Appendix D.1.2

Calculations

Kiln No. 2 - Scrubber "A"

Circular Stack Method 1 Calculation Results

Date: 11/01/96 Time: 16:33:24

Facility:	EASTERN RIDGE LIME
Source ID:	KILN NO.2
Source Name:	SCRUBBER 'A'
Date:	10/14/96
Calculated By:	ALLAN

Input Values

Traverse Point Type:	Sample - M5	
Inside of far wall to outside of nipple:	51 1/4	(inches)
Nipple Length:	3 1/4	(inches)
Distance from Upstream Disturbance:	142 even	(inches)
Distance from Downstream Disturbance:	98 even	(inches)
Number of ports:	2 ports at 90 degrees	

Calculated Values

Inside Diameter:	48.0000	(inches)
Upstream Duct Diameters:	2.95	
Downstream Duct Diameters:	2.04	
Mininum Traverse Points:	24	

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3	Nipple Length (inches)	Traverse Point Location Sum of Col. 4 & 5
1	0.021	48 even	1 even	3 1/4	4 1/4
2	0.067	48 even	3 3/16	3 1/4	6 7/16
3	0.118	48 even	5 11/16	3 1/4	8 15/16
4	0.177	48 even	8 1/2	3 1/4	11 3/4
5	0.250	48 even	12 even	3 1/4	15 1/4
6	0.356	48 even	17 1/16	3 1/4	20 5/16
7	0.644	48 even	30 15/16	3 1/4	34 3/16
8	0.750	48 even	36 even	3 1/4	39 1/4
9	0.823	48 even	39 1/2	3 1/4	42 3/4
10	0.882	48 even	42 5/16	3 1/4	45 9/16
11	0.933	48 even	44 13/16	3 1/4	48 1/16
12	0.979	48 even	47 even	3 1/4	50 1/4

Method 3 Calculation Results

Date: 12/16/96 Time: 15:30:10

Facility: EASTERN RIDGE LIME
Source ID: KILN NO.2
Source Name: SCRUBBER 'A'
Date: 10/16/96 Time: 15:10 Run: 3A-1
Operators: F. MEADOWS

Method 3 Data

Sample Type: Multipoint Integrated
Analytical Method: Orsat
Ambient Temperature: 70 (oF)

GAS	1st Reading	2nd Reading	3rd Reading
CO_2 (%)	21.10	21.10	21.00
O_2 (%)	6.60	6.60	6.70
CO (%)	0.00	0.00	0.00
N_2 (%)	72.30	72.30	72.30
Calculated Dry Molecular Weight (lb/lb-mole)	31.64	31.64	31.63
Variation from Mean	0.00 √	0.00 √	0.01 √

Average Calculated Dry Molecular Weight
(Average of three readings)
31.64 lb/lb-mole

NOTE: Zero values are non-detectable

Method 3 Calculation Results

Date: 12/16/96 Time: 15:33:29

Facility: EASTERN RIDGE LIME
Source ID: KILN NO.2
Source Name: SCRUBBER 'A'
Date: 10/17/96 Time: 11:40 Run: 3A-2
Operators: F, MEADOWS

Method 3 Data

Sample Type: Multipoint Integrated
Analytical Method: Orsat
Ambient Temperature: 70 (oF)

GAS	1st Reading	2nd Reading	3rd Reading
CO_2 (%)	23.80	23.70	23.70
Calculated Dry Molecular Weight (lb/lb-mole)	32.01	31.99	31.99
Variation from Mean	0.01 √	0.01 √	0.01 √

NOTE: Zero values are non-detectable

Method 3 Calculation Results

Date: 12/16/96 Time: 15:35:39

Facility:	EASTERN RIDGE LIME		
Source ID:	KILN NO.2		
Source Name:	SCRUBBER 'A'		
Date:	**10/18/96**	Time: 11:00	Run: 3A-3
Operators:	F. MEADOWS		

Method 3 Data

Sample Type: Multipoint Integrated

Analytical Method: Orsat

Ambient Temperature: 70 (oF)

GAS	1st Reading	2nd Reading	3rd Reading
CO_2 (%)	21.00	21.00	21.00
O_2 (%)	6.70	6.80	6.70
CO (%)	0.00	0.00	0.00
N_2 (%)	72.30	72.20	72.30
Calculated Dry Molecular Weight (lb/lb-mole)	31.63	31.63	31.63
Variation from Mean	0.00 √	0.00 √	0.00 √

Average Calculated Dry Molecular Weight

(Average of three readings)

