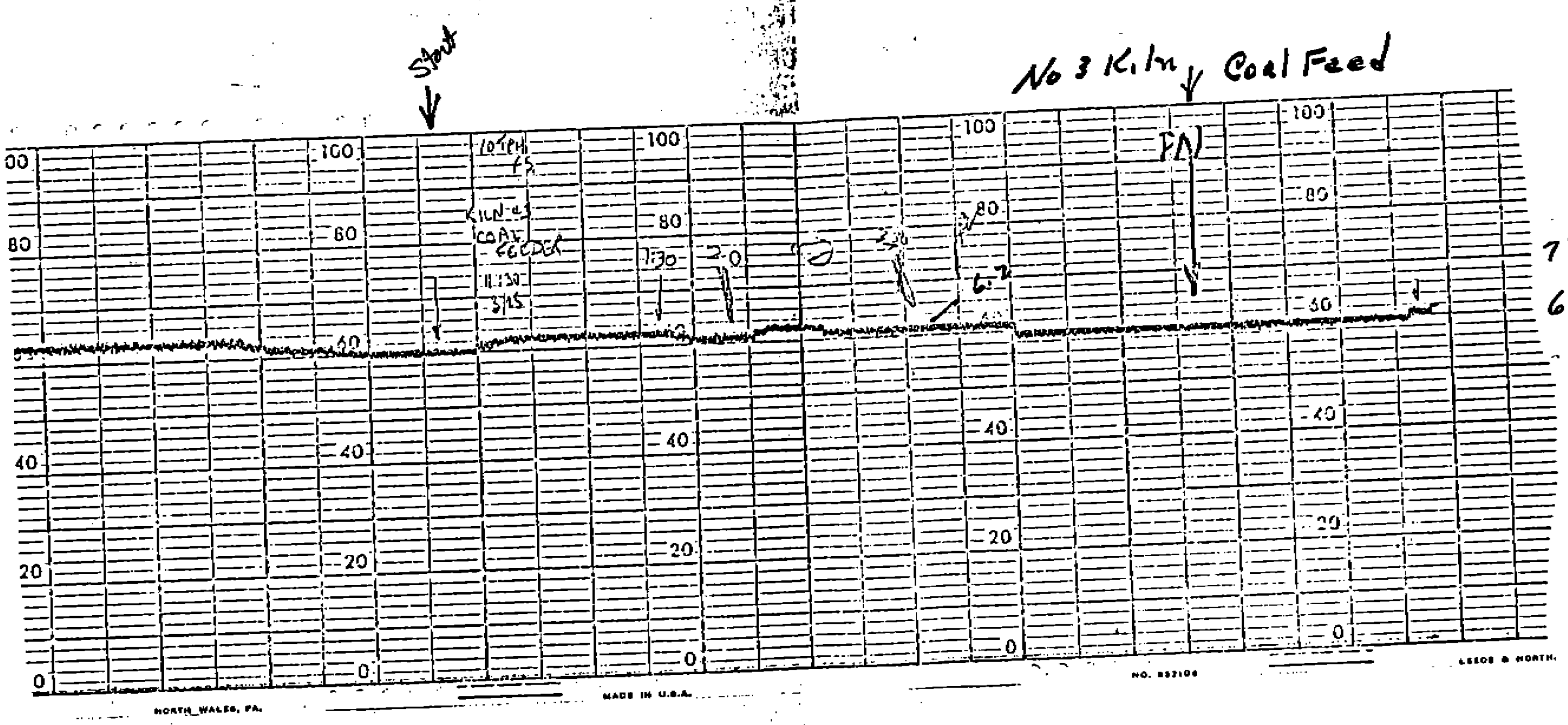


3-25-80
OKLAHOMA CEMENT

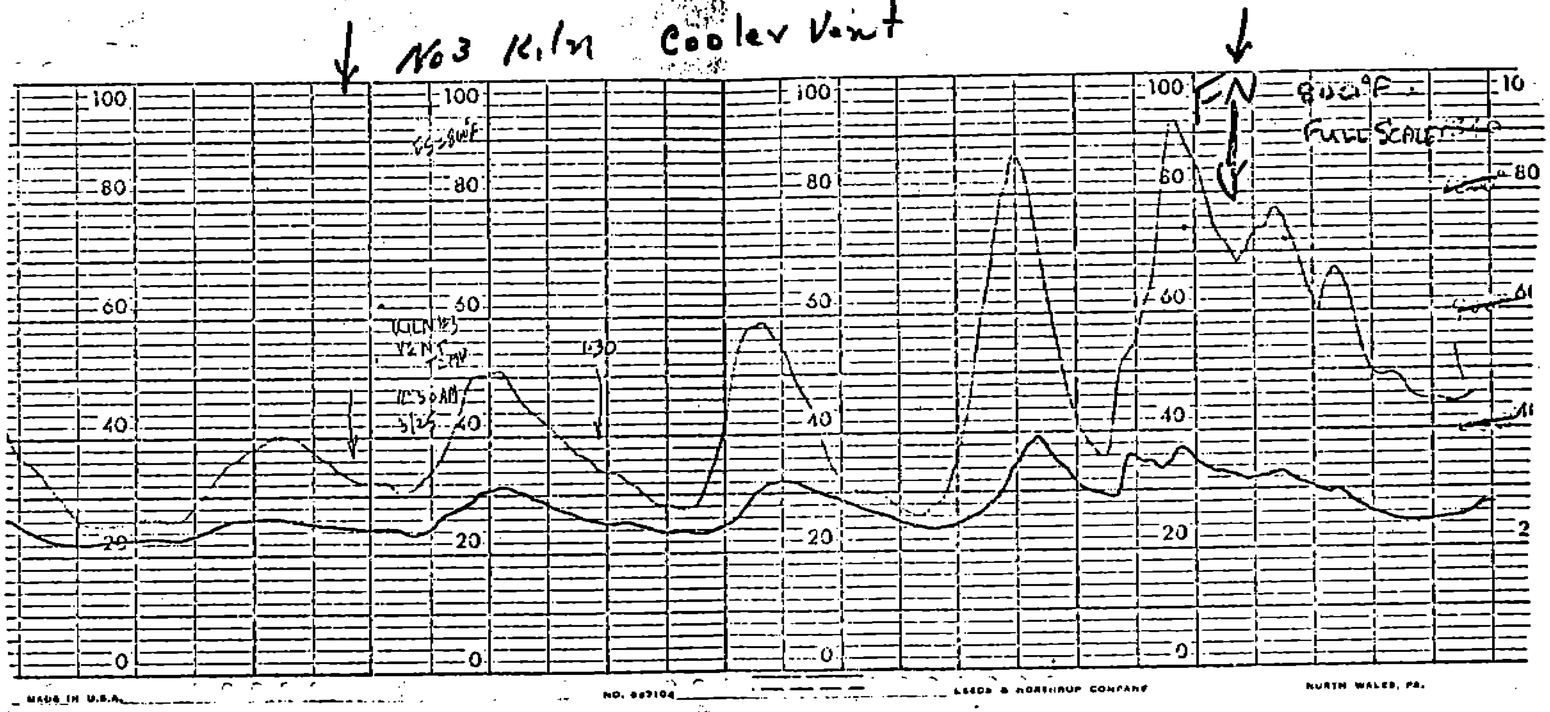
Raw Feed Chart No 3 Kiln



3-25-80
OKLAHOMA CEMENT



3-25-80
OKLAHOMA CEMENT



SAMPLING TRAIN COMPONENTS, METHOD OF USE, AND ANALYTICAL TECHNIQUES

A. Components

1. Stainless steel or glass probe with minimum 3/16 inch diameter opening, heated above the dew point of the gas stream to be sampled.

2. Glass cyclone efficient for removal of particles of 5 microns or greater, and cyclone collection flask. In cases of low particulate loadings, a glass cyclone eliminator may be substituted.

3. In-line filter of 0.3 micron porosity.

4. Heated chamber for maintaining glass fiber filter and cyclone above the dew point of the gas stream to be sampled.

5. Impingers placed in the following order:

   a. A 500 ml. modified Greenburg-Smith impinger filled with 100 mls. of distilled deionized water.

   b. A 500 ml. Greenburg-Smith impinger filled with 100 mls. of distilled deionized water.

   c. A 500 ml. modified Greenburg-Smith impinger left dry to act as a water trap to remove entrained water.

   d. A 500 ml. modified Greenburg-Smith impinger containing approximately 200 grams of precisely weighed silica gel.

6. An ice bath in which the impingers are partially submerged to maintain exit temperature well below the dew point of the gas to be sampled.

7. Dry gas meter equipped with a vacuum gage registering up to 30 inches of mercury, and a calibrated orifice.

B. General Sampling Procedure

1. Starting with clean equipment, a leak check is performed by drawing a vacuum of 15 inches on system as indicated on the vacuum gage. Leak checks are also performed post-test and corrections may be necessary to account for increases in the leakage rate.

2. The sample is collected at isokinetic rates based upon a velocity profile determined with the use of an "S" type pitot tube.

3. Samples are taken at multiple points across the gas stream representing equal areas of cross-sectional flow, and each point is sampled for as long a time as is feasible.

4. Moisture content of the gas stream is determined by the condensation method, using a series of cooled impingers described above (A-5).

5. The duration of the test depends on the number of sample points and the time required to equally sample each point. In no case will the sample time be less than that required to collect a sufficient sample for complete analysis.

C. Analytical Techniques

1. Before use, the filter is desiccated for a period of 24 hours and weighed to the nearest 0.1 mg.

2. When processing the sample, any material deposited inside the sample probe, glass cyclone (or cyclone eliminator) and the front half of the filter holder is washed into a container using acetone, or other suitable solvent, evaporated to dryness at either ambient conditions or below the boiling point of acetone (55°C), desiccated for a period of 25 hours, and weighed to the nearest 0.1 mg.

3. After sampling, the in-line glass fiber filter is desiccated for a period of 24 hours and weighedto the nearest 0.1 mg.

4. The moisture content is determined by collecting the liquid in the impingers described above and measuring. The difference between 200 ml. and the measurement is recorded as increase in water. The spent silica gel is weighed to the nearest 0.1 gram and the increase is included in the moisture content determination.

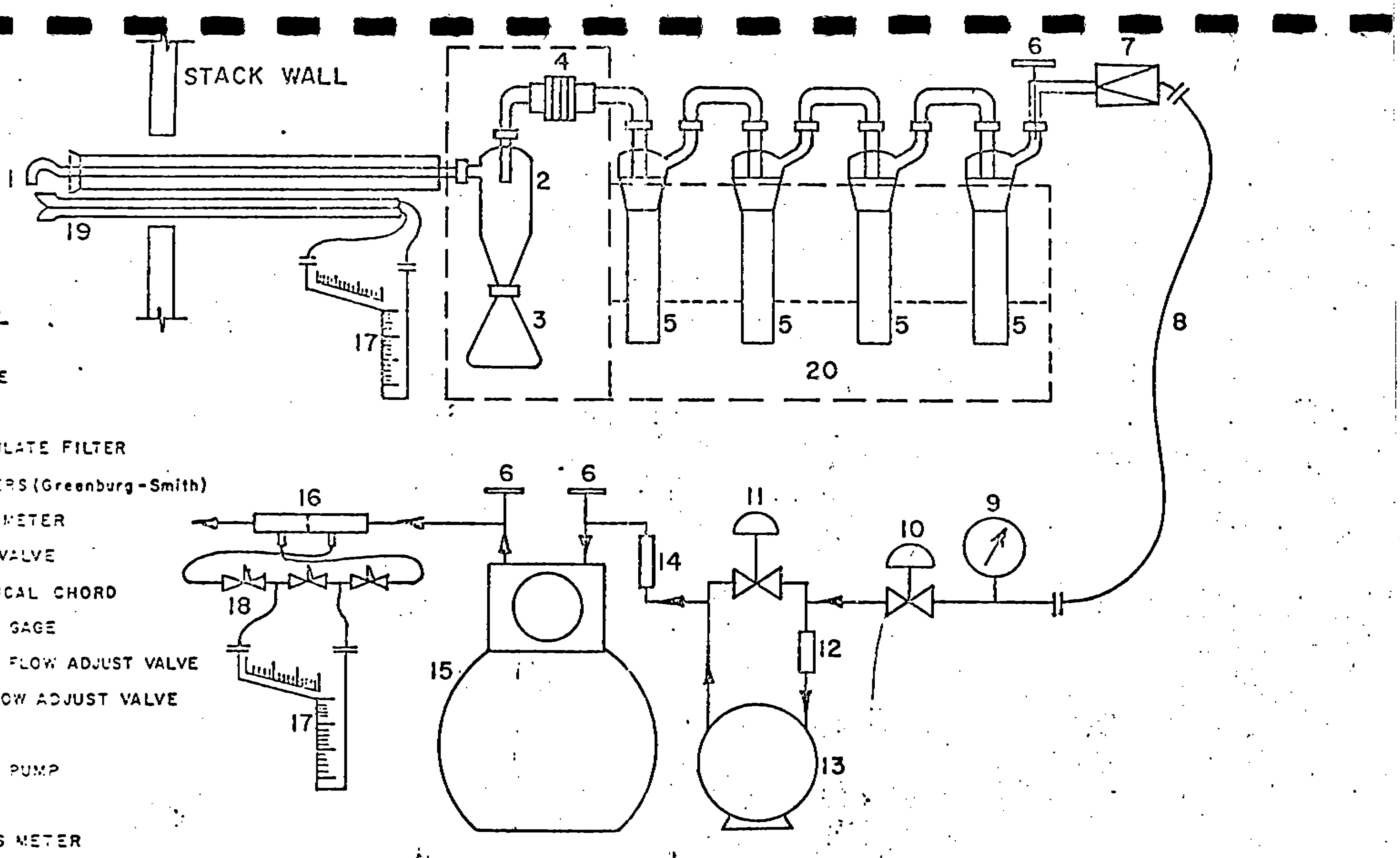
5. The liquid in the impingers may be analyzed for particulate matter and the weights may be included in the particulate catch.

6. The total particulate in the system is the sum of that collected in Nos. 2,3 and possibly 5. The contribution of each portion shall be individually identified. The inclusion of the impinger particulate catch is to be considered on an individual basis.

7. The emission rate and calculations are made from suitable measurements of gas temperature, moisture content, velocities and materials collected. In order for a test to be considered valid, isokinetic sampling rates shall be between 90% and 110%.

8. All equipment, including orifice meter, probe tip nozzles, dry gas meter, and temperature measuring devices is calibrated on a regular basis, dependent on the frequency of equipment use.

9. The stack gas content is determined by collecting a sample of stack gas and analyzing the contents with an Orsat analyzer or Fyrite analyzer.



ENDI
ROBE
YCLONE
LASK
RTICULATE FILTER
PINGERS (Greenburg-Smith)
HERMOMETER
HECK VALVE
MBILICAL CHORD
ACUUM GAGE
OURSE FLOW ADJUST VALVE
NE FLOW ADJUST VALVE
ILER
ACUUM PUMP
LTER
RY GAS METER
RIFICE TUBE
CLINE MANOMETER
OLENOID VALVES
ITOT
E BATH

FIGURE I

GENERAL ARRANGEMENT
SOURCE SAMPLING TRAIN

Mease Engineering Associates

Environmental Consultants

DRY GAS METER AND ORIFICE METER CALIBRATION

Model Number [illegible]112

Serial Number [illegible]

Meter Box No. C

Wet Test Meter No. [illegible] 10524

Calibration Date 4/3/80

Signature [illegible]

Barometric Pressure, Pb 30.78

Orifice Manometer ΔH in. H_2O	Gas Volume Wet V_w ft^3	Gas Volume Dry V_d ft^3	Temperature Wet t_w °F	Temperature Dry In t_{di} °F	Temperature Dry Out t_{do} °F	Time θ Min.	Υ	$\Delta H_@$
0.5	5.000	4.953	[illegible]	80	64	12.643	1.001	1.77
1.0	5.000	5.110	74.5	90	76	[illegible]	0.992	1.80
2.0	10.000	10.328	[illegible]	[illegible]	83	13.642	0.994	1.99
4.0	10.000	10.517	74.3	100	[illegible]	[illegible]	0.997	1.97

Vacuum 15" Hg

AVERAGE 0.996 1.88

$$\Upsilon = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)\left(t_w + 460\right)} \qquad \Delta H_@ = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$$

Mease Engineering Associates

Environmental Consultants

DRY GAS METER AND ORIFICE METER CALIBRATION

Model Number 2343 — Calibration Date [illegible]

Serial Number 1984 — Signature [illegible]

Meter Box No. C — Barometric Pressure, P_b 30.02

Wet Test Meter No. AL-20 14524

Orifice Manometer ΔH in. H_2O	Gas Volume Wet V_w ft^3	Gas Volume Dry V_d ft^3	Temperature Wet t_w °F	Temperature Dry In t_{di} °F	Temperature Dry Out t_{do} °F	Time θ Min.	Y	$\Delta H_@$
0.5	5.000	5.061	71.0	74	72	12.702	0.994	1.81
1.0	5.000	5.1[illegible]	74.0	93	80	9.155	0.991	1.85
2.0	10.000	10.413	[illegible]4.0	[illegible]	[illegible]	5.717	0.995	2.04
4.0	10.000	[illegible]	[illegible]	[illegible]	[illegible]	9.678	0.994	2.00
						AVERAGE	0.994	1.93

$$Y = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)\left(t_w + 460\right)}$$

$$\Delta H_@ = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$$

Mease Engineering Associates

Environmental Consultants

PITOT TUBE CALIBRATIONS

		ΔP_{std}	ΔP_s	C_p
Probe No. NEW 10' 1	Side A	0.80	1.12	0.838
Date 1/4/80	Side B	0.80	1.13	0.837
Probe No. OLD 10' 2	Side A	0.78	1.08	0.841
Date 1/4/80	Side B	0.78	1.08	0.841
Probe No.________	Side A			
Date________	Side B			
Probe No.________	Side A			
Date________	Side B			
Probe No.________	Side A			
Date________	Side B			
Probe No.________	Side A			
Date________	Side B			
Probe No.________	Side A			
Date________	Side B			

$$C_p = C_{p_{std}} \times \sqrt{\frac{\Delta P_{std}}{\Delta P_s}}$$

$C_{p_{std}} = 0.99$

PITOT TUBE CALIBRATION

All pitot tubes are geometrically aligned and within the limits as prescribed in the Federal Register. Therefore, they are assigned a value of 0.84.
In the event that a pitot tube tip is altered during transport, and the geometric qualifications cannot be met, the pitot tube is calibrated according to the Federal Register. In this case, the new calibration factor is listed in the report and used in the calculations.

