Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

Background Report Reference

AP-42 Section Number: 11.6

Background Chapter: 4

Reference Number: 75

Title: Source Emissions Survey of Boxcrow Cement Company Kiln Stack Midlothian TX TACB Permit C-8996, Vol. 1

Metco Enviromental

Metco Enviromental

October 1991

AP-42 Section 11.6
Reference NOT USED
Report Sect. 4
Reference X

No Chlorofom data

SOURCE EMISSIONS SURVEY
OF
BOXCROW CEMENT COMPANY
KILN STACK
MIDLOTHIAN, TEXAS
TACB PERMIT C-8996
VOLUME I

Boxcrow Copy Revised 2/13/92

OCTOBER 1991

FILE NUMBER 91-208

SOURCE EMISSIONS SURVEY
BOXCROW CEMENT COMPANY
KILN STACK
MIDLOTHIAN, TEXAS
TACB PERMIT C-8996
FILE NUMBER 91-208

INTRODUCTION

METCO Environmental, Dallas, Texas, conducted a source emissions survey of BoxCrow Cement Company located in Midlothian, Texas, on October 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, and 25, 1991. The purpose of these tests was to establish the actual pattern of emissions under representative kiln operating conditions while firing tire chip fuel. The kiln was tested under four different operating conditions. The conditions and the parameters sampled for at each condition are as follows:

Condition	Kiln Operating Conditions	Parameters
I	Without TCF, Raw Mill On	Particulate Matter, Hydrogen Chloride, Chlorine, PM 10 Particulate Matter, Metals, Hexavalent Chromium, Total Reduced Sulfur Compounds, Hydrogen Sulfide, Semivolatile Organic Compounds, Dioxins and Furans, Volatile Organic Compounds, Sulfur Dioxide, Oxides of Nitrogen, Carbon Monoxide, and Total Hydrocarbons
II	Without TCF, Raw Mill Off	Particulate Matter, Hydrogen Chloride, Chlorine, PM 10 Particulate Matter, Total Reduced Sulfur Compounds, Hydrogen Sulfide, Sulfur Trioxide, Sulfur Dioxide, Oxides of Nitrogen, Carbon Monoxide, and Total Hydrocarbons

Condition	Kiln Operating Conditions	Parameters
III	With TCF (3.3 tons/hr), Raw Mill Off	Particulate Matter, Hydrogen Chloride, Chlorine, PM 10 Particulate Matter, Total Reduced Sulfur Compounds, Hydrogen Sulfide, Sulfur Trioxide, Sulfur Dioxide, Oxides of Nitrogen, Carbon Monoxide, and Total Hydrocarbons
IV	With TCF (4.1 tons/hr), Raw Mill On	Particulate Matter, Hydrogen Chloride, Chlorine, PM 10 Particulate Matter, Metals, Hexavalent Chromium, Total Reduced Sulfur Compounds, Hydrogen Sulfide, Semivolatile Organic Compounds, Dioxins and Furans, Volatile Organic Compounds, Sulfur Dioxide, Oxides of Nitrogen, Carbon Monoxide, and Total Hydrocarbons

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, 6, 6C, 7E, 10, 11, 16A, 25A, and 201A; in the "Sampling Procedures Manual, Texas Air Control Board, January 1983"; Methods 3.1, 3.2, and 3.3.1 of the "Methods Manual for Compliance with the BIF Regulations"; and in Test Methods for Evaluating Solid Waste, Volume II, Methods 0010 and 0030.

The sampling was observed by Mr. Bill Chafin, Mr. James Sandel, and Mr. David Thompson of the Texas Air Control Board, Fort Worth, Texas.

SUMMARY OF RESULTS

Kiln Stack (EPN-07)

