ASH GROVE CEMENT WEST, INC.

5550 S.W. MACADAM AVE. SUITE 300
PORTLAND, OREGON 97201-3786
(503) 224-5747

I assume 1970 as test date unless 1988

January 15, 1980

Mr. John M. Croom
3898 West Wood Path
Stone Mountain, GA 30083

Dear Mr. Croom:

Attached please find the results of NO_x testing at our Leamington, Utah plant. This is the raw data only. If you have any questions about any of this information, I suggest you contact Mike Hrizuk at (801) 857-2380.

This plant has a precalciner kiln system rated at 1900 tons per day.

Very truly yours,

ASH GROVE CEMENT WEST, INC.

Stephen E. Sheridan
Vice President - Production

SES/ejj
Attachments

SUMMARY OF RESULTS

D-38 Raw Mill/Main Kiln Stack

Refer 35 These data were not included in either PSM or MAI results. CO_2 stuff OK. Rated C

Run Number				4
Stack Flow Rate - ACFM				292376
Stack Flow Rate - DSCFM*				176337
% Water Vapor - % Volume				11.24
% CO_2 - % Volume				16.2
% O_2 - % Volume				2.0
% Excess Air At Sampling Point				171
Particulates				
Probe, Cyclone & Filter Catch grains/dscf*	(C_{an})	0.0395	0.0182	0.0098
grains/cf at Stack Conditions	(C_{at})	0.0235	0.0109	0.0058
lbs/hr	(C_{aw})	57.182	26.151	14.726
Total Catch grains/dscf*	(C_{ao})	0.0496	0.0368	0.0216
grains/cf at Stack Conditions	(C_{au})	0.0295	0.0220	0.0128
lbs/hr	(C_{ax})	71.804	52.876	32.337
Oxides of Nitrogen lbs/hr		363.89	306.36	**397.72
Sulfur Dioxide lbs/hr		0.42	0.42	0.44

* 68°F., 29.92 "Hg (20°C., 760 mm Hg)

** Nox data is from Run 1 - aborted particulate test.

8810-106

NO_x EMISSION DATA

Job Number 8810-726

Client SW. Portland

Unit Tested Marine K.P.

Date 7/1/83

Run Number 1

Absorbance of Standards	100% 0.124	200% 0.248	300% 0.368	400% 0.490
Flask Number	30	15	7	12
Time	1104	1147	1205	1220
Initial Barometric Pressure, "Hg Abs.	25.13	25.13	25.13	25.13
Initial Manometer Reading, "Hg Abs.	-2.8	-11.8/12.2	-11.8/12.2	-11.6/11.9
P_I - Initial Pressure of Flask, "Hg Abs.	1.33	1.13	1.13	1.33
T_I - Initial Temperature of Flask, °F	97	98	98	100
V_F - Volume of Flask, ml	1994	2042	2040	2031
Final Barometric Pressure, "Hg Abs.	25.20	25.20	25.20	25.20
Final Monometer Reading, "Hg Abs.	-2.6	-2.6	-2.2	-2.5
P_F - Final Pressure of Flask, "Hg Abs.	22.6	22.4	23	22.7
T_F - Final Temperature of Flask, "Hg Abs.	71	71	71	71
A - Absorbance of sample	0.356	0.145	0.233	0.447
μgNO_2 - micrograms of NO_2	571.0	203.9	1131.0	723.3
V_s - Volume of sample at std. cond.*, ml	1358.2	1429.4	1468.2	1410.3
ppm NO_2 - Concentration of NO_2, ppm	329	258	403	268
C_{NO_2} - Emission Rate of NO_2, lbs/dscf*	2.86×10^{-5}	3.02×10^{-5}	4.31×10^{-5}	3.20×10^{-5}
F - Dilution Factor	1	3	3	1

*68°F, 29.92 "Hg (20°C, 760 mm Hg)

$$K_c = \frac{80904}{100} = \frac{A_1 + 2A_2 + 3A_3 + 4A_4}{A_1^2 + A_2^2 + A_3^2 + A_4^2} \qquad \mu g\ NO_2 = 2K_c A F$$

$$V_s = \frac{528\ (V_F - 25)}{29.92} \left[\frac{P_F}{T_F + 460} - \frac{P_I}{T_I + 460} \right] = ml \qquad ppmNO_2 = \frac{523 \times \mu gNO_2}{V_s} =$$

$$C_{NO_2} = \frac{\mu gNO_2}{V_s} \times \frac{1\ lb/ft^3}{1.6 \times 10^4\ \mu g/ml} = 6.243 \times 10^{-5} \frac{\mu gNO_2}{V_s} = lbs/dscf$$