TEMPERATURE SENSING DEVICE CALIBRATIONS

All temperature sensing devices used during a test series, including thermocouples and thermometers are calibrated after each test series, as specified in the Federal Register. In the event that these calibration factors fall within the limits as specied, no corrections are necessary. In the evnt that a device is outside the limits, as specified, the correction factor is listed and used in the calculations.

SAMPLING NOZZLE CALIBRATION

The sampling nozzle used during the test series is determined after each test series using a micrometer on several diameters as specified in the Federal Ragister.

SOURCE SAMPLING CALCULATIONS: NOMENCLATURE

An	=	Nozzle Area, $ft.^2$
As	=	Stack Area, $ft.^2$
Bwo	=	Water Vapor Proportion, by volume, dimensionless
Cm	=	Meter Correction Factor, dimensionless
Cp	=	Pitot Coefficient, dimensionless
Cs	=	Particulate Concentration, units specified
$\Delta H_{avg.}$	=	Average Pressure Drop Across Orifice, in.H_2O
$\%H_2O$	=	Water Vapor Content, dimensionless
Is	=	Percent Isokinetic of Test, dimensionless
Kp	=	85.48, unit correction
Md	=	Molecular Weight of Dry Gas
Mn	=	Total Particulate Catch, grams
Ms	=	Molecular Weight of Stack Gas
$(\sqrt{\Delta P})_{avg}$	=	Average of the Square Roots of the Velocity Head
Pbar	=	Barometric Pressure, in. Hg.
pmr	=	Pollutant Mass Rate, lb./hr.
θ	=	Time, minutes
Pstd	=	29.92 in. Hg.
Qs	=	Stack Gas Flowrate, actual cubic feet per minute
(Qs)std	=	Stack Gas Flowrate, standard cubic feet per minute
Ts	=	Stack Gas Temperature, ^oR
Tstd	=	530^oR
Vfc	=	Increase in Liquid Volume in Impingers, ml.
Vm	=	Volume Sampled at Meter Conditions, $ft.^3$
Vmstd	=	Volume of Air Metered at Standard Conditions
Vs	=	Stack Gas Velocity, ft./sec.
Vsstd	=	Stack Gas Velocity, standard conditions, ft./min.
Vwc	=	Volume of Liquid Collected, cubic feet

CUSTOMER: REXNORD / OKC PROPOSAL NO. ______ DATE: 4/1/80

PROJECT: SAMPLE CALCULATIONS JOB NO.: ______ BY: M. MEASE

RUN #1

(1.) Volume of Water Collected

$$V_{wc} = (0.04707)(V_{fc})$$
$$= (0.04707)(18.7)$$
$$= 0.8802$$

(2.) Volume of Air Metered (2)

$$V_{Mstd} = (V_M)\left(\frac{530}{T_M}\right)\left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{29.92}\right)(C_M)$$
$$= (54.418)\left(\frac{530}{538.52}\right)\left(\frac{29.82 + \frac{1.9617}{13.6}}{29.92}\right)(0.994)$$

= 53.636 SCF @ std. conditions

(3.) Moisture Contents

$$B_{wo} = \frac{V_{wc}}{V_{wc} + V_{Mstd}}$$
$$= \frac{0.8802}{0.8802 + 53.636}$$
$$= 0.0161458 \text{ OR } 1.61458\%$$ (3)

(4)

(4.) Molecular Weights

$$M_d = (\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + [(\%CO + \%N_2) \times 0.28]$$
$$= (0 \times 0.44) + (21 \times 0.32) + (79 \times 0.28)$$
$$= 28.84$$

$$M_s = M_d(1 - B_{wo}) + 18(B_{wo})$$
$$= 28.84(1 - 0.016146) + 18(0.016146)$$
$$= 28.66$$

(5) Velocity of Exit Gases

$$V_s = K_p C_p \sqrt{\frac{T_s}{P_s M_s}} \left(\sqrt{\Delta P}\right)_{AVG}$$
$$= (85.48)(0.838)\sqrt{\frac{756.0}{(29.80)(28.66)}}(0.816)$$
$$= 54.989 \text{ FT/SEC}$$

CUSTOMER: REXNORD/OKC PROPOSAL NO. ______ DATE: 4/4/80

PROJECT: SAMPLE CALCS JOB NO.: ______ BY: M. MEASE

RUN #1

(6.) Flowrates

$$Q_s = (A_s)(V_s)(60)$$
$$= (63.1)(54.989)(60)$$
$$= 208,188 \text{ ACFM}$$

$$Q_{s\,std} = (Q_s)\left(\frac{T_{std}}{T_s}\right)\left(\frac{P_s}{P_{std}}\right)(1-B_{wo})$$
$$= (208,188)\left(\frac{530}{756.0}\right)\left(\frac{29.80}{29.92}\right)(1-0.0161458)$$
$$= 143,019.67 \text{ SCFM}$$

(7.) Particulate Concentration (w/o impingers)

$$C_s = \frac{(15.43)(M_n)}{VM_{std}}$$
$$= \frac{(15.43)(0.0419)}{53.636}$$
$$= 0.01205 \text{ Grains/SCF}$$

$$C_s' = (0.01205 \text{ Grains/scf})\left(\frac{143020 \text{ SCFM}}{208189 \text{ ACFM}}\right)$$
$$= 0.00828 \text{ Grains/ACF}$$

(8) Particulate Concentration (with impingers)

$$C_s = \frac{(15.43)(M_n)}{VM_{std}}$$
$$= \frac{(15.43)(0.0431)}{53.636}$$
$$= 0.0124 \text{ Grains/SCF}$$

$$C_s' = (0.0124 \text{ Grains/SCF})\left(\frac{143020 \text{ SCFM}}{208,188 \text{ ACFM}}\right)$$
$$= 0.0085 \text{ Grains/SCF}$$

CUSTOMER: REXNORD / OKC PROPOSAL NO. ______ DATE: 4/4/80

PROJECT: SAMPLE CALCS JOB NO.: ______ BY: M. MEASE

RUN #1

(9) Particulate Emission Rate (w/o impingers)

$$pmr = \frac{(M_n)(Q_{s\,std})(60)}{(454)(V_{M\,std})}$$

$$= \frac{(0.0419)(143020)(60)}{(454)(53.636)}$$

$$= 14.7655 \text{ \#/hr}$$

(10) Particulate Emission Rate (with impingers)

$$pmr = \frac{(M_n)(Q_{s\,td})(60)}{(454)(V_{M\,STD})}$$

$$= \frac{(0.0431)(143020)(60)}{(454)(53.636)}$$

$$= 15.188 \text{ \#/hr}$$

(11) Isokinetics

$$V_{s\,std} = \frac{Q_{s\,std}}{A_s} = 2266.56$$

$$I_s = \frac{V_{M\,STD}}{(\theta)(A_n)(V_{s\,std})}$$

$$= \frac{53.636}{(72)(0.0003409)(2266.56)}$$

$$= 0.964 \text{ OR } 96.4\%$$

OKC

May 5, 1980

Air Quality Service
Oklahoma State Department of Health
Northeast 10th Street & Stonewall
P. O. Box 53551
Oklahoma City, Oklahoma 73105

Re: Oklahoma Cement
Application for Permit to Operate
Equipment Installed under Installation
Permit 78-001-C

Gentlemen:

Oklahoma Cement, Div. of OKC Corp., has completed the installation of equipment described in the Oklahoma Installation Permit No. 78-001-C. Therefore, the purpose of this letter is to obtain your approval to operate the installed equipment. Also, I wish to inform you that emission tests have been conducted and results from these tests show emissions to be within the limits prescribed in the permit.

Essentially all equipment described in the permit has been installed as proposed except for the following changes:

1. Changed clinker storage building to raw material storage building.

2. Changed pulse jet baghouse on clinker cooler exit gases to Rexnord Gravel Bed Filter.

3. Increased size of primary crusher.

4. A few minor changes.

These changes and related emissions are discussed in the attached memo dated March 18, 1980, from Mr. Chris Rayner, Kaiser Engineers. This memo answers those questions proposed by Dr. Joyce Sheedy in her letter of January 2, 1980.

Emission tests were conducted on the clinker cooler exit gases on March 25 to determine the efficiency of the Rexnord gravel bed and on March 28 tests were conducted on the kiln exit gases to determine the efficiency of the Joy baghouse. Results of these tests show the average emission from the clinker cooler and gravel bed filter to be 14.6 lbs/hr vs an Oklahoma process weight allowable of 118.0 lbs/hr. Emission test results from the Joy baghouse, kiln stack gases, show an average emission of 35.9 lbs/hr (full train) vs an Oklahoma allowable of 46.1 lbs/hr. Also, sulfur dioxide emissions were less than 0.1 lb per million BTU's. Based on these results, all emissions conform to conditions stipulated in the installation permit. A tabulation of these emissions are attached for your review as well as test reports prepared by Mease Engineering and Mullins Environmental Testing.

If there are any questions, do not hesitate to give me a call.

Yours very truly,

Roy Click, Jr.
Process Engineer

RCjr:bw
Attachment

Dust collectors for the kiln feed storage silo (06-107) and the dust tank (07-135) have apparently been deleted. If this is the case, what was the rationale for the elimination of these two dust collectors? How are the particulate emissions from these sources being controlled?

Apparently dust collectors are being added for limestone storage (04-400) and the raw mill building (05-342). The following information should be submitted for these dust collectors:

1. Equipment keyed to process flow diagram.
2. Type of collector.
3. Air contaminants to be controlled.
4. Particulate size range and composition.
5. Particle size efficiency curve.
6. Guaranteed efficiency of collector.
7. Process weight.
8. Hours of operation.
9. Calculations of projected emissions.

The information listed above should also be provided for the clinker cooler gravel bed filter.

Evaluation of fugitive dust emissions will be accomplished by an on-site operating permit inspection.

It is assumed that all other processes and pollution control equipment remain unchanged since Installation Permit No. 78-001-C was issued.

If you have any questions concerning this matter, please contact us.

Very truly yours,

Joyce D. Sheedy

Joyce D. Sheedy, Ph.D.
Environmental Engineer
Permit Review/Source Evaluation

AIR QUALITY SERVICE

Office: (405) 271-5220

JDS:mlm

KAISER ENGINEERS

KAISER ENGINEERS INC
300 LAKESIDE DRIVE
POST OFFICE BOX 23210
OAKLAND CALIFORNIA 94623

RECEIVED
OKC CORP
DALLAS OFFICE

March 18, 1980

Mr. Roy Click, Jr.
OKC Corporation
4835 LBJ Freeway
P.O. Box 34190
Dallas, Texas 75234

Dear Roy:

Subject: Oklahoma Cement, Installation Permit
Kaiser Engineers Job No. 77174

This letter is to provide the additional information requested by Dr. Joyce Sheedy of Oklahoma State concerning the Installation Permit for OKC.

1. Primary Crusher

   The process weight, hours of operation, and baghouse air-to-cloth ratio for the primary crusher remain unchanged. The crusher that was purchased has considerable reserve capacity and the increase in collector size is required because of the extra physical size of the crusher.

2. Blend Feed Silo Roof

   The process weight and hours of operation remain unchanged for the blend silo.

   The new dust collector is sized to handle the total blend silo capacity, whereas the collector in the permit application was intended to supplement existing collectors. Since the size of the existing sources is difficult to determine, we have taken no credit for the reduction in emissions from the existing sources.

3. Kiln Feed Tank and Loadout Silos

   The kiln feed tank (07-191) and the loadout silo's (09-149) process weight, hours of operation, and baghouse air-to-cloth ratio remain unchanged.

4. Kiln Feed Storage Tank and Dust Tank

   Both the new kiln feed storage silo and the new dust tank were deleted from the project after it was determined that the existing silo and tank are of adequate capacity for the expanded plant. The disposal system from the dust tank has been improved. Instead of pumping the dust, dry, to the disposal site in the quarry, it is being mixed with water. There is sufficient cementitious material in the dust to react with the water and form a solid material, which, when dry, is resistant to wind erosion.

5. Raw Mill Building (05-342), Limestone Storage Building (04-400), and Clinker Cooler Vent

   Information requested for the two new collectors and the gravel bed filter is attached.

All other processes and pollution control equipment remain essentially unchanged since the permit application was prepared. One adjustment to the process flow rate has been made. The raw mill system, which was rated for 72 tons per hour capacity, has been increased to 92 tons per hour, allowing an average operating time of 18 hours per day instead of 24. No credit was taken for the reduced emissions on a tons-per-year basis.

The rearrangement of the material storage facilities was not fully described in my last letter. In the original facility, one material storage hall was used to store all raw materials and clinker. At the time of the permit application, it was proposed to increase the storage capacity by building a new clinker storage facility. Raw material storage space in the existing hall was to be expanded.

These plans were later revised and the new storage area was allocated to raw material (limestone). The additional storage space in the existing hall was allocated to clinker. Reclaim from the proposed clinker storage facility was to depend on front-end loader reclaim. The new raw material storage building has an automatic reclaim system with vibratory feeders feeding a belt conveyor. These transfer points are vented to the new limestone storage building dust collector.

A set of revised flow sheets is included for clarification. I hope this answers all of Dr. Sheedy's questions.

Very truly yours,

KAISER ENGINEERS, INC.

C C Rayner

Christopher C. Rayner
Environmental Control Engineer

CCR:tr

Attachment

cc R. L. McNeil
   J. A. Murray

LIMESTONE STORAGE (SOURCE 04-400)

1. See Flow Sheet 03-001-M. Dust Collector 04-400 vents material transfers from Vibrating Feeders 04-280, 04-290, 04-300, 04-310, 04-320, and 04-330 to Belt Conveyor 04-370.

2. Dust collector is a baghouse.

3. Air contaminant is limestone dust (particulate).

4. Particulate size is approximately 25% less than 10 micron.

5. Particle size efficiency curve is flat for a baghouse collector over the range of particulate sizes handled.

6. The collector is guaranteed not to emit more than 0.015 grains per actual cubic foot (ACF).

7. Process weight is 500 TPH = 1,000,000 lbs/hr.

8. Hours of operation are: 13 hours/day, 5 days/week, 39 weeks/year.

9. Projected emissions are:

   4,200 ACFM x 0.015 grains/ACF = 63 grains/min = 1.89 lbs/hr.

   @ 2,548 hours/year = 2.41 TPY.

CLINKER COOLER DUST COLLECTOR (SOURCE 07-169)

1. See Flow Sheet 07-001-M. Filter, Equipment No. 07-760, collects from the two existing clinker coolers and new Cooler 07-520.

2. The collector is a gravel bed filter.

3. The air contaminant is particulate.

4. The particulate is clinker dust, approximately 10% less than 10 micron.

5. Particle size efficiency curve is flat for the gravel bed filter over the range of particulate sizes handled.

6. Collector is guaranteed not to exceed 0.009 grains per ACF and not to exceed 0.1 pound per ton of feed to the kilns.

7. Process weight is 117,000 lbs/hr.
   177,000

8. Hours of operation are: 24 hours/day, 7 days/week, 47 weeks/year.

9. Projected emissions are:

   208,000 ACFM x 0.009 grains/ACF = 1,872 grains/min = 16.1 lbs/hr.