	Condition I	Condition II	Condition III	Condition IV
Particulate Matter Emissions - gr/dscf*	0.0042	0.0102	0.0139	0.0028
Particulate Matter Emissions - lbs/hr	5.16	12.85	18.14	3.83
Particulate Matter Emissions - lbs/ton kiln feed	0.024	0.065	0.099	0.021
Hydrogen Chloride Emissions** - lbs/hr	N.D.	1.084	1.051	N.D.
Chlorine Emissions - lbs/hr	0.962	2.771	3.101	1.025
PM 10 Particulate Matter Emissions - lbs/hr	2.06	13.10	11.73	0.95
Condensible Particulate Matter Emissions - lbs/hr	27.4	205.1	102.2	5.6
Total Reduced Sulfur Compounds Emissions - lbs/hr	6.21	9.97	9.71	9.44
Hydrogen Sulfide Emissions - lbs/hr	N.D.	N.D.	N.D.	N.D.
Sulfur Dioxide Emissions - lbs/hr	1,406.0	1,498.0	1,655.2	1,380.1
Sulfur Trioxide Emissions - lbs/hr	N/A	134.1	79.6	N/A
Oxides of Nitrogen Emissions - lbs/hr	532.3	661.5	411.1	326.1
Carbon Monoxide Emissions - ppm*	1,205	1,356	1,443	1,485
Carbon Monoxide Emissions - lbs/hr	781.0	899.2	956.0	987.9
Total Hydrocarbons Emissions - ppm*	119	116	101	98
Total Hydrocarbons Emissions - lbs/hr	121.6	120.3	105.1	100.8
Hexavalent Chromium Emissions - lbs/hr	N.D.	N/A	N/A	N.D.
Kiln Feed Rate - tons/hr	214.8	197.7	184.1	182.9
Clinker Production Rate - tons/hr	121.7	112.1	104.3	111.2
Coal Feed Rate - Calciner - tons/hr	9.4	8.3	4.2	3.7
Coal Feed Rate - Kiln - tons/hr	8.0	6.9	5.7	6.6
Tire Chip Fuel Feed Rate - tons/hr	0.0	0.0	2.7	4.1
Raw Mill Status	On	Off	Off	On

* Corrected to 7 percent oxygen.
** See Page 78.
N/A - Not applicable.
N.D. - None detected.

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SUMMARY OF RESULTS

Kiln Stack (EPN-07)

Metals Emissions

	Condition I Average (lbs/hr)	Condition IV Average (lbs/hr)
Aluminum	0.071	0.012
Antimony	N.D.	N.D.
Arsenic	N.D.	N.D.
Barium	0.002	N.D.
Beryllium	N.D.	N.D.
Boron	0.005	0.006
Cadmium	N.D.	N.D.
Chromium	0.003	8.81×10^{-5}
Copper	0.002	0.001
Iron	0.102	0.046
Lead	<0.001	N.D.
Manganese	0.009	0.008
Mercury	0.003	0.002
Nickel	0.005	0.003
Selenium	N.D.	N.D.
Thallium	0.001	1.59×10^{-4}
Vanadium	N.D.	N.D.
Zinc	0.008	0.007

N.D. - None detected.

SUMMARY OF RESULTS

Kiln Stack (EPN-07)

Semivolatile Organic Compounds

	Condition I (lbs/hr)	Condition IV (lbs/hr)
Naphthalene	0.101	0.116
Acenaphthene	N.D.	N.D.
Fluorene	N.D.	N.D.
Phenanthrene	N.D.	<0.001
Benzo(a)pyrene	N.D.	N.D.
Methyl Indene	N.D.	1.122
Limonene	N.D.	N.D.
Benzaldehyde	0.058	0.250

N.D. - None detected.

SUMMARY OF RESULTS

Kiln Stack (EPN-07)

Dioxins and Furans

	Condition I (lbs/hr)	Condition IV (lbs/hr)
2,3,7,8-tetrachlorodibenzodioxin	N.D.	N.D.
total tetrachlorodibenzodioxin	N.D.	N.D.
2,3,7,8-tetrachlorodibenzofuran	N.D.	N.D.
total tetrachlorodibenzofuran	N.D.	N.D.

N.D. - None detected.

SUMMARY OF RESULTS

Kiln Stack (EPN-07)

Volatile Organic Compounds

	Condition I (lbs/hr)	Condition IV (lbs/hr)
Methylene Chloride	0.005(E)	0.055
Benzene	3.822	3.261
Toluene	3.307	4.497
Ethylbenzene	0.421	0.577
Styrene (ethenylbenzene)	0.433	0.765
Xylene (dimethylbenzene)	1.831	2.691
Methyl Styrene (ethenylmethylbenzene)	N.D.	0.007
Ethyl Toluene (ethylmethylbenzene)	N.D.	0.938
Pentadiene	0.746	0.427
Butadiene	N.D.	N.D.
Ethynylmethylbenzene	N.D.	N.D.

N.D. - None detected.
E. - Estimated. Detected, but below the quantitation limit.

