MULLINS ENVIRONMENTAL TESTING CO., INC.
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#1 (only) new coal wet

MET

AP-42 Section 11.6
Reference 44
Report Sect. 4
Reference 44

no clinker RATE

SOURCE EMISSIONS SURVEY
OF
LONE STAR INDUSTRIES, INC.
KILN NUMBER 1 STACK
NEW ORLEANS, LOUISIANA

MARCH 1984

FILE NUMBER 84-39

METCO

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INTRODUCTION

Mullins Environmental Testing Co., Inc., Dallas, Texas, conducted a source emissions survey at the Lone Star Industries, Inc. plant located in New Orleans, Louisiana, on March 20, 1984. The purpose of the survey was to determine the concentrations of particulate matter, sulfur dioxide, chloride, sodium, potassium, and ammonium being emitted to the atmosphere via the precipitator exhaust stack of Kiln Number 1.

The sampling followed the procedures set forth in the Appendix to the Code of Federal Regulations, Title 40, Chapter I, Part 60.

The tests were observed by Mr. Bob Wasconick of the Louisiana Air Control Commission and Mr. Roy Click of Lone Star Industries, Inc.

8400

Est $7.8\frac{\#}{HR} \times \frac{24 HR}{Dy} \times \frac{70 Dy}{wk} \times \frac{50 wk}{yr} \times \frac{Tow}{2000\#} = 32.76 \frac{Tow}{yr}$

SUMMARY OF RESULTS

Allow $= \frac{32.76}{7.8} \times 50.4 = 211.68$

The principal conclusions are as follows:

2.89

1. The emissions of particulate matter from the stack were equal to 7.8 pounds per hour (0.09 pounds per ton of kiln feed), based on averaging the three tests using only the "front-half" collections from the EPA-type sampling train. The allowable emission rate as calculated from the Regulations of the Louisiana Air Control Commission, Table 3 is equal to 50.4 pounds per hour. The actual emissions were 15.5 percent of the permitted emission rate.

2. The emissions of sulfur dioxide from the stack were equal to 766 parts per million (738.6 pounds per hour), based on averaging the three tests.

3. The emissions of ammonium from the stack were equal to 11.4 pounds per hour, based on averaging the three tests.

4. The emissions of chloride from the stack were equal to 40.9 pounds per hour, based on averaging the three tests.

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SUMMARY OF RESULTS

Kiln Number 1 Stack

AVG 209,513

Run Number	1	2	3
Stack Flow Rate - ACFM	210,724	207,717	210,096
Stack Flow Rate - DSCFM*	95,771	100,253	95,257
% Water Vapor - % Vol.	29.00	24.14	28.97
% CO_2 - % Vol.	15.9	16.5	15.6
% O_2 - % Vol.	9.4	9.2	9.6
% Excess Air @ Sampling Point	90	88	94
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0113	0.0071	0.0097
grains/cf @ Stack Conditions	0.0051	0.0034	0.0044
lbs/hr	9.3	6.1	8.0
Kiln Feed Rate as Provided by Lone Star Industries, Inc. -tons/hr	91.3	91.3	91.3
Emission Rate - lbs/ton of kiln feed	0.10	0.07	0.09
Allowable Emission Rate LACC Reg. Table 3 - lbs/hr	50.4	50.4	50.4
Sulfur Dioxide Emissions - lbs/hr	805.0	630.1	780.6

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

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SUMMARY OF RESULTS

Kiln Number 1 Stack

(Results expressed as pounds per hour)

	Ammonium as NH_4	Chloride	Potassium	Sodium	Sulfate
Run Number 1	10.5	42.2	<0.01	8.4	2.5
Run Number 2	13.4	46.8	<0.01	8.1	3.4
Run Number 3	10.3	33.8	<0.01	4.8	2.3

(Results expressed as parts per million by volume)

	Ammonium as NH_4	Chloride	Potassium	Sodium	Sulfate
Run Number 1	39.0	80.9	<0.01	24.7	1.8
Run Number 2	47.7	85.9	<0.01	22.6	2.3
Run Number 3	38.6	65.3	<0.01	14.0	1.6

DISCUSSION OF RESULTS

The three tests for particulate matter and sulfur dioxide taken on the Kiln Number 1 Stack appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field tests were in close agreement. The moisture percentages for the three tests were within 11.8 percent of the mean value. The measured flow rates (Q_s) for the tests were within 3.3 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 5.3 percent.

The calculated emissions (pounds per hour) of particulate matter for the three tests showed a range of -21.8 percent to +19.2 percent variation from the mean value.

Sulfur dioxide was determined simultaneously with each particulate run. The indicative parameters all indicate that the results were valid. The collection efficiencies between the two sulfur dioxide impingers in these tests were very good, indicating that little, if any, sulfur dioxide was bypassed.

The efficiencies were as follows:

	Run #1	Run #2	Run #3
Impinger #3	99.7	99.2	98.7
Impinger #4	0.3	0.8	1.3

Collection of 90 percent or more of the sampled sulfur dioxide in the first sulfur dioxide impingers is a verification of a representative sample.