   @ 7,920 hours/year = 64 TPY.

RAW MILL BUILDING (SOURCE 05-342)

1. See Flow Sheet 05-001-M. Dust Collector 05-342 vents Bucket Elevator 05-170, Belt Conveyor 05-160, and Airslide 05-290.

2. The collector is a baghouse.

3. The air contaminant is particulate consisting of: 84% limestone
15% shale
1% misc. additives

4. Particle sizing is 25% less than 10 micron.

5. Baghouse collection efficiency is independent of particle size in the size range being collected.

6. Guaranteed outlet of collector is 0.015 grains/ACF.

7. Process weight is 95 TPH.

8. Hours of operation are: 18 hours/day, 6-7 days/week, 47 weeks/year.

9. Projected emissions are:

   6,500 ACFM x 0.015 grains/ACF = 97.5 grains/min = 0.83 lb/hr.

   @ 5,445 hours/year = 2.25 TPY.

No. ________

APPLICATION FOR PERMIT
Form No. 884
Submit in Triplicate

AIR QUALITY SERVICE
OKLAHOMA STATE DEPARTMENT OF HEALTH
OKLAHOMA CITY, OKLAHOMA

The Oklahoma Cement Div. of OKC Corp. proposes the construction ☐ operation ☒ of Additional equipment to increase the production capacity of Portland Cement at the Pryor plant.

and, as required by Regulation No. 14 promulgated in accordance with Sections 2001-2003, Title 63, Oklahoma Statutes 1971, hereby makes application to the State Department of Health for approval of plans and for a permit to proceed with construction or operation. Plans, specifications, description and engineering data in triplicate, accompany the application.

Estimated date of Construction Start February 1978 ~~Completion~~ Date of Operation March 15, 1980

Total estimated cost of this project is $22,000,000

Remarks Major components of this expansion pertains to installation and operation of a long-dry rotary kiln, primary crusher and screening systems, raw mill, new cement silos and raw material storage building.

Application should be signed (1) by owner of facility or his designated legally responsible representative, and (2) the person familiar with and responsible for completion of the application, plans, specifications and engineering data.

Signature (1) [signature]	Signature (2) [signature]
Name D. W. Heineck	Name Roy Click, Jr.
Title Vice President-Manufacturing	Title Process Engineer
Company OKC Corp.	Company OKC Corp.
Address	Address P. O. Box 34190 4835 LBJ FWY Dallas, TX 75234
Zip Code	Zip Code
Telephone No. 214-233-7100	Telephone No. 214-233-7100

ODH 884
Revised
May, 1978

OKC

May 5, 1980

RECEIVED
MAY 7 1980

Mr. Mike Reid
Lone Star Industries
One Greenwich Plaza
P. O. Box 5050
Greenwich, Connecticut 06830

Dear Mr. Reid:

Enclosed are test results of the #3 kiln for Oklahoma Cement. These are for your review and files. I have discussed these with George Messinger.

Yours very truly,

Roy Click Jr./bw

Roy Click, Jr.
Process Engineer

RCjr:bw
Enclosure

OKC

MAY 7 1980

May 5, 1980

Ms. Diana Dutton
Director, Enforcement Division (6AE)
U. S. Environmental Protection Agency
Region VI
First International Building
1201 Elm Street
Dallas, Texas 75270

Re: Oklahoma Cement
Application PSD-OK-61

Dear Ms. Dutton:

Compliance testing on the Rotary Cement Kiln and Clinker Cooler stack for the subject facility was performed during the week of March 25, 1980.

Test reports prepared by Mullins Environmental Testing and Mease Engineering are submitted for your review. Also enclosed is a table prepared by Kaiser Engineers summarizing emission data and copies of the source data that was included in the permit application. A material balance requested at the pre-test meeting is also included. Both stack test results comply with the conditions of the EPA PSD permit as well as the installation permit issued by the State of Oklahoma Air Quality Service.

If you have any questions, please give me a call.

Yours very truly,

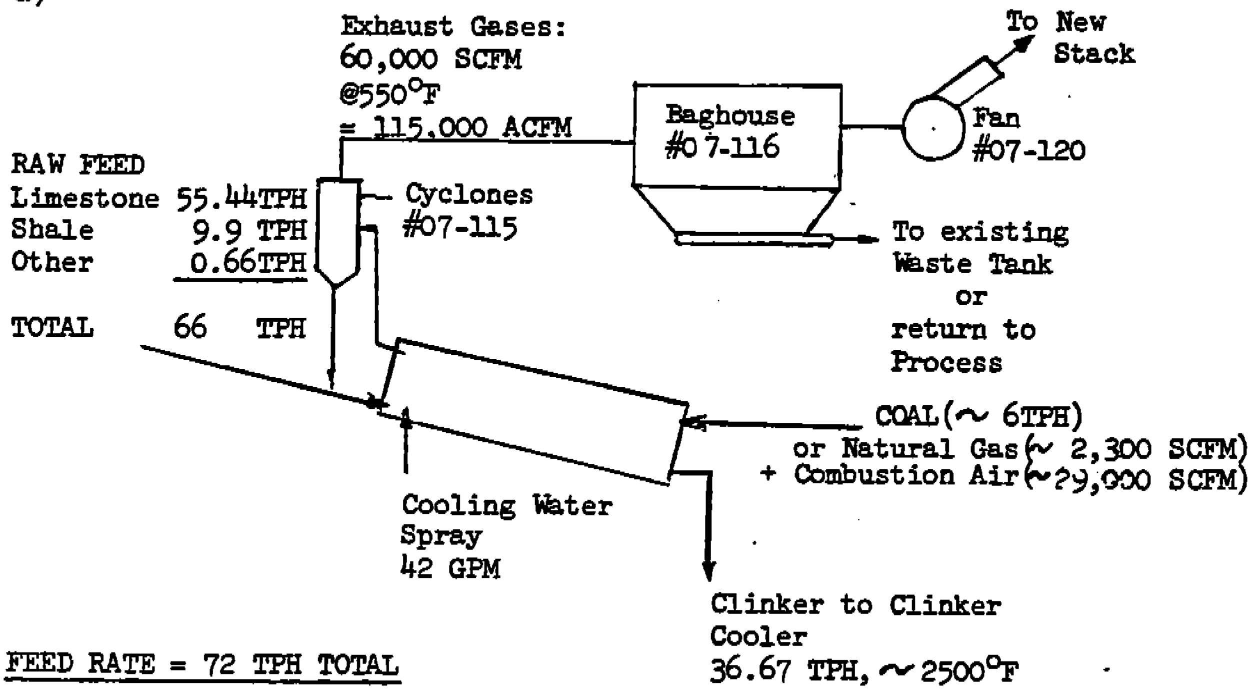
Roy Click, Jr.
Enclosure

cc: Mr. Rino Wong
EPA Region VI

Mr. Patrick J. Ford
GCA Corporation
Technology Division
Bedford, Mass. 01730

#3 KILN - SOURCE NO. 07-120

a)



FEED RATE = 72 TPH TOTAL

b) PROJECTED EMISSIONS

(1) Particulate - $.02 \times 60{,}000 \times \frac{550 + 460}{528}$ = 2295.4 grains/minute
gr/ACF SCFM = 19.67 lb/hr
@ 7920 hours/year = 77.9 tons/year

(2) Total Catch - By comparison with existing kilns ~ double particulate = 45 lb/hr

= 178 tons/year

(3) Sulfur Dioxide -
Assume all sulfur in raw mix is retained in clinker together with 75% of sulfur from the coal:

Heat Input = 3.9×10^6 BTU/Ton of Clinker
= $36.67 \times 3.9 \times 10^6$ BTU/Hr
= 1.43×10^8 BTU/Hr
Coal is 12,000 BTU/lb, @ 2.8% sulfur

Consumption is $\frac{1.43 \times 10^8}{1.2 \times 10^4}$ lb/Hr coal

= 11,917 lb/Hr ~ 6 TPH
Assuming 75% of sulfur is absorbed by clinker sulfur dioxide emitted - $2 \times 0.25 \times \frac{2.8}{100} \times 12{,}000$ lb/Hr

= 168 lb/Hr

c) Process Weight

Raw Mix & Coal = 72 tons/hr continuous
= 144,000 lb/hr

d) Normal Operating Schedule:

24 hours/day, 7 days/week 47 weeks/year

e) Yearly Production: 290,400 Tons/Year

Seasonal Production: 18% Dec/Feb 27% Mar/May
28% Jun/Aug 27% Sept/Nov

f) Process is continuous

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

h) Process Equipment - See a)

i) Raw Materials - See a)

j) Direct-fired Process - Kiln can be fired by coal or natural gas

Coal is 7.9% moisture, 10.3% ash, 33.3% volatile, 48.6% carbon,
2.8% sulfur, 12,000 BTU/lb
USAGE = 12,000 lb/hr = 47,500 TPY

Gas is natural gas, 1,050 BTU/CF, usage ~ 140 MCF/hr ~ 1,100,000 MCF/yr

k) Product - Cement Clinker

l) Exhaust Ventilation - To Cyclones, Baghouse, Fan & Stack

m) Gas Cleaning Equipment:

Equipment Type	- Fabric Filter Baghouse
Equipment No.	- 06-116
Manufacturer	- Not known
Model No.	- Not known
Contaminant	- Particulate
Size Range	- Not known
Composition	- See a)
Gas inlet temp & humidity	- 550°F, 17-22% by volume
Gas outlet temp & humidity	- 550°F, 17-22% by volume
Fabric/Weave	- Glass Fiber/Woven
Max. operating temp	- 550°F

m) Gas Cleaning Equipment (cont.)

Configuration - Not known
Cleaning Method - Reverse Air
Containment & disposal - Return to process or existing waste dust pile
Cloth Area - 57,500 sq. ft.
Filtration Velocity - 2 FPM
Connection to other collectors - Feed is from Cyclones
Guaranteed Efficiency - 0.02 grains/ACF
Guarantee Terms - Later

Particle size/efficiency curve - Not applicable

SUMMARY

Particulate

Allowable Emission - (Oklahoma)

$$55(72^{0.11}) - 40$$

= 48 lb/hr Total catch

Predicted Emission = 45 lb/hr Total catch

Allowable Emission - EPA - 0.3 (72) lb/hr

= 21.6 lb/hr Dry catch

Predicted Emission = 19.7 lb/hr Dry catch

Opacity - Allowed - 20%

- Predicted-No visible emission

Sulfur Dioxide - If fuel burning equipment rules are applied, max. 2 Hr. average allowable is 1.2#/million BTU heat input.
Allowable SO_2 = 1.2 x 143 lb/Hr = 171.6#/Hr
Predicted = 168#/Hr

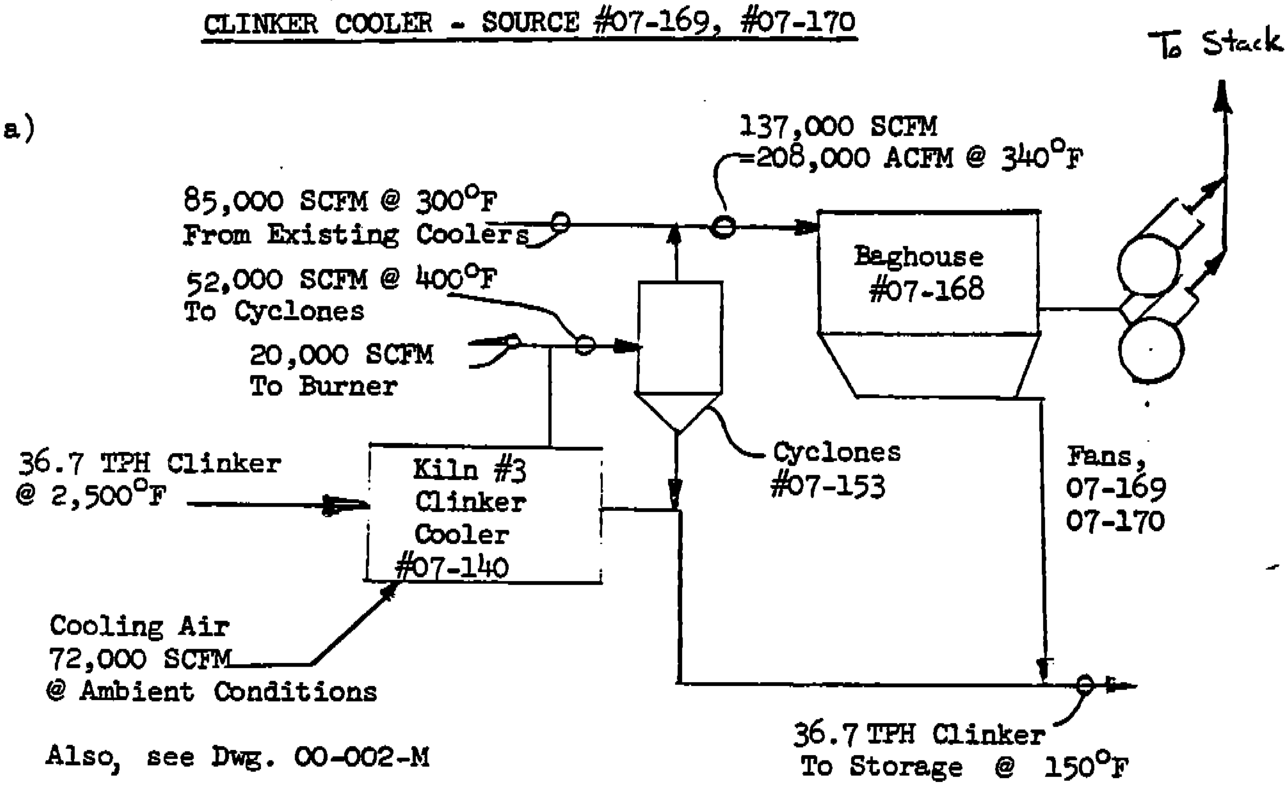
Cyclone Information

Equipment No.
Quantity
Inlet Area
Outlet Diameter
Height
Configuration
Pressure Drop

} Later

CLINKER COOLER - SOURCE #07-169, #07-170

a)



Also, see Dwg. 00-002-M

b) Projected Emissions - Dust Collector #07-168

208,000 ACFM x 0.009 Grains/ACF = 1,872 Gr/min

= 16.1 lb/hr

@ 7,920 hrs/yr = 64 TPY

c) Process Weight

(1) Based on Kiln Feed (EPA Regulation)

Cooler #1 & #2 = $\frac{625 \times 1.8}{24}$ + 4 (coal) = 51 TPH = 102,000 lb/hr each

Cooler #3 = $\frac{880 \times 1.8}{24}$ + 6 = 72 TPH = 144,000 lb/hr

(2) Based on Cooler Feed (Oklahoma)

Cooler #1 = $\frac{625}{24}$ = 26 TPH = 52,000 lb/hr

Cooler #2 = 26 TPH = 52,000 lb/hr

Cooler #3 = $\frac{880}{24}$ = 36.7 TPH = 73,000 lb/hr

d) Normal Operating Schedule

24 hours/day, 7 days/week 47 weeks/year

e) Yearly Production: 706,200 tons/year (including existing coolers)

Seasonal Production:	18% Dec/Feb	27% Mar/May
	28% June/Aug	27% Sep/Nov

f) Process is Continuous

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

h) Process Equipment - see (a)

i) Raw Materials - see (a)

j) Direct Fired Process - Not applicable

k) Product - Cement Clinker

l) Exhaust Ventilation - Through Cyclones to Baghouse and Fan

m) Gas Cleaning Equipment:

Equipment Type - Fabric Filter Baghouse
Equipment No. - 07-168
Manufacturer - Not known
Model No. - Not known
Contaminant - Particulate
Size Range - Not known
Composition - see a)
Gas inlet temp & humidity 340°/Ambient
Gas outlet temp & humidity 340°/Ambient
Fabric/Weave Nomex/Felted
Max. Operating temp 350° Continuous
400° Intermittent

Configuration - Not known
Cleaning Method - Pulse Jet
Containment & Disposal - Return to process
Cloth Area - 35,000 sq. ft.
Filtration Velocity - 6 FPM
Connection to other Collectors - Feed from Cyclones #07-153
Guaranteed Efficiency - 0.009 Grains/ACF
Guarantee Terms - Later

m) Gas Cleaning Equipment (cont.)