SUMMARY OF RESULTS

Kiln Stack (EPN-07)

Kiln Process Conditions

Condition	Date	Kiln Feed Rate (tons/hr)	Clinker Production Rate (tons/hr)	Coal Feed Rate Calciner (tons/hr)	Coal Feed Rate Kiln (tons/hr)	Tire Chip Feed Rate (tons/hr)	Raw Mill Status
I	10/15/91	209.6	119.0	9.0	8.0	0.0	On
	10/16/91	216.8	123.0	9.6	8.0	0.0	On
	10/17/91	218.0	123.0	9.5	8.0	0.0	On
II	10/18/91	197.7	112.1	8.3	6.9	0.0	Off
III	10/21/91	184.1	104.3	4.2	5.7	3.3	Off
IV	10/22/91	175.9	99.8	4.1	6.1	2.7	On
	10/23/91	185.6	116.8	3.6	6.7	4.7	On
	10/24/91	187.1	117.1	3.3	7.0	5.0	On

METCO ENVIRONMENTAL

SUMMARY OF RESULTS
Kiln Stack
Condition I - Without TCF, Raw Mill On

Run Number	1	2	3
Date	10/15/91	10/16/91	10/17/91
Time	1205-1420	1000-1348	0953-1203
Stack Flow Rate - ACFM	366,548	373,303	368,192
Stack Flow Rate - DSCFM*	223,913	227,872	225,972
% Water Vapor - % Vol.	15.54	15.37	16.21
% CO_2 - % Vol.	14.3	15.4	14.5
% O_2 - % Vol.	12.3	11.6	12.2
% Excess Air @ Sampling Point	172	150	169
Stack Temperature - °F	251	256	244
Stack Pressure - "Hg	29.03	29.15	29.11
Percent Isokinetic	97.7	99.7	98.2
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0030	0.0028	0.0023
grains/cf @ Stack Conditions	0.0018	0.0017	0.0014
lbs/hr	5.72	5.38	4.38
grains/dscf* corrected to 7% O_2	0.0048	0.0042	0.0037
Hydrogen Chloride Emissions - ppm**	N.D.	N.D.	N.D.
Hydrogen Chloride Emissions - lbs/hr**	N.D.	N.D.	N.D.
Chlorine Emissions - ppm	0.02	0.65	0.48
Chlorine Emissions - lbs/hr	0.054	1.628	1.203

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)
** See Page 78.
N.D. - None detected.

SUMMARY OF RESULTS

Kiln Stack

Ion Analysis

Condition I

Run Number	1	2	3
Ammonia - µg	9,636	5,389	2,992
Calcium - µg	N.D.	N.D.	N.D.
Potassium - µg	N.D.	N.D.	N.D.
Sodium - µg	1,648	1,982	909
Chloride - µg	N.D.	N.D.	N.D.

N.D. - None detected.

SUMMARY OF RESULTS

Kiln Stack

Condition I - Without TCF, Raw Mill On

PM 10

Run Number	1	2	3
Date	10/15/91	10/16/91	10/17/91
Time	1949-2154	1744-1949	1535-1808
Stack Flow Rate - ACFM	369,695	376,901	369,716
Stack Flow Rate - DSCFM*	225,840	229,862	227,276
% Water Vapor - % Vol.	16.04	15.02	15.70
% CO_2 - % Vol.	15.1	15.0	15.4
% O_2 - % Vol.	11.7	11.8	11.4
% Excess Air @ Sampling Point	152	155	143
Stack Temperature - °F	250	256	244
Stack Pressure - "Hg	29.17	29.01	28.99
Percent Isokinetic	92.3	93.0	91.3
Particulates - PM 10 Probe, Cyclone & Filter Catch grains/dscf*	0.0008	0.0015	0.0008
grains/cf @ Stack Conditions	0.0005	0.0009	0.0005
lbs/hr	1.61	3.04	1.53
Calculated Cut-off Diameter -microns	9.7	9.6	9.7
Condensible Particulate Matter Emissions - lbs/hr	63.2	8.7	10.4

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Condition I - Without TCF, Raw Mill On

Metals

Run Number	1	2	3
Date	10/15/91	10/16/91	10/17/91
Time	1922-2129	1634-1842	1355-1606
Stack Flow Rate - ACFM	405,064	412,376	423,550
Stack Flow Rate - DSCFM*	254,918	252,060	257,171
% Water Vapor - % Vol.	14.13	15.06	16.28
% CO_2 - % Vol.	15.1	15.0	15.0
% O_2 - % Vol.	11.7	11.8	12.0
% Excess Air @ Sampling Point	152	155	163
Stack Temperature - °F	245	254	253
Stack Pressure - "Hg	29.17	29.01	29.19
Percent Isokinetic	100.1	99.6	100.2
Volume Dry Gas Sampled - DSCF*	73.517	72.304	71.936

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)