The calculated emissions (pounds per hour) of sulfur dioxide for the three tests showed a range of -14.7 percent to +9.0 percent variation from the mean value.

DESCRIPTION OF PROCESS OPERATION

The New Orleans, Louisiana, plant is considered a wet process system for the production of Portland Cement. The process consists of two raw mills, two finish mills, and two rotary kilns.

The basic raw materials used at this plant are aragonite, clay, and iron ore. These materials are fed to a ball raw mill in the following proportions: 80 percent aragonite, 18 percent clay, and 2 percent iron ore. These materials are ground in water forming a slurry containing 36 to 40 percent water.

In addition, these materials are ground to a fineness where 70 percent passes a 200 mesh screen.

When the slurry is properly blended, it is fed to a rotary kiln and heated to temperatures ranging from 600°F at the feed end to 2800°F in clinkering zone. The kiln uses a direct coal-fired system wherein it converts the raw feed to cement clinker. Within the kiln, there are four process changes: drying, calcination, clinkering - liquid formation, and cooling of clinker. The liquid clinkers, upon cooling, form hard masses 1/8 inch to 1 1/2 inches in diameter. These clinkers, when cooled, are conveyed to a storage area where eventually they are

transferred to a ball mill and ground to a fine powder. The fine powder is the final product. Exhibit "A" presents a general material flow diagram.

Process Weight

During the past several years, considerable production and process data have been compiled and summarized which enables a prediction and verification of production capacities of the various process units.

Presently, kiln production is obtained by weighing clinker as it departs the clinker cooler area to storage. Daily clinker production may be further substantiated by flow meter rate, slurry tank measurements, or an inventory of raw mix slurries.

During the emission sampling of Kiln Number 1, the production process weight was 79.0 tons per hour. Coal was being fed to the kiln at an average rate of 12.3 tons per hour, which brings the total feed to the Kiln Number 1 of 91.3 tons per hour. Therefore, production process weight for Kiln Number 1 during emission testing will be considered as 91.3 tons per hour.

Identity of Emissions

Emissions from the process are fine particulates and combustion gases. Coal is used as a source of fuel which contains some sulfur; consequently, the combustion gases are a mixture of water vapor, oxygen, carbon dioxide, and sulfur dioxide. The particulates are composed of calcined or semi-calcined aragonite and clay.

From the kiln, the combustion gases enter a drop out chamber-dust collector then split into two electrostatic precipitators where the majority of the particulate is removed. The air is then exhausted through a fan, out the stack to the atmosphere.

Plant Operations

Plant operations were normal during outlet emission testing of Number 1 Kiln. These tests were conducted from approximately 1:00 p.m. to 9:30 p.m. on March 20, 1984.

Production Data

Tabulated below is a summation of production data accumulated during outlet emission testing of Kiln Number 1.

Production Data During Testing
Outlet Number 1 & Number 2
March 20, 1984

	Raw Feed (tons/hr)	Coal Feed (tons/hr)	Total Feed (tons/hr)	Allowable Emissions (~~tons~~ lbs/hr)
Kiln Number 1	79.0	12.3	91.3	50.4*

* Kiln Number 1 - is under Louisiana Regulation, classified as existing facility.