Particle size/efficiency curve - Not applicable

SUMMARY

Allowable Emission - (Oklahoma)

$$= 55\ (26^{0.11})\ -40$$
$$+ 55\ (26^{0.11})\ -40$$
$$+ 55\ (36.7^{(0.11)})\ -40$$
$$= 38.7 + 38.7 + 41.75 = 119 \text{ lb/hr}$$

Predicted Emissions = 16.1/lb/hr

Allowable Emission - (EPA) = (.1)(72+51+51)
= 17.4 lb/hr

Predicted Emission = 16.1 lb/hr

Allowable Opacity - 10%

Predicted Opacity - No visible emission

Cyclone Information:

Equipment No. Quantity Inlet Area Outlet Diameter Height Configuration Pressure Drop	Later

Emission Information for Existing Clinker Coolers

The existing Clinker Coolers are discharging a minimum of 80,000 SCFM at 200°F to the cyclones at an estimated particulate grain loading of 2-1/2 grains/ACF. Cyclone efficiency is approximatelv 92.5%. Particulate discharge is, therefore:

$$0.075 \times \frac{(200 + 460)}{528} \times 80{,}000 \times 2.5 \times \frac{60}{7000}\ \#/\text{hr} = 160\ \#/\text{hr}$$

This emission will be eliminated when the cyclones are connected to the Clinker Cooler Baghouse.

KAISER
ENGINEERS

KAISER ENGINEERS INC
300 LAKESIDE DRIVE
POST OFFICE BOX 23210
OAKLAND CALIFORNIA 94623

May 1, 1980

KAISER ENGINEERS
TRANSMITTED
Via Telecopier
Date: 5/1/80
To: Roy Click, Jr.
Attn: OKC Corp.
Sender: C. C. Rayner
Job No. 77174

Mr. Roy Click, Jr.
OKC Corporation
4835 LBJ Freeway
P.O. Box 34190
Dallas, TX 75234

Dear Roy:

Subject: Pryor Plant Expansion
Stack Test Results
KE Job No. 77174

The attached table compares the stack test data with the requirements of the construction permits issued by Oklahoma and the EPA. Some process parameters during the test (actual) were lower than the estimates contained in the permit application (permit). This reduces the allowable emissions as shown in the table.

The tests for the kiln (Source 07-120) and the clinker cooler (Source 07-169) both comply with the conditions of the permit.

I have also attached a typical material balance for the kilns. This was requested by the EPA in the pretest meeting.

Very truly yours,

C. C. Rayner / T.R.

Christopher C. Rayner
Environmental Control Engineer

CCR:tr

Attachment

cc R. L. McNeil
J. A. Murray

SOURCE 07-120 KILN #3

(1) PARTICULATE EMMISSIONS

AGENCY	EMISSION FORMULA	PROCESS WEIGHT, KILN FEED, P, TPH		ALLOWABLE EMISSION, LB/HR		PERMIT LIMIT LB/HR	TEST RESULT LB/HR
		PERMIT	ACTUAL	PERMIT	ACTUAL		
Oklahoma (1)	$55(P^{0.11})-40$	72	58.6	48	46	-	35.9
EPA (2)	0.3(P)	72	58.6	21.6	17.6	19.7	6.5

(1) Includes Wet & Dry Catch (2) Dry Catch Only

(2) SULFUR DIOXIDE

AGENCY	EMISSION FORMULA	COMBUSTION RATE, Q, MMBTU/HR		ALLOWABLE EMISSION, LB/HR		PERMIT LIMIT LB/HR	TEST RESULT LB/HR
		PERMIT	ACTUAL	PERMIT	ACTUAL		
Oklahoma	1.2Q	143	141 (3)	171.6	169.2	-	12.5
EPA	-	-	-	-	-	168	12.5

(3) 5.96 TPH x 2000 lb/ton x 11,800 BTU/LB = 141 MMBTU/HR

SOURCE 07-169 - CLINKER COOLERS 1, 2 & 3

(1) PARTICULATE EMMISSIONS

AGENCY	EMISSION FORMULA	PROCESS WEIGHT, (4) KILN FEED, P, TPH		ALLOWABLE EMISSION, LB/HR		PERMIT LIMIT LB/HR	TEST RESULT LB/HR
		PERMIT	ACTUAL	PERMIT	ACTUAL		
Oklahoma	$55(P^{0.11})-40$	26,26,38	25,26,33	119	118	-	14.6
EPA	0.1P	174	148	17.4	14.8	16.1	13.8

(4) Process Weight for Oklahoma is the feed to the cooler and the emission for each cooler is calculated seperately.

Run# #/hr emission
1 11.8
2 13.6
3 12.9
Avg 13.8

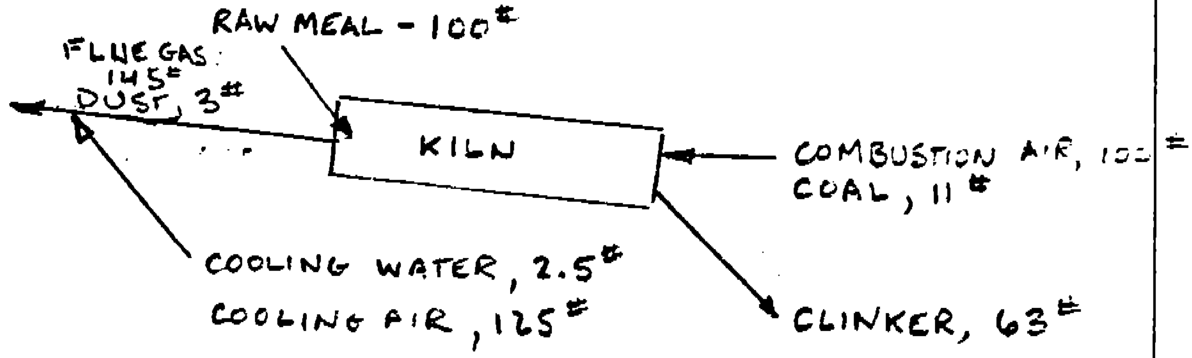
133 Raw Feed [illegible]
15.8 coal
148.8 Total
allowable on R. Feed alone = 13.3

KAISER ENGINEERS

Job No. 77174
SHEET OF

OKLAHOMA CEMENT.
TYPICAL MATERIAL BALANCE

DESIGNED BY CCR DATE 4/28
CHECKED BY DATE



DISTRIBUTION

IN \ OUT	CLINKER	FLUE GAS	DUST	TOTAL
RAW MEAL	61.3	35.8	2.9	100
COAL	1.4	9.5	0.1	11
COMBUSTION AIR	.3*	99.7	-	100
TOTAL	63	145	3	211

* OXYGEN REACTS WITH SULFUR IN COAL AND ALKALI IN MEAL TO FORM SOLID SULFATE SALTS

CALCULATIONS KE Form No. E-6 Rev. 10-71

LONE STAR INDUSTRIES, INC.

Interoffice Memo

Mail: P. O. Box 12449, Dallas, Texas 75225

July 16, 1980

TO: Ted Cox
Bob Kizer
Mike Reid
George Messinger
Thomas J. Dullahan
Pratt Lathem
Mike Harokopis

FROM: Roy Click, Jr.

SUBJECT: Oklahoma Cement
Pryor Plant EPA and Oklahoma Permits

Gentlemen:

Enclosed are notifications from the Environmental Protection Agency and the Oklahoma State Department of Health, Air Quality Service, informing Lone Star that Oklahoma Cement's No. 3 Rotary Cement Kiln and Clinker Cooler are in compliance with the respective regulations.

These approved permits complete OKC's obligations as stipulated in Sections D, E, and F of the OKC Supplement to Agreement of Sale and Purchase of the Oklahoma Cement facility.

RC:MM
Encs.

cc: Mr. Phil Gilbert
OKC Corp.
Dallas, Texas

Mr. Leo Bourdon
OKC Corp.
Dallas, Texas

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1201 ELM STREET
DALLAS, TEXAS 75270

11 JUL 1980

Mr. Roy Click, Jr.
Regional Environmentalist
Lone Star Industries, Inc.
P. O. Box 12449
Dallas, Texas 75225

Re: OK-1900-90002 & PSD-OK-61

Dear Mr. Click:

We have evaluated the results of your performance test submitted on May 5, 1980, for your No. 3 Rotary Cement Kiln and Clinker Cooler located at Pryor, Oklahoma. Based on our evaluation, we have determined that your Kiln and Clinker Cooler are in compliance with the requirements of 40 CFR Part 60 Subpart F, and PSD permit OK-61, at the time of the test.

If you significantly change the method of operation of the plant, the conditions under which you conducted the tests may no longer be "representative". We request that you notify us of such changes within 20 days after the change occurs, so we may determine whether you should retest the facility.

We appreciate your efforts to date to comply with your PSD permit and NSPS requirements. If you have any questions or need additional information, please call Mr. Alvin Blackwell at (214) 767-2755. In any correspondence to us, please reference your source number.

Sincerely,

Carl E. Edlund
Chief, Air Enforcement Branch (6AEA)

cc: Oklahoma Air Quality Service

Commissioner
JOAN K. LEAVITT, M.D.

Oklahoma
State Department of Health
1000 Northeast 10th Street
Post Office Box 53551
Oklahoma City, Oklahoma 73152

July 10, 1980

Mr. Roy Click, Jr.
Regional Environmentalist
Lone Star Industries, Inc.
P. O. Box 12449
Dallas, Texas 75225

Re: Operating Permit 78-001-0
Oklahoma Cement
Division of Lone Star Industries, Inc.
Pryor, Mayes County, Oklahoma
Expansion of Cement Production Capacity

Dear Mr. Click:

Enclosed is the permit authorizing operation of the referenced facility. Please note that this permit is subject to the attached standard provisions.

If we can be of further service please contact us.

Very truly yours,

Joyce D. Sheedy

Joyce D. Sheedy, Ph.D.
Environmental Engineer
Permits & Engineering Division
AIR QUALITY SERVICE

JDS:mlm

Enclsr.

cc Mr. Mike Harokopis, Plant Mgr.
Oklahoma Cement
Div. of Lone Star Industries, Inc.
Pryor, Okla. 74361, Box 68

PERMIT

AIR QUALITY SERVICE
ENVIRONMENTAL HEALTH SERVICES
OKLAHOMA STATE DEPARTMENT OF HEALTH
OKLAHOMA CITY, OKLAHOMA 73152

Date July 2, 19 80 Permit No. 78-001-0

The Oklahoma Cement Division of Lone Star Industries, Inc., having complied with the requirements of the law, is hereby granted permission to operate the expansion of cement production capacity to their facility located at Pryor, Oklahoma in Mayes County, as constructed and inspected under Installation Permit 78-001-C

subject to the standard provisions listed on page two (2) ~~and the following special conditions:~~

[signature] Chief, Air Quality Service

Mark S. Coleman Deputy Commissioner for Environmental Health Services

Joan K. Leavitt, M.D. Commissioner of Health

ODH Form No. 885

PERMIT TO OPERATE AIR
POLLUTION CONTROL FACILITY
(continued)

Standard Provisions

1. If any statement or representation in the application is found to be incorrect, this permit may be revoked and the permittee thereupon waives all rights thereunder; however, the application may be amended and a supplemental written permit issued therefor.

2. Any modification of operating procedures from those for which this permit was issued which results in an increase in emission of air contaminants without notification of Air Quality Service, Oklahoma State Department of Health, shall be grounds for revocation of this permit.

3. Any agent of the Oklahoma State Department of Health shall have the right and authority to inspect at reasonable times the operation of the equipment for which this permit is issued.

4. This permit shall not be considered in any manner affecting the title of the premises upon which the equipment is located, does not release the permittee from any liability for damage to persons or property caused by or resulting from the maintenance or operation of the equipment for which this permit is issued, and does not release the permittee from compliance with other applicable rules, regulations and statutes of Oklahoma or with applicable local laws, rules, regulations or ordinances.

5. This permit is subject to periodic review and change as deemed necessary to fulfill the intent and purposes of the Oklahoma Clean Air Act and rules and regulations promulgated in accordance therewith.

6. In compliance with Section 11.1 of Regulation No. 11 (Malfunction of Control Equipment), written notice containing the information required by this section shall be submitted to Air Quality Service of the Oklahoma State Department of Health.

7. In compliance with Section 11.2 of Regulation No. 11, the operator of the equipment for which this permit is issued will notify Air Quality Service, Oklahoma City, Oklahoma, phone (405) 271-5220, and when the emergency has been controlled, submit to Air Quality Service, Oklahoma State Department of Health, the information required in this section within 30 days of the occurrence.

ODH Form No. 885-2B
Revised April, 1979

G. Messinger R

Interoffice Memo

LONE STAR INDUSTRIES, INC.

Originating Office: P&PE Greenwich

Date: July 14, 1980

TO: M. M. Reid

FROM: R. Simmons

SUBJECT: Oklahoma Cement - Pryor

Mike Harakopis has informed me on this date that Oklahoma Cement has been issued an EPA operating permit #78 - 001 - 1. Apparently no additional conditions or requirements with respect to the Gravel Bed Filter have been imposed.

Rod

R, Simmons

RS:ml

cc: E. Buttiker
J. Mengwasser

Re: Discussion with Roy Click, OKC on May 13, 1980.

1. Copies of the test reports were submitted to the appropriate agency departments and other concerned parties on May 5, 1980.

2. Pat Ford of the GCA Corporation, who represented EPA at the tests, has not completed his review of the reports. He advised Roy in a phone conversation this date, he will <u>try</u> to complete his review and forward his recommendations to EPA Region VI by the end of next week. (May 23, 1980) Roy has pressed upon him the urgency involved.

3. EPA told Roy they also have 20 to 30 other reviews pending and will act on the OKC application as soon as they can. They will require Ford's recommendations prior to issuing their decision.

4. Roy <u>hopes</u> to have an EPA decision within 30 days. ??

GFM

LONE STAR INDUSTRIES, INC.
Cement & Construction Materials Group

RECEIVED

Interoffice Memo

Mail: P. O. Box 12449, Dallas, Texas 75225

May 8, 1980

TO: Tom Dullahan

FROM: George Biggs

SUBJECT: EPA Operating Permit Status - Oklahoma

Dear Tom:

Roy Click, OKC's environmentalist, visited with me this morning at my request. We went into the status of OKC's application to the EPA for an operating permit on the expansion at Pryor. Following is a summary of his comments and attitudes on this subject:

(1) Construction was completed and emission tests conducted within the time limitations provided in the construction permit. Test results were forwarded to the EPA by letter of May 5, 1980.

(2) The test results submitted are within the prescribed limitations.

(3) The weight of the coal was added to the weight of the feed in achieving favorable test results.

(4) On two prior occasions, Roy has added the weight of the coal in achieving test results, as follows:

(a) New Orleans plant changed to coal some years ago. Thereafter compliance testing ordered by the EPA resulted in favorable EPA consideration. Testing results were achieved by adding the weight of the coal to the feed. This was not a permit application specifically but the testing, done under EPA orders, used the added coal weight method and it was accepted by the EPA.

(b) When Pryor went to coal, tests were run as required by the State of Oklahoma using the same method as at New Orleans. The results were favorable and were accepted by the State. These tests were run at the State's request and not at EPA's request, but copies of the results were furnished to the EPA by the State. EPA apparently accepted these results with the coal being added for weight, without taking exception thereto.

(5) Roy is optimistic that the permit will be granted by the EPA, or if exception is taken, then he can justify with the EPA the adding of the coal weight to the feed system.

(6) He estimates obtaining the permit in approximately three months.

(7) The State operating permit application is in process with the State and he anticipated no problem on the State permit.

(8) He thinks the gravel bed antipollution equipment is satisfactory but assures me that there is warranty that the installation will meet EPA requirements (he is still speaking of adding the coal weight to the feed) but is confident that Kaiser will come in and make it right at Kaiser's cost.

(9) He recognizes that if the coal weight is not added to the feed, it might create a problem in meeting EPA requirements; and work on the gravel bed might be required to correct the problem; and if this work were required that undoubtedly the kilns would have to be shut down in order to accomplish the modifications.

Again, Roy is sanquine about his ability to get the permit as applied for.

This does not satisfy the problem expressed in our Monday meeting in connection with closing before obtaining the permit and the possibility of the problem arising after closing of having to make changes in order to meet permit requirements. I have no solution to suggest that approaches that of John Martin's Monday of attempting to negotiate an escrow as a cover for subsequent costs to meet permit requirements.

EGB:mb

cc: Margaret Hannigan
Ted Cox
George Messinger

Interoffice Memo

LONE STAR INDUSTRIES, INC.

Originating Office: P&PE Greenwich

Date: April 30, 1980

TO: M. M. Reid

FROM: R. Simmons

SUBJECT: OKC Pryor - Gravel Bed Filter

Guarantee -

0.009 grains per ACF with a gas volume of 208000 ACFM
0.1 pounds/ton of dry feed for gas volumes below 208000 ACFM

Tests Results:

Gas Volume:	206,333 ACFM
Outlet:	13.7 pounds/hour
Feed:	133 tons/hour
Coal:	15.8 tons/hour
Allowable:	13.3 pounds/hour emission without coal

Rexnord feeds that performance should be about twice as good as that shown through the test and desires to improve the performance.

