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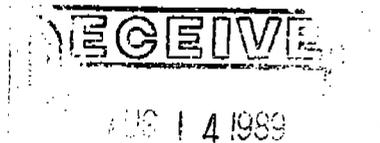
KOSMOS

SOURCE EMISSIONS SURVEY
SOUTHWESTERN PORTLAND CEMENT COMPANY
KOSMOS CEMENT DIVISION
KILN STACK
KOSMOSDALE, KENTUCKY
FILE NUMBER 89-106

INTRODUCTION

METCO Environmental, Dallas, Texas, conducted a source emissions survey of Southwestern Portland Cement Company, Kosmos Cement Division, located in Kosmosdale, Kentucky, on June 6, 7, and 8, 1989. The purpose of these tests was to determine the concentrations of particulate matter, hydrogen chloride, sulfur dioxide, oxides of nitrogen, carbon monoxide, total hydrocarbons, and volatile organic compounds being emitted to the atmosphere via the Kiln Stack.

The sampling followed the procedures set forth in the Appendix to the Code of Federal Regulations, Title 40, Chapter I, Part 60, Methods 1, 2, 3, 5, 6C, 7E, 10, and 25A, and in the "Sampling Procedures Manual, Texas Air Control Board, January 1983."



SUMMARY OF RESULTS

Kiln Stack

Run Number	Particulate Matter Emissions (gr/dscf) (lbs/hr)	Hydrogen Chloride Emissions (ppm) (lbs/hr)	Sulfur Dioxide Emissions (ppm) (lbs/hr)	Oxides of Nitrogen Emissions (ppm) (lbs/hr)	Carbon Monoxide Emissions (ppm) (lbs/hr)	Total Hydrocarbons Emissions (ppm) (lbs/hr)	Non-methane, Non-ethane Volatile Organic Compounds Emissions (ppm) (lbs/hr)
1	0.0116	2.8	8	400	53	15	18
2	0.0116	2.2	5	410	58	13	22
3	0.0114	2.9	10	398	65	12	21
Average	0.0115	2.6	8	403	59	13	20
4	0.0156	2.2	0	380	67	11	12
5	0.0174	2.0	5	415	67	10	17
6	0.0098	1.7	3	400	78	11	15
Average	0.0143	2.0	3	398	70	11	15
7	0.0200	3.8	3	400	500.0		9.6
8	0.0124	4.8	4	385	480.6		23.9
9	0.0068	5.6	3	378	476.1		14.5
Average	0.0131	4.7	3	388	485.6		16.0

Ref 32
 Preheater Kiln
 Contains data on CO₂, CO, VOC, and HCl.
 Rated B for CO₂, CO, & VOC because supporting data limited and avg process rate
 Rated O for HCl because method not specified and O₂ APCO & O₂ because not in

3.29

Average of 3
 6/19

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Run Number	1	2	3
Stack Flow Rate - ACFM	334,538	335,971	336,158
Stack Flow Rate - DSCFM*	202,734	202,297	204,143
% Water Vapor - % Vol.	6.26	6.47	6.03
% CO ₂ - % Vol.	11.9	12.5	12.8
% O ₂ - % Vol.	13.9	14.3	13.4
% Excess Air @ Sampling Point	241	281	218
Particulates <u>Probe, Cyclone & Filter Catch</u> grains/dscf*	0.0116	0.0116	0.0114
grains/cf @ Stack Conditions	0.0070	0.0069	0.0069
lbs/hr	20.2	20.1	20.0
<u>Total Catch</u> grains/dscf*	0.0132	0.0138	0.0130
grains/cf @ Stack Conditions	0.0080	0.0083	0.0079
lbs/hr	23.0	23.9	22.7
Hydrogen Chloride Emissions - ppm	2.8	2.2	2.9
Hydrogen Chloride Emissions - lbs/hr	3.26	2.50	3.31
Sulfur Dioxide Emissions - ppm	8	5	10
Sulfur Dioxide Emissions - lbs/hr	16.2	10.1	20.4
Oxides of Nitrogen Emissions - ppm	400	410	398
Oxides of Nitrogen Emissions - lbs/hr	581.3	594.6	582.4

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Run Number	1	2	3
Carbon Monoxide Emissions - ppm*	53	58	65
Carbon Monoxide Emissions - lbs/hr	46.9	51.2	57.9
Total Hydrocarbon Emissions as Propane - ppm	15	13	12
Total Hydrocarbon Emissions as Propane - lbs/hr	20.8	18.0	16.8
Non-Methane, Non-Ethane Volatile Organic Compounds Emissions as Propane - ppm	18	22	21
Non-Methane, Non-Ethane Volatile Organic Compounds Emissions as Propane - lbs/hr	25.0	30.5	29.4

* Corrected for Carbon Dioxide.

SUMMARY OF RESULTS

Kiln Stack

Run Number	4	5	6
Stack Flow Rate - ACFM	326,677	303,250	305,088
Stack Flow Rate - DSCFM*	199,643	185,114	187,103
% Water Vapor - % Vol.	6.75	7.87	7.53
% CO ₂ - % Vol.	10.9	13.6	13.4
% O ₂ - % Vol.	14.7	13.1	13.2
% Excess Air @ Sampling Point	293	207	211
Particulates <u>Probe, Cyclone & Filter Catch</u> grains/dscf*	0.0156	0.0174	0.0098
grains/cf @ Stack Conditions	0.0095	0.0106	0.0060
lbs/hr	26.7	27.5	15.7
<u>Total Catch</u> grains/dscf*	0.0178	0.0182	0.0117
grains/cf @ Stack Conditions	0.0109	0.0111	0.0071
lbs/hr	30.5	28.9	18.7
Hydrogen Chloride Emissions - ppm	2.2	2.0	1.7
Hydrogen Chloride Emissions - lbs/hr	2.53	2.06	1.83
Sulfur Dioxide Emissions - ppm	0	5	3
Sulfur Dioxide Emissions - lbs/hr	0.0	9.2	5.6
Oxides of Nitrogen Emissions - ppm	380	415	400
Oxides of Nitrogen Emissions - lbs/hr	543.8	550.7	536.5