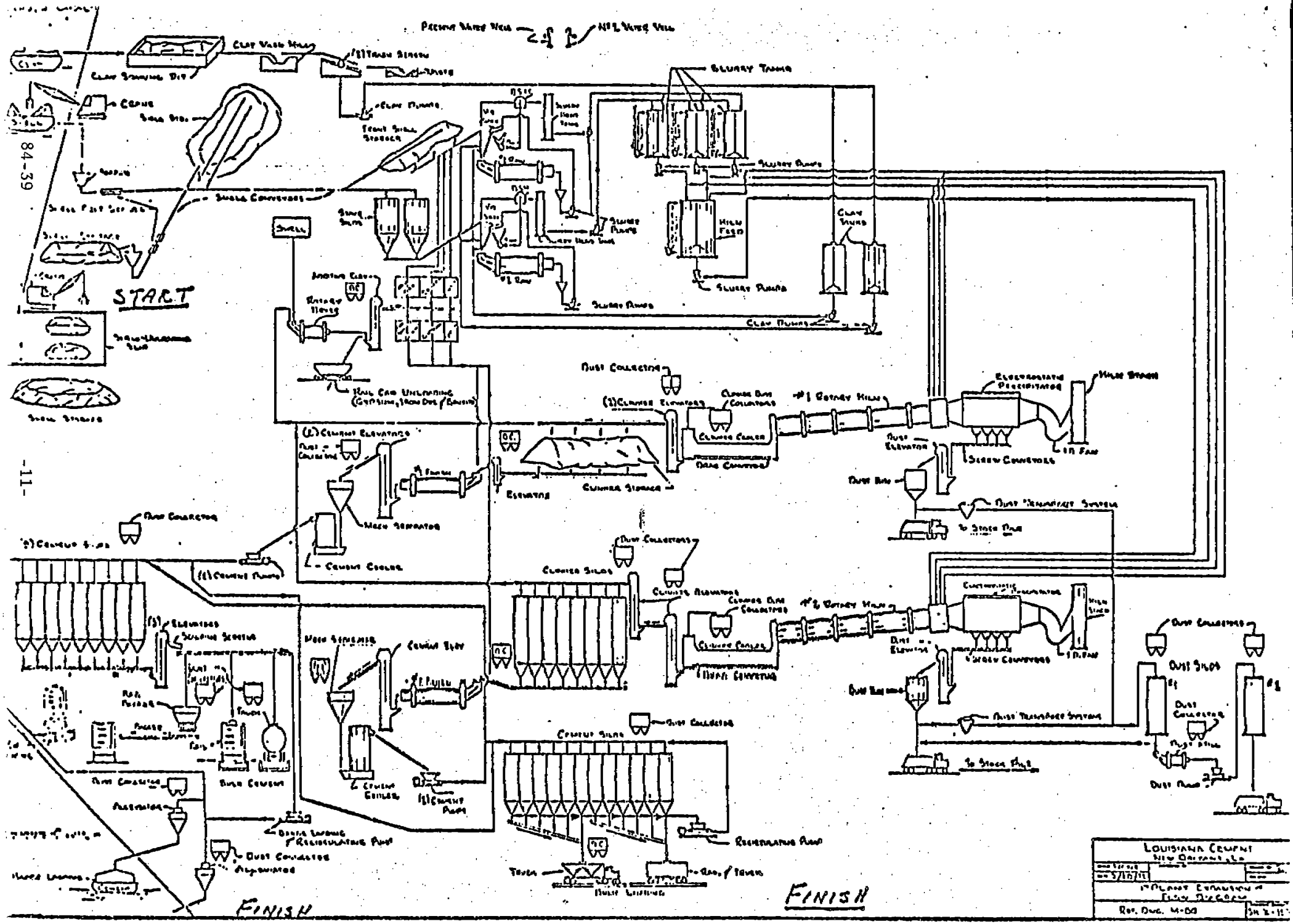

EXHIBIT "A" PROPOSED FLOW DIAGRAM

84-39

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DESCRIPTION OF SAMPLING LOCATION

The sampling location on the exhaust stack of the precipitator of Kiln Number 1 is approximately 77 feet above the ground. The inlet to the stack is approximately 47 feet above ground level. The sampling ports are located approximately 29 feet 7 inches (2.96 stack diameters) downstream from the inlet to the stack and 11 feet 6 inches (1.15 stack diameters) upstream from the outlet of the stack.

SAMPLING AND ANALYTICAL PROCEDURES

The sampling followed the procedures outlined in the Appendix to the Code of Federal Regulations, Title 40, Chapter I, Part 60.

A preliminary velocity traverse was made at each of the two ports on the exhaust stack of the precipitator of Kiln Number 1, in order to determine the uniformity and magnitude of the flow prior to testing. Twenty-two traverse points were sampled from each of the two ports on the stack for a total of forty-four traverse points. Samples of two-minute duration were taken isokinetically at each of the twenty-two points on the traverse from each port using an EPA-type, heated, glass-lined probe.

On all tests the sampling train was leak-checked at the nozzle at 15 inches of mercury vacuum before each test, and leak-checked at the nozzle after each test at the highest vacuum reading recorded during the test. This was performed to predetermine the possibility of a diluted sample.

Also before and after each test, the pitot tube lines were checked for leaks under both a vacuum and pressure. The lines were also checked for clearance and the manometer zeroed before each test.

Particulate emissions were calculated from gravimetric analysis using only the "front-half" collections from the EPA-type sampling train. The "back-half" of the sampling train contained a deionized water impinger to absorb hydrogen chloride, ammonium, potassium and sodium, an 80 percent isopropyl alcohol solution to absorb sulfur trioxide, a six percent hydrogen peroxide solution to absorb sulfur dioxide, and silica gel to absorb moisture.

The first impinger from each sample was analyzed for ammonium, chloride, potassium, sulfate, and sodium.

DESCRIPTION OF TESTS

Personnel from Mullins Environmental Testing Co., Inc. arrived at the plant at 10:30 a.m. on Tuesday, March 20, 1984. The equipment was moved onto the exhaust stack of Kiln Number 1 and the preliminary data were taken. The first test began at 1:38 p.m. and continued without difficulty until its completion at 3:10 p.m. The second test began at 4:28 p.m. and continued until its completion at 6:00 p.m. The third and final test began at 7:08 p.m. and continued without difficulty until its completion at 8:41 p.m.

The equipment was moved off of the stack and loaded into the sampling van. The samples were recovered and taken to Mullins Environmental Testing Co.'s laboratory in Dallas, Texas, for analysis and evaluation.

Operations at the Lone Star Industries, Inc., Kiln Number 1 Stack, in New Orleans, Louisiana, were completed at 10:45 p.m. on Tuesday, March 20, 1984.

Billy J. Mullins, Jr.

Billy J. Mullins, Jr., P.E.
President