Mike Schuck - Rex project manager states that the unit was not fine tuned prior to the test and only visual adjustments were made. Before a retest - if one is required - inbound particulate testing and outbound testing would be done by Rexnord and the unit adjusted for optimum performance. Rexnord would also desire to make an intermal inspection of the unit to determine if everything is in order, requiring all 3 kilns down. OKC and Kaiser started this unit up with no significant participation by Rexnord.

Rexnord is contractually bound to make the unit work if it fails the test. They are also receptive to performing the testing and adjustment work as soon as possible - prior to a ruling by EPA on the use of coal in the feed calculation, if LSI desires. It is, however, doubtful if it can be done prior to May 13, 1980, due to manpower limitations at Rex.

Rex does not feel that any major modifications are necessary and feels responsible for meeting EPA requirements.

Rod.

R. Simmons

RS:ml
cc: E. Buttiker
G. Messinger

OKC

March 11, 1980

Mr. Mike Reid
Lone Star Industries, Inc.
One Greenwich Plaza
Greenwich, Connecticut 06830

Dear Mr. Reid:

As per our discussion on Tuesday regarding emission testing of the new No. 3 kiln at Oklahoma Cement, Pryor, Oklahoma, the following individuals will be present during the testing of kiln exit gases and exit gases from gravel bed.

Stephen Wood	-	Joy - Westerm Precipitation Dept. Western will be doing the test on the baghouse
Michael J. Mease	-	Mease Engineering Mr. Mease will be conducting the tests for Rexnord Gravel Bed
Joyce D. Sheedy ~~Grant Marburger~~	-	Representing Oklahoma Air Control
Patrick J. Ford	-	GCA Corporation, Bedford, Mass.
Richard Graziano	-	GCA Corporation Representing EPA region VI - They are a contract company and will be observing the tests for EPA
Chris Rayner	-	Representing Kaiser Engineers

Actual emission tests are scheduled to start on March 25. However, test teams are scheduled to arrive on March 24 and I, too, plan to be there on the 24th.

If you wish to send someone, I would be pleased to make the necessary arrangements.

Yours very truly,

Roy Click, Jr.

RCjr:bw

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Tests are to be conducted to determine particulate and SO_2. Maximum emission rates for these pollutants are as follows:

	POLLUTANT EMISSION RATE (lbs/hr)	
	SO_2	Total Particulate
Kiln No. 3	168	19.7
Clinker Cooler Gravel Bed	-	16.1
Kilns 1 & 2	-	88.0

Tests on No. 1 and No. 2 will be run as soon as possible after completing No. 3.

Mr. Bill Hankins, Western Precipitation, will be in touch with you or me regarding work on Western's baghouse.

ROY CLICK, Jr.

RCjr:bw

OKLAHOMA PROCESS DATA
FOR
REXNORD GRAVEL BED

	KILN #1	KILN #2	KILN #3	TOTAL KILN FEED RATE
RAW FEED TONS/HR	40.2	40.9	51.9	133.0
COAL FEED TONS/HR	4.5	5.1	6.2	15.8
TOTAL FEED RATE	44.7	46.0	58.1	148.8
CLINKER PROD COOLER FEED RATE OKLA	25.3	25.8	32.7	83.8
ALLOWABLE EMISSIONS CLINKER COOLER EPA 0.1 LB/TON KILN FEED WITH COAL				14.9 LBS/HR
OKLAHOMA ALLOWABLE PROCESS WT TABLE - CLINKER PRODUCTION 83.8 LBS/HR.				49.5 LBS/HR

PRODUCTION RATES ARE DURING TIME OF TESTING 11 A.M. to 6 P.M. 3-25, 1980 - REPRESENTATIVES PRESENT DURING TIME OF TEST WERE - GCA REPRESENTING EPA, DR. JOYCE SHEEDY OKLAHOMA AIR CONTROL, CHRIS RAYNER KAISER ENGINEERS

Kilns Soy Bag House

T #1	6.9	#/hr.	Front half
2	6.6	"	
3	6.1	"	
Av.	6.53	#/hr.	front half

Allow 15.6 #/hr EPA (Fw)
17.4 Total.

Total. 1	34.9	Total catch
2	34.6	
3	38.3	
	35.9	

Allowable 40- 45.0 #/hr State on total catch

SO_2 ? 125,000 a.c.f.m.

Coal 1.5% S

4/22/80

Region VI

Roy Click (214) 233-7100

Gravel Bed 13.8 #/hr. avg.
allowable ... rate ...

Quantity .009 gr/...
.008 ...

Coal 13.3 > EPA
14.9

Ok. 49.5

affidavit submitted ... combination
seemed to allow coal
Kansas City ... (Rayner)
submit ... combination
then study.
Oklahoma process ... clk ... state
Requirement to retest.

	Raw	Coal	
K 1	40.2 T/hr.	4.5 T/hr	44.7
2	40.9	5.1	46.0
3	51.9	6.2	58.1
	133.0	15.8	

148.8

	Clk. Prod
K.1	25.3
2	25.8
3	32.7
	83.8

800
785

buckets ... prod ...
... 800 Tons ...

2-25-80

SCHEDULE 8 TO
AGREEMENT OF SALE AND PURCHASE

1. All required environmental tests shall have been completed, the results thereof shall have been satisfactory to all appropriate Governmental agencies and authorities and the plant and equipment shall be operating within the limits provided for by the permits issued by such agencies and authorities.

2. OKC shall have effectively transferred and assigned to Lone Star, effective on the Closing Date, all of its rights and remedies, existing or potential, to which OKC is entitled under all warranties, guaranties, covenants and agreements, express or implied, from all manufacturers, distributors, and contractors with respect to any and all machinery, equipment, wiring, piping and any other part of the new kiln and its supporting apparatus and facilities and the installation of any and all of the same.

3. Throughput on the new kiln system will have achieved production of 800 short tons of clinker per 24 hour period for each of seven consecutive 24 hour periods, such production test to have been observed by Lone Star personnel.

Phillip Gilbert, Esq.: Foregoing draft presently being reviewed by Lone Star operating personnel. I expect to have a report either this afternoon or tomorrow morning. Please call and advise as to whether you find the foregoing satisfactory.

Harvey Kaplan

[illegible] Pryor [illegible] 3/25/80

[illegible] Filter - [illegible]
3 Coolers -
Test [illegible]

[illegible] - problem [illegible]
[illegible] velocity
flow with pitot tube [illegible]
[illegible]
[illegible] 9% between max flow
position + vertical -

[illegible] people approve run for
warranty [illegible] with pitot at
vertical.

EPA states run @ vertical. if
results 50% below allowable
acceptable - 50-75% will
need to [illegible] - above 75%
could be retest.

Warranty calls for 65% of
allowable - at 0.01 grain/acf
at 115,000 acfm

[illegible] at [illegible] - 125,000 acfm

[illegible]

[illegible] fine unit [illegible]
[illegible] answer at test—
[illegible] [illegible] to all
[illegible]
All [illegible] [illegible] [illegible]

721

MMI - 257

March 25 Start

Roy Click Jr.

→ OKC (214) 233 7100

K.C.W.

Joy Mfg acceptance

Steve Wood

Frank Mease Grout

Grant Marburger O.K Air C.B.

Tom JCA Corp EPA Region IV

min Kiw Eng.

(1) Prod Kiln @ 800 T/day,

THERM-O-FLEX® FABRIC FILTER DATA SUMMARY

Plant Name: OKLAHOMA CEMENT COMPANY
Location: Pryor, Oklahoma
Job Number: 78-010-11-17/07

Date: May 1979

DESIGN CONDITIONS

Process	Process Cement
Suspended Material	Fly Ash and Cement Dust
Fuel	Coal
Gas:	
Source:	Rotary Cement Kiln
Gas Flow (max acfm)	115,000
Temperature (°F)	550
Inlet Loading (gr/acf)	5-15
Outlet Loading (gr/acf)	0.010
Moisture (% by vol)	24
Design Pressure (in. WHC)	-20
Effective Filter Area (sq ft)	77,520
Total Filter Ratio	2.34:1
Active Filter Ratio*	2:1
Reverse Air Flow:	
Total (max acfm)	16,700
Static Pressure (in. WHC)	10.6
Reverse Air Fan (qty)	1

THERM-O-FLEX® FABRIC FILTER

Type	Modular
No. of Units	1
No. Compartments/Unit	8
Bags:	
Total Quantity	5376
Per Compartment	672
Material	Woven Fiberglass w/silicone graphite finish
Diameter (in.)	5.25
Length (ft)	10.5
Power Requirements	460V, 3 phase, 60Hz

Air Flow Regulation (valves & dampers)

	Type	Qty
Hopper Inlet (Isolation)	Butterfly	8
Reverse Air/Outlet Valve	Double Disc**	8
Reverse Air Control (Null) Damper	Butterfly**	1
Outlet Duct Damper	Butterfly	8
Reinflation Damper	Butterfly**	1
Sequence Controller	W.P. Design	1
Differential Pressure Measurement	Magnehelic	8
Hoppers	Trough W/24 in. manhole	8

*With one compartment out for cleaning and one out for service
**Pneumatic operated

OKC

November 30, 1977

United States Environmental Protection Agency--Region VI
First International Building
1201 Elm Street
Dallas, Texas 75270

Attention: Mr. J. Winkler

Gentlemen:

Subject: Oklahoma Cement Expansion
Pryor, Oklahoma

Oklahoma Cement desires to expand the production capacity of the Portland cement plant at Pryor, Oklahoma. The purpose of this letter is to request EPA review and approval of a construction permit for the project as related to prevention of significant deterioration. I believe the information contained in this letter and its attachments constitute a complete application suffcient for the EPA evaluation of the proposed project.

The proposed increased capacity at the Pryor plant will be accomplished by the addition of a new long-dry kiln. A more complete description of this project is summarized in Attachment A. Additional engineering data are shown on the following drawings:

1. Plot plan and emission points are given in Drawing 01-001-C-Rev A, including latest red line revision.
2. Flow sheet showing equipment for the expansion with the existing equipment shown by background lines while the new plant is denoted by cross hatching. The complete flow sheet is given in Drawings 00-002-G and 00-003-G, including latest red line revisions.
3. Property boundary map of Pryor plant.

The particulate emission and ground level concentration will be reduced by this project. The clinker coolers for the existing two kilns are vented to atmosphere after passing through multicyclones. These clinker coolers will have their vent gases going to a new baghouse which will also treat the vent gases from the new clinker cooler.

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This reduction in emission is more than three times the combined emission from all new sources. The emission inventory for particulate is summarized in Attachment B.

The clinker dome is the only new fugitive source. The clinker dome will result in a net decrease in fugitive particulate emissions because it replaces much of the on-ground open storage that currently is used. No credit has been taken for this net reduction in particulate emission in the Attachment B summary.

The SO_2 emissions from the plant will be increased by the amount from kiln stack. The sulfur originates in the cement-making raw materials and from the fuel--coal. Most of the sulfur is absorbed by the raw materials and leaves the kiln via the clinker. Virtually all the sulfur in the raw materials stays with the material and approximately 75% of the sulfur in the coal is taken up in the clinker. The resulting sulfur emission when the new kiln is fired with 2.8% sulfur coal will be no more than 168 pounds/hour of SO_2. Normally, the sulfur content of the coal is less than 2.8%.

The nearest significant structure to the kiln stack will be the baghouse, and the stack-baghouse separation and stack height conform to the 2.5-times rules. The surrounding terrain is rolling hills.

The maximum SO_2 ground level emissions from a new 100 foot kiln stack were determined by using the PTMAX model in the UNAMAP series of computer programs. The maximum calculated ground level concentration was less than 53 ug/m^3 and this was within the property line. Other ground level concentrations of about 50 ug/m^3 were calculated to fall outside the property line. It is important to note that the diffusion constants used in the PTMAX program are based on those from D. Bruce Turner's Workbook and represent averaging periods of 3 to 10 minutes not the 3-hour to annual averaging periods of the PSD increments. If the PTMAX values are extrapoleted using the convential expotential relationship between time and concentration, the resulting ground level concentrations are only a fraction of the Class II PSD increments and are approximately the Class I PSD increments. Because the ground level concentrations from this emission is so low, it is felt that no further meterological modelling is warranted and as a result, the annual meterological (STAR) data is not included. A copy of the PTMAX output is included in Attachment C.

Also included in Attachment C are the:

1. Emission estimate calculations

2. Fuel type and content

3. Description of the emission control equipment. The resulting outlet grain loadings are given in lieu of efficiencies.

4. Description of each point source sufficient for meterological modelling.

The dust collectors are baghouses. Baghouses are the best available control technology for cement plants.

The proposed expansion project will have negligible effect on other sources, except for the control of the clinker cooler vent which has been discussed above as resulting in a net reduction in particulate from the plant. The commercial, industrial, and residential development will only have to accomodate approximately five new hires.

In conclusion, the proposed plant expansion is designed to meet applicable emission standards and is being submitted to the State of Oklahoma for their review and approval. There will be a net reduction in particulate emission. The SO_2 emission will result in an increased ground level concentrationthat is only a fraction of the allowable PSD Class II increment. Construction can be scheduled to begin as early as February, 1978; and operation could begin in the fall of 1979.

If there is any further information that I can furnish you to expedite the processing of this permit, please contact me by phone at (504) 254-0203.

Sincerely,

Roy Click, Jr.
Process Engineer

dh

Attachments

LIST OF ATTACHMENTS

Attachment

A. Summary Scope of Oklahoma Cement Expansion

B. Summary of Particulate Emission Inventory

C. Letter - Hankins to Click dated 23 November 1977. Includes detailed source data PTMAX dispersion model, output and application of emission regulations to sources.

Drawings

Plant plot plan showing emission sources

Flow sheets (2)

Plant boundary map

ATTACHMENT A

SUMMARY SCOPE OF OKLAHOMA CEMENT EXPANSION

OKC has finalized plans to increase cement production at their Pryor, Oklahoma Plant. This expansion entails the expenditure of 20-22 million dollars which will be used to purchase equipment and provide jobs for many individuals for about 1 1/2 years.

Present expansion plans call for the installation of the following equipment:

A. Primary Crusher Impactor and Screening System. System has rated capacity of 500 tons per hour of limestone rock.

B. Raw Mill - Size 11' x 33', 2,000 HP with a rated capacity of 95 TPH.

C. Kiln Feed Storage Silo.

D. Rotary Cement Kiln - Size 12' x 425', raw feed rate capacity of 72 TPH including coal consumption. Rated clinker production of 36.7 TPH. Particulate emission in the kiln exit gases will be controlled by a bank of cyclones and a glass baghouse.

E. Raymond Coal Mill - for direct firing of the new cement kiln.

F. Clinker Cooler - 1st section 6' x 19', 2nd sloped section 8' x 12'. Exit gases from this cooler will combine with gases from kilns 1 & 2 coolers. Exit gases from all coolers will be diverted into a common baghouse.

G. New Kiln Feed Tank.

H. Two New Cement Silos with associated fill and load out spouting, dust collectors, scales, etc.

I. Clinker Dome Storage Building - 150' diameter.

J. Several new belt conveyors which will be covered to prevent material from becoming airborne.

Emissions from New Facility

A. Particulate Emissions:

In all cases bag collectors will be used to control emissions at various emission points. Calculations indicate that emissions will be within the limits established by Oklahoma Air Quality Service and EPA.

Attached is a table showing the predicted emissions.

B. Sulfur Dioxide Emissions

Calculations indicate that a 12,000 BTU/lb. coal with a 2.8% sulfur content can be used without exceeding regulatory limits.