*Revised 4/85

NO_x EMISSION DATA

Job Number 8810-106

Client S.W. Portland

Unit Tested MAIN KILN

Date 7/13/88

Run Number 2

Absorbance of Standards				
Flask Number	2	19	35	23
Time	1545	1610	1640	1655
Initial Barometric Pressure, "Hg Abs.	25.13	25.13	25.13	25.13
Initial Manometer Reading, "Hg Abs.	-1.4	-1.5	-1.7	-1.7
P_I - Initial Pressure of Flask, "Hg Abs.	23.7	23.6	23.4	23.4
T_I - Initial Temperature of Flask, °F	163	183	133	153
V_F - Volume of Flask, ml	96	98	98	98
Final Barometric Pressure, "Hg Abs.	2040	2051	2047	2020
Final Monometer Reading, "Hg Abs.	25.20	25.29	25.20	25.34
P_F - Final Pressure of Flask, "Hg Abs.	-3.1	+0.15	-2.7	-3.5
T_F - Final Temperature of Flask, "Hg Abs.	22.1	25.35	22.5	21.7
A - Absorbance of sample	70°F	70°F	70°F	70°F
μgNO_2 - micrograms of NO_2	0.408	0.146	0.425	0.433
V_s - Volume of sample at std. cond.*, ml	660.2	709.7	687.7	700.6
ppm NO_2 - Concentration of NO_2, ppm	1378.5	1582.8	1443.9	1394.9
C_{NO_2} - Emission Rate of NO_2, lbs/dscf*	250	233	249	272
F - Dilution Factor	2.99×10^{-5}	2.28×10^{-5}	2.97×10^{-5}	2.25×10^{-5}
	1	3	1	1

*68°F, 29.92 "Hg (20°C, 760 mm Hg)

$$K_c = \frac{80904}{} = 100\,\frac{A_1 + 2A_2 + 3A_3 + 4A_4}{A_1^2 + A_2^2 + A_3^2 + A_4^2}$$

$$\mu g\,NO_2 = 2K_c AF$$

$$V_s = \frac{528\,(V_F - 25)}{29.92}\left[\frac{P_F}{T_F + 460} - \frac{P_I}{T_I + 460}\right] = ml$$

$$ppm NO_2 = \frac{523 \times \mu gNO_2}{V_s} =$$

$$C_{NO_2} = \frac{\mu gNO_2}{V_0} \times \frac{1\ lb/ft^3}{1.6 \times 10^4\ \mu g/ml} = 6.240 \times 10^{-5}\ \frac{\mu gNO_2}{V_s} = lbs/dscf$$

Revised 4/85

NO_x EMISSION DATA

Job Number 8810-10
Client So. Portland
Unit Tested MAIN KILN

Date 7/13/88
Run Number 3

Absorbance of Standards				
Flask Number	25	9	36	37
Time	1730	1745	1800	1825
Initial Barometric Pressure, "Hg Abs.	25.13	25.13	25.13	25.13
Initial Manometer Reading, "Hg Abs.	-11.5/12.9	-11.8/12.3	-11.6/12.4	-11.5/12.7
P_I - Initial Pressure of Flask, "Hg Abs.	1.63	1.03	1.33	1.12
T_I - Initial Temperature of Flask, °F	98	96	96	96
V_F - Volume of Flask, ml	2017	2000	2078	2081
Final Barometric Pressure, "Hg Abs.	25.20	25.20	25.20	25.20
Final Monometer Reading, "Hg Abs.	-2.0	-1.70	-1.10	-2.2
P_F - Final Pressure of Flask, "Hg Abs.	23.2	23.5	24.1	23
T_F - Final Temperature of Flask, ~~"Hg Abs.~~ °F	~~33~~ 91	~~[illegible]~~ 90	~~32~~ 91	~~[illegible]~~ 96
A - Absorbance of sample	0.210	0.151	0.151	0.441
μgNO_2 - micrograms of NO_2	1018.4	244.3	733.0	794.5
V_s - Volume of sample at std. cond.*, ml	1377.44	1428.60	1457.96	1443.52
ppm NO_2 - Concentration of NO_2, ppm	387.2	89.7	255.9	227.8
C_{NO_2} - Emission Rate of NO_2, lbs/dscf	4.62×10^{-5}	1.07×10^{-5}	3.06×10^{-5}	3.44×10^{-5}
F - Dilution Factor	3	1	3	1

*68°F, 29.92 "Hg (20°C, 760 mm Hg)

$$K_c = \underline{809.04} = 100 \frac{A_1 + 2A_2 + 3A_3 + 4A_4}{A_1^2 + A_2^2 + A_3^2 + A_4^2}$$

$$\mu g\ NO_2 = 2K_c AF$$

$$V_s = \frac{523\ (V_F - 25)}{29.92} \left[\frac{P_F}{T_F + 460} - \frac{P_I}{T_I + 460} \right] = ml$$

$$ppmNO_2 = \frac{523 \times \mu gNO_2}{V_s} =$$

$$C_{NO_2} = \frac{\mu gNO_2}{V_s} \times \frac{1\ lb/ft^3}{1.6 \times 10^4\ \mu g/ml} = 6.243 \times 10^{-5}\ \frac{\mu gNO_2}{V_s} = lbs/dscf$$