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Run Number	4	5	6
Carbon Monoxide Emissions - ppm*	67	67	78
Carbon Monoxide Emissions - lbs/hr	58.4	54.1	63.7
Total Hydrocarbon Emissions as Propane - ppm	11	10	11
Total Hydrocarbon Emissions as Propane - lbs/hr	15.1	12.7	14.1
Non-Methane, Non-Ethane Volatile Organic Compounds Emissions as Propane - ppm	12	17	15
Non-Methane, Non-Ethane Volatile Organic Compounds Emissions as Propane - lbs/hr	16.4	21.6	19.2

* Corrected for Carbon Dioxide.

SUMMARY OF RESULTS

Kiln Stack

Run Number	7	8	9
Stack Flow Rate - ACFM	308,108	309,616	310,283
Stack Flow Rate - DSCFM*	174,367	174,152	175,709
% Water Vapor - % Vol.	5.99	5.72	5.86
% CO ₂ - % Vol.	14.6	14.6	14.7
% O ₂ - % Vol.	12.6	12.6	12.3
% Excess Air @ Sampling Point	188	188	175
Particulates <u>Probe, Cyclone & Filter Catch</u> grains/dscf*	0.0200	0.0124	0.0068
grains/cf @ Stack Conditions	0.0113	0.0069	0.0038
lbs/hr	29.9	18.5	10.3
<u>Total Catch</u> grains/dscf*	0.0223	0.0146	0.0089
grains/cf @ Stack Conditions	0.0126	0.0082	0.0050
lbs/hr	33.4	21.8	13.4
Hydrogen Chloride Emissions - ppm	3.8	4.8	5.6
Hydrogen Chloride Emissions - lbs/hr	3.80	4.78	5.53
Sulfur Dioxide Emissions - ppm	3	4	3
Sulfur Dioxide Emissions - lbs/hr	5.2	7.0	5.3
Oxides of Nitrogen Emissions - ppm	400	385	378
Oxides of Nitrogen Emissions - lbs/hr	500.0	480.6	476.1

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Run Number	7	8	9
Carbon Monoxide Emissions - ppm*	165	188	299
Carbon Monoxide Emissions - lbs/hr	125.5	142.8	229.2
Total Hydrocarbon Emissions as Propane - ppm	12	12	10
Total Hydrocarbon Emissions as Propane - lbs/hr	14.3	14.3	12.0
Non-Methane, Non-Ethane Volatile Organic Compounds Emissions as Propane - ppm	8	20	12
Non-Methane, Non-Ethane Volatile Organic Compounds Emissions as Propane - lbs/hr	9.6	23.9	14.5

* Corrected for Carbon Dioxide.

DISCUSSION OF RESULTS

The nine tests for particulate matter and hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the nine tests were within 21.1 percent of the mean value. The measured flow rates (Q_m) for the tests were within 8.1 percent of the mean value. The rates of sampling for the nine tests were well within the specified limits, the greatest deviation being 4.1 percent.

The calculated emissions (pounds per hour) of particulate matter for the nine tests showed a range of -50.9 percent to +42.5 percent variation from the mean value.

The calculated emissions (pound per hour) of hydrogen chloride for the nine tests showed a range of -44.4 percent to +68.1 percent variation from the mean value.

The calculated emissions (pound per hour) of sulfur dioxide for the nine tests showed a range of -100.0 percent to +132.4 percent variation from the mean value. The large variation was due to the low concentration of sulfur dioxide present.

DESCRIPTION OF SAMPLING LOCATION

The sampling location on the Kiln Stack is approximately 61 feet above the ground. The sampling ports are located 37 feet 2 inches (3.76 stack diameters) downstream from the inlet to the stack and 18 feet 2 inches (1.84 stack diameters) upstream from the outlet of the stack.

SOURCE TEST SUMMARY - KOSMOS,

Date Tested Testing Agency	6/16/83		6/7/89 (Test 1)	
	WFT Emissions	SCIENCE Allowable	METCO Emissions	ALLOWABLE
Ave. Gas Temperature, °F	446		349	
Act. Gas Velocity (fps)	62.3		72.9	
Gas Flow Rate (dscfm)	160300		203058	
CO2 dry (Volume %)	16.8		12.4	
O2 dry (Volume %)	11.1		13.9	
Water (%)	5.3		6.3	
AVG. EMISSION CONCENTRATION				
Filterable Particulate (gr/dscf)	0.0257		0.0115	
Total Particulate (gr/dscf)			0.0133	
CO (ppm)			59	
SO2 (ppm)			8	
NOx (ppm)			403	
HC (ppm)			13	
VOC (ppm)			20	
HCl (ppm)			2.6	
AVG. EMISSION RATE				
Filterable Particulate (lb/hr)	35.3	*46.2	20.1	*46
Total Particulate (lb/hr)			23.2	
CO (lb/hr)			52.0	
SO2 (lb/hr)		*522	15.6	*5
NOx (lb/hr)			586.1	
HC (lb/hr)			18.5	
VOC (lb/hr)			28.3	
HCl (lb/hr)			3.02	
Fuel			Coal	
Kiln Feed Rate - TPH			145	
Clinker Rate - TPH			85	
Opacity - %		* 20		*

*Permit Limit - Air Pollution Control, District of Jefferson County
 **New Mill Grinding Limestone
 ***New Mill Grinding Kiln Feed
 ****New Mill Down