SUMMARY OF PARTICULATE EMISSION

INVENTORY

TOTAL NEW PARTICULATE

#03-160	Primary Crusher	1.3	#/hr	1.69	TPY
#03-190	Primary Screen	1.3	#/hr	1.69	TPY
#05-128	#3 Raw Mill	5.1	#/hr	18.66	TPY
#06-107	Kiln Feed Storage Silo	0.2	#/hr	.375	TPY
#06-121	Blend Silo	0.4	#/hr	1.4	TPY
#07-120	New Cement Kiln	19.7	#/hr	77.9	TPY
#07-135	Dust Tank	0.2	#/hr	.75	TPY
#07-169 -170	Clinker Cooler	16.0	#/hr	64.0	TPY
#07-191	Kiln Feed Tank	0.2	#/hr	0.375	TPY
#09-128 #09-149 #09-150	Cement Loadout Silos	0.7	#/hr	.28	TPY
	Total	45	#/hr	167	TPY

DELETED PARTICULATE SOURCES				
Existing Clinker Cooler emission	160	#/hr	634	TPY
NET PARTICULATE DECREASE	115	#/hr	467	TPY
TOTAL NEW SULFUR DIOXIDE EMISSIONS =	168	#/hr	665	TPY

TOTAL NEW SULFUR DIOXIDE EMISSIONS=	168	#/hr	665	TPY

KAISER ENGINEERS

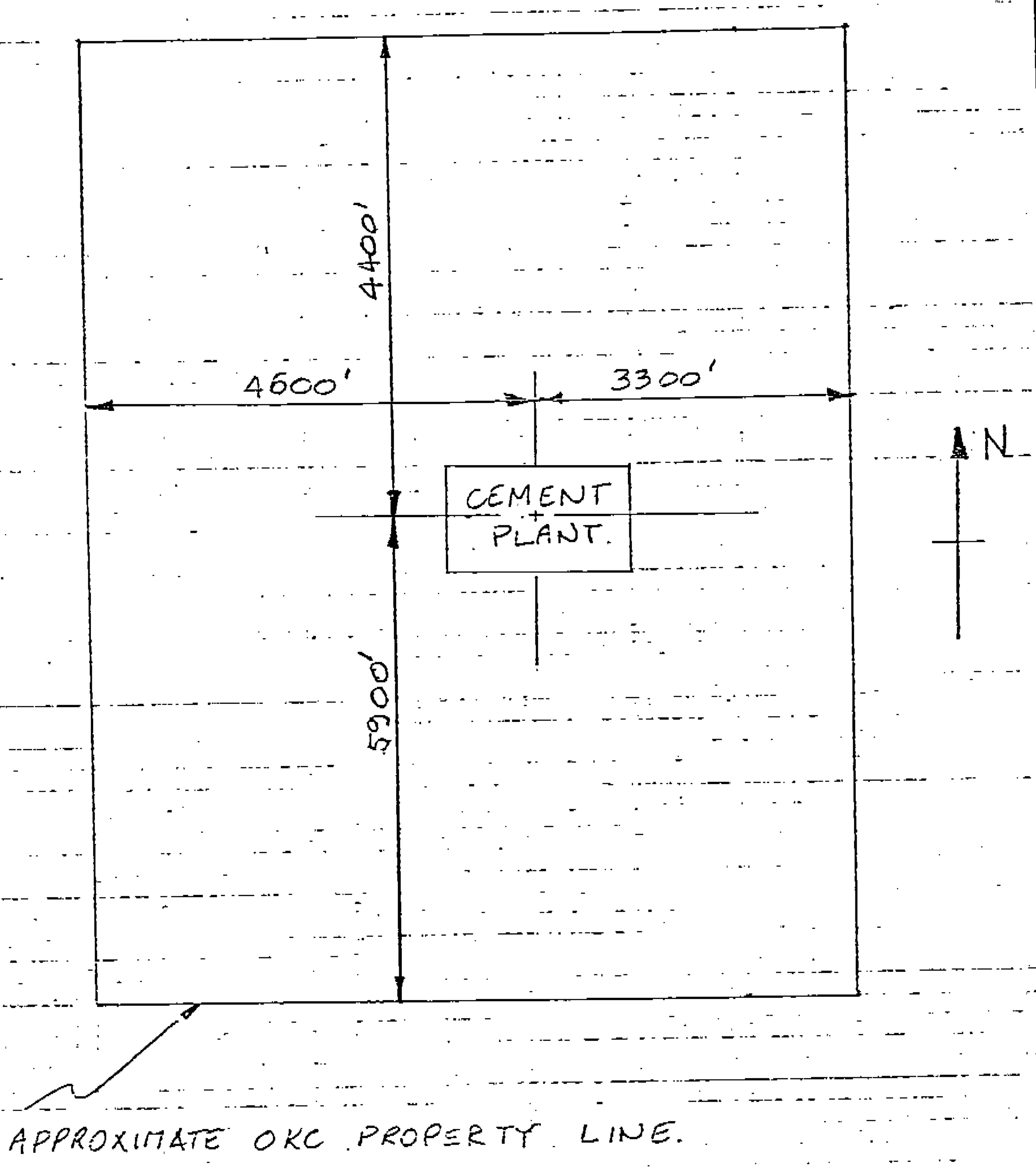
Job No. [illegible]

Sheet 1 of 1

PROPERTY BOUNDARY MAP
OKLAHOMA CEMENT CO.
PRYOR, OKLAHOMA.

DESIGNED BY CCR DATE 11/30/77

CHECKED BY DATE



CALCULATIONS KE Form No. E-6 Rev. 10-71

KAISER ENGINEERS

KAISER ENGINEERS, INC.
KAISER CENTER · 300 LAKESIDE DRIVE
OAKLAND, CALIFORNIA 94666

November 23, 1977

Mr. Roy Click, Jr.
Processing Engineer
Louisiana Cement Company
14900 Intracoastal Drive
New Orleans, LA 70129

Subject: Environmental Permits - Rev. A Data
Oklahoma Cement Co. Plant Expansion
KE Job 77174

Dear Mr. Click:

Attached are three copies of the revised data compiled by our Environmental Control Department which they believe is necessary for application to obtain Oklahoma State permits.

If any explanation or further information is required, please advise.

Very truly yours,

W. L. Hankins
Project Manager

WLH:jm
Attachments

KAISER
ENGINEERS

INTEROFFICE MEMORANDUM

TO	W. L. Hankins ED - 6	DATE	November 17, 1977
		FROM	C. C. Rayner Chris
COPIES TO	J. A. Murray T. G. Smith	AT	220 Mall
		JOB NO.	77112

SUBJECT PLANT EXPANSION
OKLAHOMA CEMENT COMPANY
BACK-UP INFORMATION FOR ENVIRONMENTAL PERMITS

he attached back-up information is required by Oklahoma to accompany the permit application for the #3 kiln addition at Pryor Oklahoma. Data for each source is listed in he same order that it is requested in the Oklahoma permit application instructions. dditional data required by the Environmental Protection Agency (EPA) is listed in Table 1: Stack Data. I understand that Roy Click will want to take this data with him o a pre-application conference.

his is a summary of the main points:

Particulate Emissions

Oklahoma uses a process weight formula to determine the allowable particulate emission from any source.

Emissions were predicted for each source based on dust collectors with an output grain loading guarantee of 0.015 gr/ACF. In no case did the predicted emission exceed the allowable emission.

The Oklahoma sampling technique for hot emissions measures volatiles that become particulate at ambient temperatures. A baghouse dust collector is unable to stop these emissions, however, based on a comparison with the existing kiln baghouses at Pryor the "total catch" from the #3 kiln baghouse will still be within the allowable limits.

EPA particulate emission regulations apply only to the kiln and the clinker cooler and are both based on feed rate to the kiln. In order to meet the EPA limits for the clinker cooler, a baghouse with an output grain loading of .009 gr/ACF must be specified. Kiln emissions are within EPA limits, using the standard 0.02 gr/ACF specification.

Sulfur Dioxide Emissions

Oklahoma will require that the kiln meet the SO_2 emission limits specified for fuel burning equipment. In order to calculate the SO_2 emissions, it is assumed that 75% of the sulfur in the coal will be absorbed in the clinker. This number was used by OKC in their application to burn coal in their existing kilns and appears to be conservative. On this basis 12000 BTU/LB coal with up to 2.8% sulfur content can be burned without exceeding the regulatory limits.

November 17, 1977

The EPA has no applicable limitation on SO_2 emissions.

c. Ambient Air Quality

Ambient air particulate levels will decrease as a result of the #3 kiln expansion because the clinker cooler cyclones have been emitting more particulate than the total of all the new sources. These cyclones will now exhaust into the new clinker cooler baghouse.

Ambient Air Sulfur Dioxide levels will increase due to the new emissions from the #3 kiln stack.

The EPA "significant deterioration" regulation limits the incremental increase in ambient air concentrations and Oklahoma has adopted similar regulations. An EPA approved computer program (printout attached) was used to calculate the maximum 10 minute average concentrations of SO_2 at ground level resulting from the new emissions from the #3 kiln stack. Averages over longer time periods will be lower. The input data was based on a 100' stack, maximum sulfur content coal and a gas temperature of 450°F leaving the stack.

The result (52 ug/M^3) was well below the 3 hour average (512 ug/M^3) and the 24 hour average (91 ug/M^3) allowed by the regulations.

Stack Height

The stack is required to be sufficiently high to avoid plume downwash in the wake of a tall building.

A rule of thumb that has been used to avoid this is that either (a) the stack must be $2\frac{1}{2}$ times the height of the building or (b) the distance between the stack and the building must be $2\frac{1}{2}$ times the height of the building. William Snyder et al in Report No. EPA-600/3-76-001 dated February 1976 showed that this rule is good where building width is 2 times the height, but is unnecessarily conservative for tall, narrow buildings.

As the baghouse is the nearest tall structure to the stack and will be approximately 40' high, a 100' stack was selected. The existing 150' tall stack is too narrow to have a significant wake.

CR:kc
Attachment

DB [redacted] VER[redacted] 743 [redacted]
JOB 77112 16θ#/HR 450 F,NEW 100' STACK

ANALYSIS OF CONCENTRATION AS A FUNCTION OF STABILITY AND WIND SPEED. 1971 VERSION, D. B. TURNER.

EMISSION RATE (G/SEC) = 21.20, PHY HT (M) = 30.00, STACK TEMP (DEG,K) = 505.00, STACK VEL (M/SEC) = 18.82,
DIAM (M) = 1.83, VOLUME FLOW (CU M/SEC) = 49.50

WIND SPEED (M/SEC)	0.5	0.8	1.0	1.5	2.0	2.5	3.0	4.0	5.0
STABILITY = 1									
MAX CONC (G/CU M)	3.0352E-05	3.5971E-05	3.8795E-05	4.4078E-05	4.7726E-05	5.0372E-05	5.2443E-05		
DIST OF MAX (KM)	1.323	1.069	0.967	0.810	0.716	0.653	0.604		
PLUME HEIGHT (M)	976.3(2)	621.5(2)	503.2(2)	345.4(2)	266.6(2)	219.3(2)	187.7		
STABILITY = 2									
MAX CONC (G/CU M)	1.0594E-05	1.4937E-05	1.7484E-05	2.2593E-05	2.7558E-05	3.1407E-05	3.4699E-05	3.9927E-05	4.3790E-05
DIST OF MAX (KM)	5.636	3.727	3.074	2.179	1.720	1.439	1.249	1.006	0.859
PLUME HEIGHT (M)	976.3(2)	621.5(2)	503.2(2)	345.4(2)	266.6(2)	219.3(2)	187.7	148.3	124.6
STABILITY = 3									
MAX CONC (G/CU M)					2.0955E-05	2.4707E-05	2.8033E-05	3.3618E-05	3.8013E-05
DIST OF MAX (KM)					3.440	2.776	2.341	1.809	1.496
PLUME HEIGHT (M)					266.6(2)	219.3(2)	187.7	148.3	124.6
STABILITY = 4									
MAX CONC (G/CU M)	9.6428E-07	2.0109E-06	2.8402E-06	5.1082E-06	7.4217E-06	9.7747E-06	1.2054E-05	1.6230E-05	1.9986E-05
DIST OF MAX (KM)	164.304(3)	67.213	44.238	23.025	14.674	10.589	8.193	5.592	4.220
PLUME HEIGHT (M)	976.3(2)	621.5(2)	503.2(2)	345.4(2)	266.6(2)	219.3(2)	187.7	148.3	124.6
STABILITY = 5									
MAX CONC (G/CU M)					3.5365E-05	3.3113E-05	3.1306E-05	2.8501E-05	2.6183E-05
DIST OF MAX (KM)					7.749	7.025	6.494	5.753	5.272
PLUME HEIGHT (M)					117.5	111.2	106.4	99.4	94.5
STABILITY = 6									
MAX CONC (G/CU M)					2.7096E-05	2.6160E-05	2.4858E-05	2.2815E-05	2.1252E-05
DIST OF MAX (KM)					15.996	14.179	12.972	11.312	10.203
PLUME HEIGHT (M)					102.6	97.4	93.4	87.6	83.5

WIND SPEED (M/SEC)	7.0	10.0	12.0	15.0	20.0
STABILITY = 3					
MAX CONC (G/CU M)	4.4192E-05	4.9238E-05	5.0860E-05	5.1773E-05	
DIST OF MAX (KM)	1.144	0.885	0.787	0.689	
PLUME HEIGHT (M)	97.6	77.3	69.4	61.5	
STABILITY = 4					
MAX CONC (G/CU M)	2.6147E-05	3.2055E-05	3.4603E-05	3.7029E-05	3.8663E-05
DIST OF MAX (KM)	2.845	1.978	1.673	1.387	1.121
PLUME HEIGHT (M)	97.6	77.3	69.4	61.5	53.7

(1) THE DISTANCE TO THE POINT OF MAXIMUM CONCENTRATION IS SO GREAT THAT THE SAME STABILITY IS NOT LIKELY TO PERSIST LONG ENOUGH FOR THE PLUME TO TRAVEL THIS FAR.

(2) THE PLUME IS OF SUFFICIENT HEIGHT THAT EXTREME CAUTION SHOULD BE USED IN INTERPRETING THIS COMPUTATION AS THIS STABILITY TYPE MAY NOT EXIST TO THIS HEIGHT. ALSO WIND SPEED VARIATIONS WITH HEIGHT MAY EXERT A DOMINATING INFLUENCE.

(3) NO COMPUTATION WAS ATTEMPTED FOR THIS HEIGHT AS THE POINT OF MAXIMUM CONCENTRATION IS GREATER THAN 100 KILOMETERS FROM THE SOURCE.

SUMMARY OF PARTICULATE EMISSION

INVENTORY

TOTAL NEW PARTICULATE

#03-160	Primary Crusher	1.3 #/hr	1.69 TPY
#03-190	Primary Screen	1.3 #/hr	1.69 TPY
#05-128	#3 Raw Mill	5.1 #/hr	18.66 TPY
#06-107	Kiln Feed Storage Silo	0.2 #/hr	.375 TPY
#06-121	Blend Silo	0.4 #/hr	1.4 TPY
#07-120	New Cement Kiln	19.7 #/hr	77.9 TPY
#07-135	Dust Tank	0.2 #/hr	.75 TPY
#07-169 -170	Clinker Cooler	16.0 #/hr	64.0 TPY
#07-191	Kiln Feed Tank	0.2 #/hr	0.375 TPY
#09-128 #09-149 #09-150	Cement Loadout Silos	0.7 #/hr	.28 TPY
	Total	45 #/hr	167 TPY

DELETED PARTICULATE SOURCES

Existing Clinker Cooler emission	160 #/hr	634 TPY
NET PARTICULATE DECREASE	115 #/hr	467 TPY
TOTAL NEW SULFUR DIOXIDE EMISSIONS =	168 #/hr	665 TPY

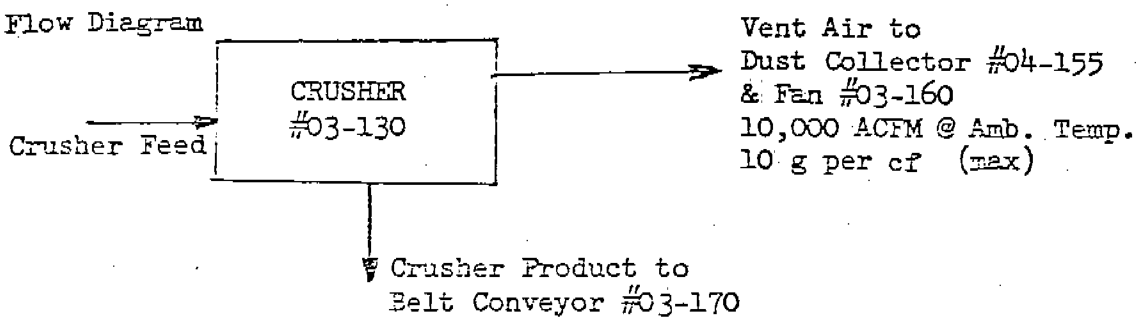
TOTAL NEW SULFUR DIOXIDE EMISSIONS=	168 #/hr	665 TPY

STACK DATA

UTM CO-ORDINATES	STACK DATA				EXHAUST RATE	
	HEIGHT (METERS) (FT)	I.S. DIA (METERS) (FT)	VELOCITY (M/S) (FPM)	TEMP (°C) (°F)	(M^3/S) (ACFM)	(Nm^3/S) (SCFM)
	11.0 35.0	0.61 2.0	16.1 3,180	Ambient	4.7 10,000	4.4 10,000
	21.0 68.0	0.61 2.0	16.1 3,180	Ambient	4.7 10,000	4.4 10,000
	30.0 100.0	1.22 4.0	18.2 3,580	65° 150°	21.2 45,000	17.15 39,000
	52.0 170.0	0.23 0.75	17.2 3,400	Ambient	0.7 1,500	0.7 1,500
	23.0 75.0	0.3 1.0	19.2 3,800	Ambient	1.4 3,000	1.3 3,000
	30.0 100.0	1.83 6.0	18.82 3,713	232° 450°	49.5 105,000	26.4 60,000
95° 14' W	15.0 50.0	0.23 0.75	17.2 3,400	93° 200°	0.7 1,500	0.6 1,200
36° 21' N	29.0 95.0	2.59 8.5	15.40 3,000	93° [1] 200°	81.2 172,000	60.6 137,000
	23.0 75.0	0.23 0.75	17.2 3,400	Ambient	0.7 1,500	0.7 1,500
	76.0 250.0	0.3 1.0	16.1 3,180	Ambient	1.2 2,500	0.7 2,500
	11.0 35.0	0.23 0.75	17.2 3,400	Ambient	0.7 1,500	0.7 1,500
	11.0 35.0	0.23 0.75	17.2 3,400	Ambient	0.7 1,500	0.7 1,500
	23.0 75.0	1.8 6.0	9.3 1,768	93° 200°	23.6 50,000	17.6 40,000
	23.0 75.0	1.8 6.0	9.3 1,768	93° 200°	23.6 50,000	17.6 40,000