Revised 4/85

SUMMARY OF RESULTS

N-13 Alkali Bypass Collector Stack

Run Number		1	2	3
Stack Flow Rate - ACFM		35585	30933	32449
Stack Flow Rate - DSCFM*		19968	17070	17957
% Water Vapor - % Volume		8.16	9.14	9.06
% CO_2 - % Volume		2.0	1.8	1.8
% O_2 - % Volume		19.0	18.8	19.0
% Excess Air At Sampling Point		982	839	956
Particulates				
Probe, Cyclone & Filter Catch grains/dscf*	($C_{s\,n}$)	0.0255	0.0405	0.0247
grains/cf at Stack Conditions	($C_{s\,t}$)	0.0143	0.0223	0.0136
lbs/hr	($C_{s\,w}$)	4.364	5.925	3.801
Total Catch grains/dscf*	($C_{s\,n}$)	0.0433	0.0570	0.0396
grains/cf at Stack Conditions	($C_{s\,t}$)	0.0242	0.0313	0.0218
lbs/hr	($C_{s\,w}$)	7.410	8.339	6.094
Oxides of Nitrogen lbs/hr		6.91	3.90	5.38
Sulfur Dioxide lbs/hr		0.06	0.05	0.05

* 68°F., 29.92 "Hg (20°C., 760 mm Hg)

8810-106

NO_x EMISSION DATA

Job Number 8810-106

Client S.W. Portland - Nephi, UT.

Unit Tested A.L. Bypass

Date 7-13-88

Run Number 1

Absorbance of Standards				
Flask Number				
Time	3	11	17	27
Initial Barometric Pressure, "Hg Abs.	11:19	11:34	11:57	12:02
Initial Manometer Reading, "Hg Abs.	25.23	25.23	25.23	25.23
P_I - Initial Pressure of Flask, "Hg Abs.	23.0	23.0	23.0	22.9
T_I - Initial Temperature of Flask, °F	2.23	2.23	2.23	2.33
V_F - Volume of Flask, ml	~~379~~	404	[illegible]	~~58~~ 118
Final Barometric Pressure, "Hg Abs.	2007	2045	2057	2033
Final Monometer Reading, "Hg Abs.	25.20	25.20	25.20	25.20
P_F - Final Pressure of Flask, "Hg Abs.	-3.3	-3.8	0	+0.1
T_F - Final Temperature of Flask, "Hg Abs.	70°F	71°F	71°F	71°F
A - Absorbance of sample	70	71	71	71
μgNO_2 - micrograms of NO_2	0.085	0.058	0.073	0.060
V_s - Volume of sample at std. cond.*, ml	137.54	93.85	118.12	97.08
ppm NO_2 - Concentration of NO_2, ppm	1305.72	1245.68	1560.99	1545.50
C_{NO_2} - Emission Rate of NO_2, lbs/dscf*	55.1	37.9	39.6	32.8
F - Dilution Factor	6.58×10^{-4}	4.52×10^{-4}	4.22×10^{-4}	3.92×10^{-4}
	1	1	1	1

*68°F, 29.92 "Hg (20°C, 760 mm Hg)

$$K_c = \underline{809.04} = 100 \frac{A_1 + 2A_2 + 3A_3 + 4A_4}{A_1^2 + A_2^2 + A_3^2 + A_4^2}$$

$$\mu g\ NO_2 = 2K_c AF$$

$$V_s = \frac{528\ (V_F - 25)}{29.92} \left[\frac{P_F}{T_F + 460} - \frac{P_I}{T_I + 460} \right] = \text{ml}$$

$$ppmNO_2 = \frac{523 \times \mu gNO_2}{V_s} =$$

$$C_{NO_2} = \frac{\mu gNO_2}{V_s} \times \frac{1\ lb/ft^3}{1.6 \times 10^4\ \mu g/ml} = 6.243 \times 10^{-5}\ \frac{\mu gNO_2}{V_s} = lbs/dscf$$