PRIMARY CRUSHER - SOURCE # 03-160

a) Flow Diagram



Crusher Feed and Product is	84% Limestone	=	840,000 #/yr
	15% Shale	=	150,000 #/yr
	1% Other	=	10,000 #/yr

Feed Rate: 500 tons per hour

b) Projected Emissions - Dust Collector 03-155

10,000 ACFM x 0.015 grains/CFM = 150 gr/min
Particulate = 1.29 lb/hr

@ 2,548 hours/year = 1.69 tons/yr

Based on Dust Collector emission factor

c) Process Weight

Feed to crusher will be continuous 500 ton/hour during each 6½ hour shift

Process weight is 500 x 2,000 = 1,000,000 lb/hr

d) Normal Operating Schedule:

13 hours/day; 5 days/week; 39 weeks/year

e) Production per year = 1,274,000 tons/year

Seasonal Production	18% Dec/Feb	27% Mar/May
	28% Jun/Aug	27% Sep/Nov

f) Process is continuous

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

h) Process Equipment: see a)

i) Raw Materials - see a)

j) Direct Fired Process - Not applicable

k) Products: Raw material for Cement Plant

l) Exhaust ventilation is by hoods & duct work to baghouse fan & stack

m) Gas Cleaning Equipment:

Equipment Type - Fabric Filter Baghouse
Equipment No. - 03-155
Manufacturer - Not selected
Model No. - Not selected
Contaminant - Particulate
Size Range - Not known
Composition - see a)
Gas inlet temp & humidity - Ambient
Gas outlet temp & humidity - Ambient
Fabric/weave - Polyester/felted
Maximum operating temp - 250°F
Configuration - Not known
Cleaning Method - Pulse Jet
Containment & Disposal - Return to Process
Cloth Area - 1430 sq. ft.
Filtration Velocity - 7 FPM
Connection to Other Collectors - None
Guaranteed Efficiency - 0.015 grains/ACF
Particle Size/Efficiency Curve - Not Applicable

SUMMARY

Allowable Emissions - (Oklahoma)

$$= 55 (500^{.11}) - 40$$
$$= 69 \text{ lb/hr}$$

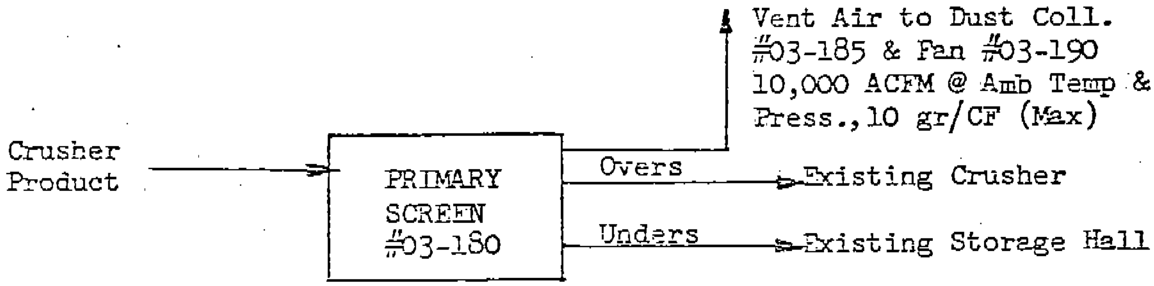
Predicted Emission = 1.29 lb/hr

Allowable Emission - EPA - 10% Opacity

Predicted Emission - No Visible Emission

PRIMARY SCREEN - SOURCE #03-190

a)



Screen Feed & Product is	- 84%	Limestone	=	840,000 #/hr
	- 15%	Shale	=	150,000 #/hr
	- 1%	Other	=	10,000 #/hr

Feed Rate: 500 tons per hour total

b) Projected Emissions - Dust Collector #03-185

Particulate:

10,000 ACFM x .015 grains/CF	= 150 gr/min
	= 1.29 lb/hr
@ 2,548 hours/yr	= 1.69 tons/yr

c) Process Weight

Feed to Screen will be continuous 500 ton/hr during each $6\frac{1}{2}$ hour shift

Process weight is 1,000,000 lb/hr

d) Normal Operating Schedule:

13 hours/day, 5 days/week; 39 weeks/year

e) Yearly Production --- —1,274,000 tons/year

Seasonal Production	- 18% Dec/Feb	27% Mar/May
	28% Jun/Aug	27% Sep/Nov

f) Process is continuous

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

h) Process Equipment - see a)

i) Raw Materials - see a)

j) Direct Fired Process - Not applicable

k) Products: Raw Feed to Cement Kiln

l) Exhaust Ventilation is by hoods and ductwork to baghouse fan & stack

m) Gas Cleaning Equipment:

Equipment Type	- Fabric Filter Baghouse
Equipment No.	- 03-185
Manufacturer	- Not selected
Model No.	- Not known
Contaminant	- Particulate
Size Range	- Not known
Composition	- see a)
Gas inlet temp & humidity	- Ambient
Gas outlet temp & humidity	- Ambient
Fabric/Weave	- Polyester/not selected
Max. operating temp	- 250°F
Configuration	- Not known
Cleaning Method	- Pulse jet
Containment & Disposal	- Return to Process
Cloth Area	- 1,430 sq. ft.
Filtration Velocity	- 7 FPM
Connection to Other Collectors	- None
Guaranteed Efficiency	- 0.015 grains/ACF
Guarantee Terms	- Later

Particle size/efficiency curve - Not applicable

SUMMARY

Allowable Emission -(Oklahoma)

$$= 55\ (500^{.11}) - 40$$
$$= 69 \text{ lb/hr}$$

Predicted Emission = 1.29 lb/hr

Allowable Emission - EPA - 10% Opacity

Predicted Emission - No visible emission

RAW MILL #3, SOURCE #05-128

a) Flow Sheet - see Drawing #00-002-M

Air ventilation for process is to cyclones 05-122 & 05-123, Baghouse #05-125, 45,000 ACFM @ 200°F, Dust loading 10 grains per ACF max. to Baghouse

Mill Feed & Product is	84% Limestone	=	120,960 #/hr
	15% Shale	=	21,600 #/hr
	1% Other	=	1,440 #/hr

Feed rate is 72 tons per hour

b) Projected Emissions - Dust Collector - 05-125

Particulate:

40,000 ACFM @ .015 grains/cf	= 600 grains/min
	= 5.14 lb/hr
@ 7,260 hours/year	= 18.66 tons/yr

c) Process Weight

Feed to Raw Mill circuit will be continuous 72 tons per hour during 8-hour shift.

Process weight is 72 x 2,000 = 144,000 lb/hr

d) Normal Operating Schedule:

24 hours/day, 6/7 days/week, 47 weeks/year

e) Yearly Production: 522,720 tons/year

Seasonal Production:	18% Dec/Feb	27% Mar/May
	28% Jun/Aug	27% Sep/Nov

f) Process is continuous

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

h) Process Equipment - see (a)

i) Raw Materials - see (a)

j) Direct Fired Process - Not applicable

k) Products: Raw Mix for Kiln

l) Exhaust Ventilation: Is by hoods & ductwork to cyclones, baghouse & fan

m) Gas Cleaning Equipment:

Equipment Type - Fabric Filter Baghouse
Equipment No. - 05-125
Manufacturer - Not selected
Model No. - Not selected
Contaminant - Particulate
Size Range - Not known
Composition - See a)
Gas inlet temp & humidity - 150-200°F/ambient
Gas outlet temp & humidity - 150-200°F/ambient
Fabric/Weave - Polyester/Felted
Max. Operating Temp - 250°F
Configuration - Not known
Cleaning Method - Pulse Jet
Containment & Disposal - Return to Process
Cloth Area - 6,430 sq. ft.
Filtration Velocity - 7 FPM
Connection to other Collectors - Feed is from cyclones Equip = 05-122, 05-123
Guaranteed Efficiency - 0.015 grains/ACF
Guarantee Terms - Later

Particle Size/Efficiency Curve - Not applicable

SUMMARY

Allowable Emission - (Oklahoma)

$= 55(72^{0.11}) - 40$

= 48#/hr

Predicted Emission = 5.14#/hr

m) Gas Cleaning Equipment Summary (cont.)

Allowable Emission - EPA - 10% Opacity

Predicted Emission - No visible emission

Cyclone Information:

Equipment No.	Later
Quantity	
Inlet Area	
Outlet Diameter	
Height	
Configuration	
Pressure Drop	

RAW KILN FEED STORAGE SILO #2 - SOURCE NO. 06-107

a) Flow Diagram - See Drawing 00-002-M

Air Ventilation is to Dust Collector #06-106 & Fan #06-107

1,500 ACFM @ Amb temp, Dust Loading 10 grains/ACF (max)

Silo Feed Rate is	- 84% Limestone	- 336,000 #/hr
	15% Shale	- 60,000 #/hr
	1% Other	- 4,000 #/hr

Feed Rate is 200 tons/hour total

b) Projected Emissions - Dust Collector #06-107

Particulate:

1,500 ACFM x 0.015 grains/ACF = 22.5 gr/min
= 0.19 lb/hr

@ 3,960 hours/yr = 0.375 ton/yr

c) Process Weight:

Feed to Silos will be 200 TPH while operating

Average Feed/shift $= \frac{47 + 47 + 66}{2} = 80$ TPH

Minimum Process weight is 80 x 2,000 = 160,000 lb/hr

d) Normal Operating Schedule:

12 hours/day, 7 days/week, 47 weeks/year

e) Yearly Production - 316,800 tons/year

Seasonal Production - 18% Dec/Feb 27% Mar/May
28% Jun/Aug 27% Sep/Nov

f) Process is cyclical, as feed will alternate between Silo #1 and Silo #2

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

h) Process Equipment - see a)

i) Raw Materials - see a)

j) Direct Fired Process - Not applicable

k) Products - Raw feed to kiln

l) Exhaust Ventilation is to Baghouse & Fan

m) Gas Cleaning Equipment:

Equipment Type - Fabric Filter Baghouse
Equipment No. - 06-106
Manufacturer - Not known
Model No. - Not known
Contaminant - Particulate
Size Range - Not known
Composition - see a)
Gas inlet temp & humidity - Ambient
Gas outlet temp & humidity - Ambient
Fabric/weave - Polyester/Not known
Max. Operating temp - 250°F
Configuration - Not known
Cleaning Method - Pulse Jet
Containment & Disposal - Return to Bin
Cloth Area - 215 sq. ft.
Filtration Velocity - 7 FPM
Connection to Other Collectors - None
Guaranteed Efficiency - 0.015 grains/ACF
Guarantee Terms - Later

Particle size/efficiency curve - Not applicable

SUMMARY

Allowable Emission - (Oklahoma)
$= 55 (80^{.11}) - 40$
= 49 lb/hr

Predicted Emission = .19 lb/hr

Allowable Emission - EPA = 10% Opacity

Predicted Emission - No visible emission

BLEND SILO - SOURCE #06-121

a) Process Flow: See Dwg. 00-002-M

Feed Rate is: Limestone = 285,600 #/hr
Shale = 51,000 #/hr
Other = 3,400 #/hr

Feed Rate: 170 TPH

b) Projected Emissions: Dust Collector #06-120

Particulate - 3,000 ACFM @ 0.015 grains/cf = 45 gr/min
= 0.385 #/hr
@ 7,260 hrs/yr = 1.4 tons/yr

c) Process Weight

Feed to Blend Silos will be continuous

170 TPH = 340,000 lb/hr

=1,274,000 tons/yr

d) Normal Operating Schedule

24 hours/day, 7 days/week, 47 weeks/year

e) Yearly Production: 1,274,000 tons/year

Seasonal Production: 18% Dec/Feb 27% Mar/May
28% Jun/Aug 27% Sep/Nov

f) Process is continuous

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

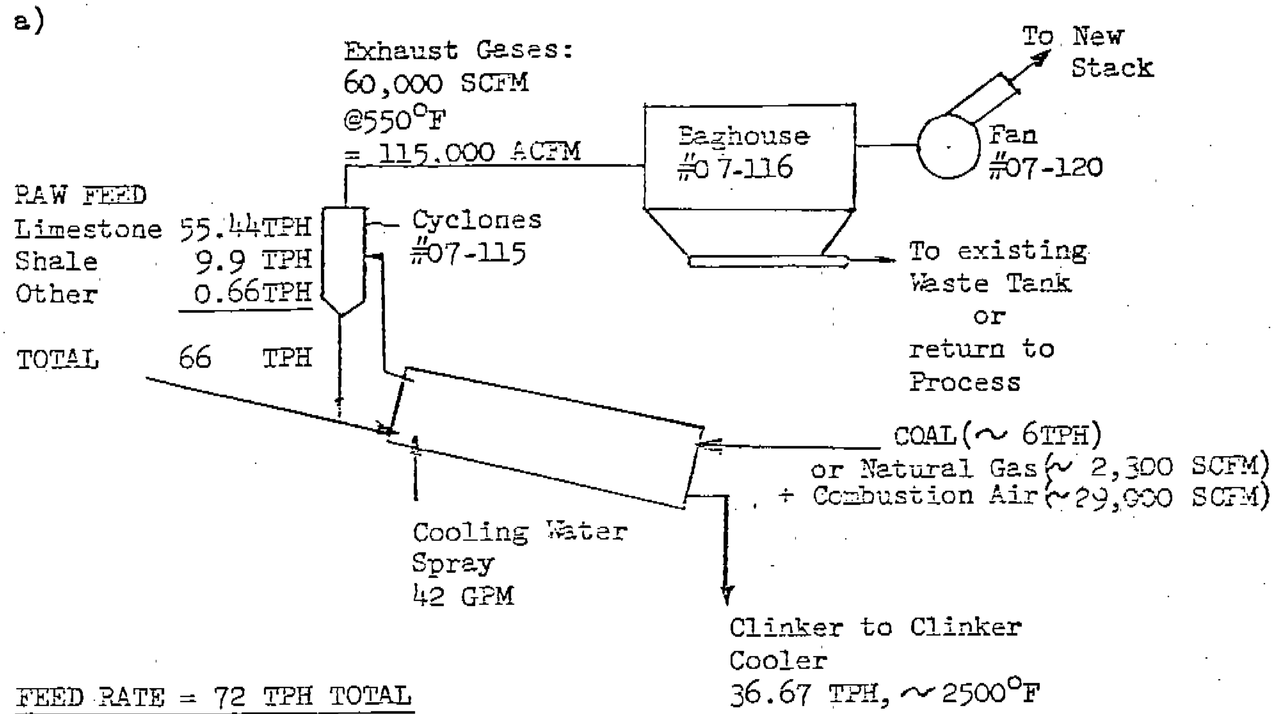
h) Process Equipment - See a)

i) Raw Materials - See a)

j) Direct Fired Process - Not applicable

#3 KILN - SOURCE NO. 07-120

a)



FEED RATE = 72 TPH TOTAL

b) PROJECTED EMISSIONS

(1) Particulate - .02 gr/ACF x 60,000 SCFM x $\frac{550 + 460}{528}$ = 2295.4 grains/minute
= 19.67 lb/hr
@ 7920 hours/year = 77.9 tons/year

(2) Total Catch - By comparison with existing kilns ~ double particulate = 45 lb/hr

= 178 tons/year

(3) Sulfur Dioxide -
Assume all sulfur in raw mix is retained in clinker together with 75% of sulfur from the coal:

Heat Input = 3.9×10^6 BTU/Ton of Clinker
= $36.67 \times 3.9 \times 10^6$ BTU/Hr
= 1.43×10^8 BTU/Hr

Coal is 12,000 BTU/lb, @ 2.8% sulfur

Consumption is $\frac{1.43 \times 10^8}{1.2 \times 10^4}$ lb/Hr coal

= 11,917 lb/Hr ~ 6 TPH

Assuming 75% of sulfur is absorbed by clinker sulfur dioxide emitted - $2 \times 0.25 \times \frac{2.8}{100} \times 12,000$ lb/Hr

= 168 lb/Hr

c) Process Weight

Raw Mix & Coal = 72 tons/hr continuous
= 144,000 lb/hr

d) Normal Operating Schedule:

24 hours/day, 7 days/week 47 weeks/year

e) Yearly Production: 290,400 Tons/Year

Seasonal Production: 18% Dec/Feb 27% Mar/May
28% Jun/Aug 27% Sept/Nov

f) Process is continuous

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

h) Process Equipment - See a)

i) Raw Materials - See a)

j) Direct-fired Process - Kiln can be fired by coal or natural gas

Coal is 7.9% moisture, 10.3% ash, 33.3% volatile, 48.6% carbon,
2.8% sulfur, 12,000 BTU/lb
USAGE = 12,000 lb/hr = 47,500 TPY

Gas is natural gas, 1,050 BTU/CF, usage ~ 140 MCF/hr ~ 1,100,000 MCF/yr

k) Product - Cement Clinker

l) Exhaust Ventilation - To Cyclones, Baghouse, Fan & Stack

m) Gas Cleaning Equipment:

Equipment Type	- Fabric Filter Baghouse
Equipment No.	- 06-116
Manufacturer	- Not known
Model No.	- Not known
Contaminant	- Particulate
Size Range	- Not known
Composition	- See a)
Gas inlet temp & humidity	- 550°F, 17-22% by volume
Gas outlet temp & humidity	- 550°F, 17-22% by volume
Fabric/Weave	- Glass Fiber/Woven
Max. operating temp	- 550°F

m) Gas Cleaning Equipment (cont.)

Configuration - Not known
Cleaning Method - Reverse Air
Containment & disposal - Return to process or existing waste dust pile
Cloth Area - 57,500 sq. ft.
Filtration Velocity - 2 FPM
Connection to other collectors - Feed is from Cyclones
Guaranteed Efficiency - 0.02 grains/ACF
Guarantee Terms - Later

Particle size/efficiency curve - Not applicable

SUMMARY

Particulate

Allowable Emission - (Oklahoma)

$$55(72^{0.11}) - 40$$

= 48 lb/hr Total catch

Predicted Emission = 45 lb/hr Total catch

Allowable Emission - EPA - 0.3 (72) lb/hr

= 21.6 lb/hr Dry catch

Predicted Emission = 19.7 lb/hr Dry catch

Opacity

- Allowed - 20%
- Predicted-No visible emission

Sulfur Dioxide

- If fuel burning equipment rules are applied, max. 2 Hr. average allowable is 1.2#/million BTU heat input.
Allowable SO_2 = 1.2 x 143 lb/Hr = 171.6#/Hr
Predicted = 168#/Hr

BTU/hr.

Cyclone Information

Equipment No.
Quantity
Inlet Area
Outlet Diameter
Height
Configuration
Pressure Drop

} Later

DUST TANK - SOURCE #07-135

a) Flow Diagram - See dwg 00-002-M

Air Ventilation is to Dust Collector #07-134 & Fan 07-135

1500 ACFM @ 200°F, Dust Loading 10 grains/ACF Max

Feed Rate is 18 TPH Total

b) Projected Emissions - Dust Collector 07-134

Particulate: 1500 ACFM x 0.015 grains/ACFM = 22.5 gr/min
= 19 lb/hr
@ 7,920 hrs/yr = 0.75 ton/yr

c) Process Weight
4 TPH = 8,000 lb/hr continuous

c) Normal Operating Schedule:

24 hours/day, 7 days/week 47 weeks/year

e) Yearly Production: 31,680 tons/year

Seasonal Production: 18% Dec/Feb 27% Mar/May
28% Jun/Aug 27% Sep/Nov

f) Process is Continuous

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

h) Process Equipment - see a)

i) Raw Materials - see a)

j) Direct Fired Process - Not applicable

k) Products - Waste dust

l) Exhaust Ventilation - Baghouse & Fan

m) Gas Cleaning Equipment:

Equipment Type	- Fabric Filter Baghouse
Equipment No.	- 07-134
Manufacturer	- Not known
Model No.	- Not known
Contaminant	- Particulate
Size Range	- Not known
Composition	- See a)
Gas inlet temp & humidity	- 200°F/humidity - not known
Gas outlet temp & humidity	- Not known
Fabric/Weave	- Polyester/not known
Max. Operating temp	- 250°F
Configuration	- Not known
Cleaning Method	- Pulse Jet
Containment & Disposal	- Return to Tank
Cloth Area	- 215 sq. ft.
Filtration Velocity	- 7 FPM
Connection to Other Collectors	- No
Guaranteed Efficiency	- 0.015 grains/ACF
Guarantee Terms	- Later

Particle size/efficiency curve - Not applicable

SUMMARY

Allowable Emission - (Oklahoma)
$= 4.1\ (18^{0.67})$ lb/hr
= 28.4 lb/hr

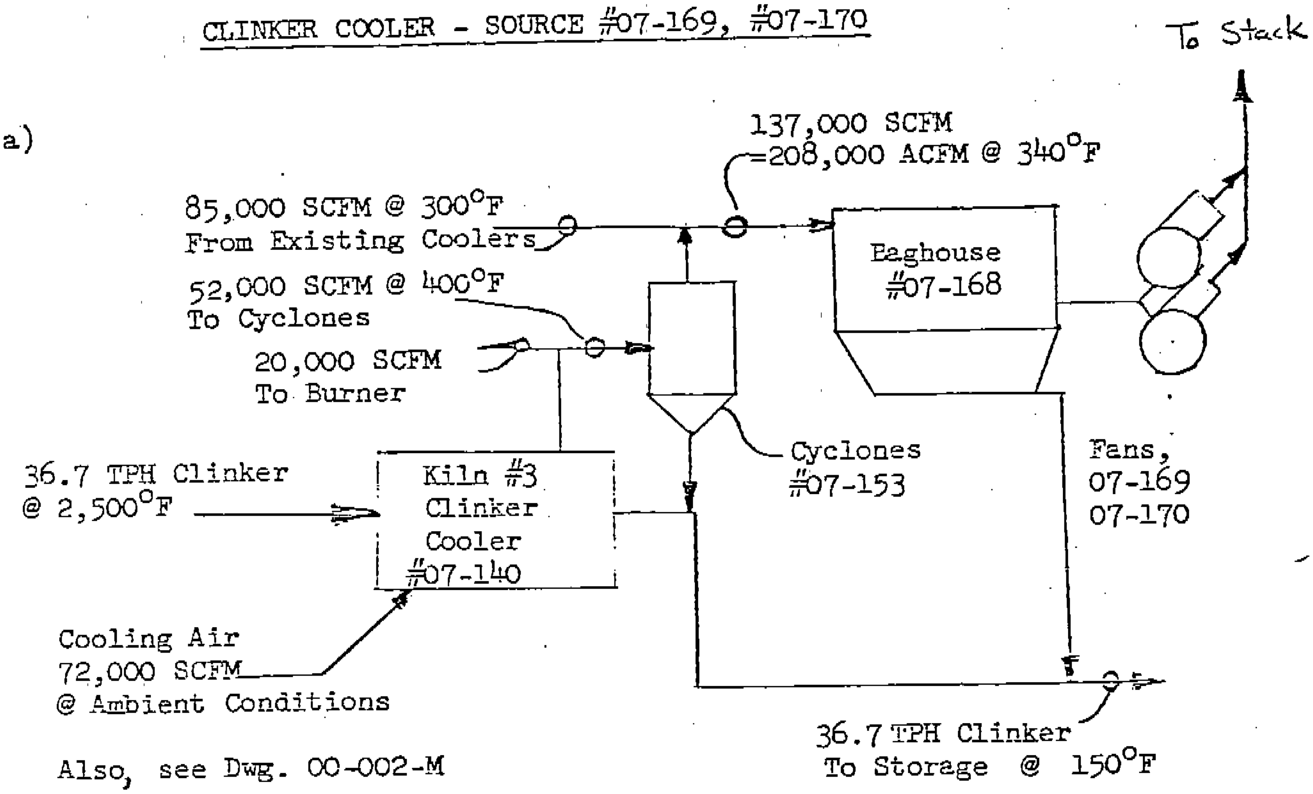
Predicted Emission = 0.19 lb/hr

Allowable Emission - EPA - 10% Opacity

Predicted Emission - No visible Emission

CLINKER COOLER - SOURCE #07-169, #07-170

a)



Also, see Dwg. 00-002-M

b) Projected Emissions - Dust Collector #07-168

208,000 ACFM x 0.009 Grains/ACF = 1,872 Gr/min

= 16.1 lb/hr

@ 7,920 hrs/yr = 64 TPY

17.4

c) Process Weight

(1) Based on Kiln Feed (EPA Regulation)

Cooler #1 & #2 = $\frac{625 \times 1.8}{24}$ + 4 (coal) = 51 TPH = 102,000 lb/hr each

Cooler #3 = $\frac{880 \times 1.8}{24}$ + 6 = 72 TPH = 144,000 lb/hr

(2) Based on Cooler Feed (Oklahoma)

Cooler #1 = $\frac{625}{24}$ = 26 TPH = 52,000 lb/hr

Cooler #2 = 26 TPH = 52,000 lb/hr

Cooler #3 = $\frac{880}{24}$ = 36.7 TPH = 73,000 lb/hr

d) Normal Operating Schedule

24 hours/day, 7 days/week 47 weeks/year

e) Yearly Production: 706,200 tons/year (including existing coolers)

Seasonal Production: 18% Dec/Feb 27% Mar/May
28% June/Aug 27% Sep/Nov

f) Process is Continuous

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

h) Process Equipment - see (a)

i) Raw Materials - see (a)

j) Direct Fired Process - Not applicable

k) Product - Cement Clinker

l) Exhaust Ventilation - Through Cyclones to Baghouse and Fan

m) Gas Cleaning Equipment:

Equipment Type - Fabric Filter Baghouse
Equipment No. - 07-168
Manufacturer - Not known
Model No. - Not known
Contaminant - Particulate
Size Range - Not known
Composition - see a)
Gas inlet temp & humidity 340°/Ambient
Gas outlet temp & humidity 340°/Ambient
Fabric/Weave Nomex/Felted
Max. Operating temp 350° Continuous
400° Intermittent

Configuration - Not known
Cleaning Method - Pulse Jet
Containment & Disposal - Return to process
Cloth Area - 35,000 sq. ft.
Filtration Velocity - 6 FPM
Connection to other Collectors - Feed from Cyclones #07-153
Guaranteed Efficiency - 0.009 Grains/ACF
Guarantee Terms - Later

m) Gas Cleaning Equipment (cont.)

Particle size/efficiency curve - Not applicable

SUMMARY

Allowable Emission - (Oklahoma)

$$= 55\,(26^{0.11}) - 40$$
$$+ 55\,(26^{0.11}) - 40$$
$$+ 55\,(36.7^{(0.11)}) - 40$$
$$= 38.7 + 38.7 + 41.75 = 119 \text{ lb/hr}$$
$$= 16.1/\text{lb/hr}$$

Predicted Emissions

Allowable Emission - (EPA) $= (.1)(72+51+51)$
$= 17.4$ lb/hr.

Predicted Emission = 16.1 lb/hr

Allowable Opacity - 10%

Predicted Opacity - No visible emission

Cyclone Information:

Equipment No.
Quantity
Inlet Area
Outlet Diameter
Height
Configuration
Pressure Drop
} Later

Emission Information for Existing Clinker Coolers

The existing Clinker Coolers are discharging a minimum of 80,000 SCFM at 200°F to the cyclones at an estimated particulate grain loading of 2-1/2 grains/ACF. Cyclone efficiency is approximately 92.5%. Particulate discharge is, therefore:

$$0.075 \times \frac{(200 + 460)}{528} \times 80{,}000 \times 2.5 \times \frac{60}{7000} \text{ \#/hr} = 160 \text{ \#/hr}$$

This emission will be eliminated when the cyclones are connected to the Clinker Cooler Baghouse.

KILN FEED TANK - SOURCE #07-191

a) Process Flow: See Drawing #00-002-M

Feed Rate is:	Limestone	110,880 #/hr
	Shale	19,880 #/hr
	Other	1,320 #/hr
	Total	132,000 #/hr

Feed Rate is 66 tons per hour
Ventilation is to Dust Collector #07-101
1,500 ACFM @ Amb. temp Dust Loading 10 grains/ACF (max)

b) Projected Emissions from Dust Collector #07-101

Particulate - (0.015) x 1,500 = 22.5 gr/min
= 0.19 lb/hr

@ 7,920 hours/yr = 0.375 ton/yr

c) Process Weight

Feed to Silo is 66 TPH average

Process weight is 66 x 2,000 = 132,000 lb/hr

d) Normal Operating Schedule:

24 hours/day, 7 days/week, 47 weeks/year

e) Yearly Production 522,720 tons/year

Seasonal Production 18% Dec/Feb 27% Mar/May
28% Jun/Aug 27% Sep/Nov

f) Process is continuous

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

h) Process Equipment - see a)

i) Raw Materials - see a)

j) Direct Fired Process - Not applicable

k) Products - Raw Feed to Kiln

l) Exhaust Ventilation to Baghouse and Fan

m) Gas Cleaning Equipment:

Equipment Type	- Fabric Filter Baghouse
Equipment No.	- 07-101
Manufacturer	- Not selected
Model No.	- Not known
Contaminant	- Particulate
Size Range	- Not known
Composition	- see a)
Gas inlet temp & humidity	- Ambient
Gas outlet temp & humidity	- Ambient
Fabric/weave	- Polyester/Not selected
Max Operating temp	- 250°F
Configuration	- Not known
Cleaning Method	- Pulse Jet
Containment & Disposal	- Return to Tank
Cloth Area	- 215 sq ft
Filtration velocity	- 7 FPM
Connection to other collectors	- None
Guaranteed Efficiency	- 0.015 grains/ACF
Guarantee Terms	- Later

Particle size/efficiency curve - Not applicable

SUMMARY

Allowable Emission - (Oklahoma)
$= 55 (66^{.11}) - 40$ lb/hr
$= 47.2$ lb/hr

Predicted emission = .19 lb/hr

Allowable emission - EPA = 10% Opacity

Predicted emission = No visible emission

CEMENT LOADOUT SILOS No.'s 15, 16

SOURCES - #09-128, #09-149, #09-150

a) Flowsheet - see Drawing 00-003-M

Air Ventilation is to Dust Collectors:

#09-126: - 2,500 ACFM	Ambient Temp.
#09-145: - 1,500 ACFM	Dust Loading
#09-146: - 1,500 ACFM	10 grains/ACF(max)

Silo Feed Rate is (100% cement) 200,000 #/hr

Total feed rate is 100 TPH

b) Projected Emissions - Dust Collectors #09-126, 09-145, 09-146

Particulate

(2,500 + 1,500 + 1,500)(0.015) = 82.5 grains/min
= .707 lb/hr
@ 7,920 hrs/yr = .28 tons/yr

c) Process Weight - Feed to silo will be intermittent at either 30, 60 or 90 TPH

Minimum process weight is 30TPH

30 x 2,000 = 60,000 lb/hr

d) Normal operating schedule:

24 hours/day, 7 days/week, 47 weeks/year

e) Yearly Production $\frac{415,800 + 290,400}{} \times \frac{4}{18}$ = 157,000 tons/year

Seasonal Production

18% Dec/Feb	27% Mar/May
28% Jun/Aug	27% Sep/Nov

f) Process is intermittent for any one silo

g) Process does not use lead, asbestos, beryllium, fluorides or mercury

h) Process Equipment - see a)

i) Raw Materials - see a)

j) Direct Fired Process - Not applicable

k) Products - Cement

l) Exhaust Ventilation to Baghouse & Fan

m) Gas Cleaning Equipment:

Equipment Type	- Fabric Filter Baghouse
Equipment No.'s	- 09-126, 09-145, 09-146
Manufacturer	- Not known
Model No.	- Not known
Contaminant	
Size Range	- Not known
Composition	- see a)
Gas inlet temp & humidity	- Ambient
Gas outlet temp & humidity	- Ambient
Fabric/Weave	- Polyester/not known
Max Operating temp	- 250°F
Configuration	- Not known
Cleaning method	- Pulse Jet
Containment & Disposal	- Return to Loadout Vehicle
Cloth Area	- 357, 214 & 214 sq. ft.
Filtration Velocity	- 7 FPM
Connection to Other Collectors	- None
Guaranteed efficiency	- 0.015 grains/ACF
Guarantee Terms	- Later

Particle size/efficiency curve - Not applicable

SUMMARY

Allowable emission - (Oklahoma)
$= 55 (30^{.11}) - 40$
$= 40$ lb/hr

Predicted emission = .71 lb/hr

Allowable emission - EPA = 10% Opacity

Predicted emission - No visible emission

FUGITIVE DUST SOURCES

The new belt conveyors 03-170, 03-205, 03-220, 08-100 and 08-101 are potential fugitive dust sources. They will be equipped with covers to prevent material from becoming air-borne.

All new material storage will be covered.