Revised 4/85

NO_x EMISSION DATA

Job Number 8810-106

Client Scw. Portland Cogen, L.P. Date 7-13-88

Unit Tested Aux. Bypass Run Number 2

Absorbance of Standards				
Flask Number	1	2	18	22
Time	1403	1418	1441	1856
Initial Barometric Pressure, "Hg Abs.	25.18	25.18	25.18	25.18
Initial Manometer Reading, "Hg Abs.	22.9	23.0	23.0	23.0
P_I - Initial Pressure of Flask, "Hg Abs.	2.28	2.18	2.18	2.28
T_I - Initial Temperature of Flask, °F	44	44	44	44
V_F - Volume of Flask, ml	2018	2016	2016	2033
Final Barometric Pressure, "Hg Abs.	25.20	25.20	25.20	25.20
Final Monometer Reading, "Hg Abs.	-0.2	-4.2	+0.3	+0.2
P_F - Final Pressure of Flask, "Hg Abs.	25.0	21.0	25.5	25.4
T_F - Final Temperature of Flask, "Hg Abs.	70°F	70°F	74°F	70°F
A - Absorbance of sample	0.073	0.064	0.039	0.043
μgNO_2 - micrograms of NO_2	118.12	103.56	63.10	69.58
V_s - Volume of sample at std. cond.*, ml	1518.55	1271.49	1566.93	1536.23
ppm NO_2 - Concentration of NO_2, ppm	42.7	42.6	22.1	23.4
C_{NO_2} - Emission Rate of NO_2, lbs/dscf*	4.86×10^{-6}	5.03×10^{-6}	2.51×10^{-6}	2.79×10^{-6}
F - Dilution Factor	1	1	1	1

*63°F, 29.92 "Hg (20°C, 760 mm Hg)

$$K_c = \frac{409.04}{} = 100\,\frac{A_1 + 2A_2 + 3A_3 + 4A_4}{A_1^2 + A_2^2 + A_3^2 + A_4^2}$$

$$\mu g\ NO_2 = 2K_c AF$$

$$V_s = \frac{523\ (V_F - 25)}{29.92}\left[\frac{P_F}{T_F + 460} - \frac{P_I}{T_I + 460}\right] = \text{ml}$$

$$ppmNO_2 = \frac{523 \times \mu gNO_2}{V_s} =$$

$$C_{NO_2} = \frac{\mu gNO_2}{V_s} \times \frac{1\ lb/ft^3}{1.6 \times 10^4\ \mu g/ml} = 9.243 \times 10^{-5}\ \frac{\mu gNO_2}{V_s} = lbs/dscf$$

Revised 4/85

NO_x EMISSION DATA

Job Number 8810-106

Client S. W. Portland - Lephi, UT.

Unit Tested AFT. ByPass

Date 2-13-88

Run Number 3

Absorbance of Standards				
Flask Number				
Time	20	24	33	34
Initial Barometric Pressure, "Hg Abs.	1551	1606	1625	1640
Initial Manometer Reading, "Hg Abs.	25.18	25.18	25.18	25.19
P_I - Initial Pressure of Flask, "Hg Abs.	23.0	23.0	23.0	23.1
T_I - Initial Temperature of Flask, ~~°F~~ °C F	2.18 ~~100~~	2.18 ~~100~~	2.18 118	2.18
V_F - Volume of Flask, ml	38	38	[illegible]	415
Final Barometric Pressure, "Hg Abs.	2062	2049	2054	2009
Final Monometer Reading, "Hg Abs. 3.4	25.20	25.20	25.20	~~[illegible]~~ 25.20
P_F - Final Pressure of Flask, "Hg Abs.	~~[illegible]~~	-0.3	-4.6	-4.55
T_F - Final Temperature of Flask, "Hg Abs.	21.8	24.9	20.6	20.4
A - Absorbance of sample	70	70	70	70
μgNO_2 - micrograms of NO_2	0.043	0.094	0.062	0.067
V_s - Volume of sample at std. cond.*, ml	64.58	152.10	120.32	108.41
ppm NO_2 - Concentration of NO_2' ppm	1338.64	1539.01	1256.65	1211.42
C_{NO_2} - Emission Rate of NO_2' lbs/dscf*	27.2	51.7	41.8	46.7
F - Dilution Factor	3.24×10^{-6}	6.17×10^{-6}	4.98×10^{-6}	5.57×10^{-6}
	1	1	1	1

*68°F, 29.92 "Hg (20°C, 760 mm Hg)

$$K_c = \underline{\hspace{2cm}} = 100 \frac{A_1 + 2A_2 + 3A_3 + 4A_4}{A_1^2 + A_2^2 + A_3^2 + A_4^2}$$

$$\mu g\ NO_2 = 2K_c AF$$

$$V_s = \frac{528\ (V_F - 25)}{29.92} \left[\frac{P_F}{T_F + 460} - \frac{P_I}{T_I + 460} \right] = ml$$

$$ppmNO_2 = \frac{523 \times \mu gNO_2}{V_s} =$$

$$C_{NO_2} = \frac{\mu gNO_2}{V_s} \times \frac{1\ lb/ft^3}{1.6 \times 10^{4}\ \mu g/ml} = 6.243 \times 10^{-5}\ \frac{\mu gNO_2}{V_s} = lbs/dscf$$

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