31.63 lb/lb-mole

NOTE: Zero values are non-detectable

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber A Outlet

	RUN NUMBER	M23-A-1	M23-A-2	M23-A-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1510-2038	1140-1630	1100-1543	
	MEASURED DATA				
(Y)	Meter Box Correction Factor, Y	0.990	0.990	0.990	0.990
(dH)	Avg Meter Orifice Pressure, in. H2O	1.073	0.827	0.984	0.962
(Pbar)	Barometric Pressure, in. Hg	28.65	28.54	28.32	28.50
(Vm)	Sample Volume, ft^3	138.188	121.991	130.841	130.340
(Tm)	Average Meter Temperature, °F	84	90	98	91
(Pg)	Stack Static Pressure, in. H2O	-0.07	-0.07	-0.07	-0.07
(Ts)	Average Stack Temperature, °F	138	135	135	136
(Vlc)	Condensate Collected, ml	653.3	606.3	556.0	605.2
(%CO2)	Carbon Dioxide content, % by volume	21.1	23.7	21.0	21.9
(%O2)	Oxygen content, % by volume	6.6	5.0	6.7	6.1
(%N2)	Nitrogen content, % by volume	72.3	71.3	72.3	72.0
(Cp)	Pitot Tube Coefficient	0.84	0.84	0.84	0.84
(dP)	Avg Sqrt Delta P, (in. H2O)½	0.583	0.547	0.589	0.573
(Theta)	Sample Time, min	240	240	240	240
(Dn)	Nozzle Diameter, in.	0.257	0.247	0.247	0.250
	CALCULATED DATA				
(An)	Nozzle Area, ft^2	0.000360	0.000333	0.000333	0.000342
(Vmstd, cf)	Standard Meter Volume, dscf	127.343	110.767	116.234	118.115
(Vmstd, cm)	Standard Meter Volume, dscm	3.587	3.120	3.274	3.327
(Qm)	Average Sampling Rate, dscfm	0.531	0.462	0.484	0.492
(Ps)	Stack Pressure, in. Hg	28.64	28.53	28.31	28.50
(%H2O)	Moisture, % by volume	19.5	20.5	18.4	19.4
(%H2Osat)	Moisture (at saturation), %	19.3	18.1	18.1	18.5
(Vwstd)	Standard Water Vapor Volume, ft^3	30.751	28.539	26.171	28.487
(Mfd)	Dry Mole Fraction	0.81	0.82	0.82	0.82
(Md)	Molecular Weight-dry, lb/lb-mole	31.64	31.99	31.63	31.75
(Ms)	Molecular Weight-wet, lb/lb-mole	29.01	29.46	29.17	29.21
(Vs)	Stack Gas Velocity, ft/s	35.5	33.0	35.9	34.8
(A)	Stack Area, ft^2	12.57	12.57	12.57	12.57
(Qa)	Stack Gas Volumetric flow, acfm	26,779	24,919	27,049	26,249
(Qs,cmm)	Stack Gas Volumetric flow, dscfm	18,276	17,273	18,613	18,054
(Qs,cfm)	Stack Gas Volumetric flow, dscmm	517.5	489.1	527.1	511.2
(I)	Isokinetic Sampling Ratio, %	101.3	101.0	98.3	100.2

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber A Outlet

	RUN NUMBER	M23-A-1	M23-A-2	M23-A-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1510-2038	1140-1630	1100-1543	
	EMISSIONS DATA				
	DIOXINS:				
	2378 TCDD				
(ng)	Catch, ng	(0.0100)	(0.0100)	(0.0100)	0.00
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0028)	(0.0032)	(0.0031)	0.00
(µg/hr)	Emission Rate, µg/hr	(0.0866)	(0.0941)	(0.0966)	0.00
	Total TCDD				
(ng)	Catch, ng	0.15	0.21	0.47	0.28
(ng/dscm)	Concentration, ng/dscm, as measured	0.042	0.067	0.14	0.084
(µg/hr)	Emission Rate, µg/hr	1.2985	1.9752	4.5397	2.60
	12378 PeCDD				
(ng)	Catch, ng	(0.020)	(0.020)	(0.020)	0.00
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0056)	(0.0064)	(0.0061)	0.00
(µg/hr)	Emission Rate, µg/hr	(0.1731)	(0.1881)	(0.1932)	0.00
	Total PeCDD				
(ng)	Catch, ng	0.030	0.060	0.30	0.1
(ng/dscm)	Concentration, ng/dscm, as measured	0.0084	0.019	0.092	0.04
(µg/hr)	Emission Rate, µg/hr	0.2597	0.5643	2.8977	1.241
	123478 HxCDD				
(ng)	Catch, ng	(0.020)	(0.020)	(0.020)	0.00
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0056)	(0.0064)	(0.0061)	0.00
(µg/hr)	Emission Rate, µg/hr	(0.1731)	(0.1881)	(0.1932)	0.00
	123678 HxCDD				
(ng)	Catch, ng	(0.020)	(0.020)	(0.020)	0.00
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0056)	(0.0064)	(0.0061)	0.00
(µg/hr)	Emission Rate, µg/hr	(0.1731)	(0.1881)	(0.1932)	0.00

( ) Not Detected. Value shown is the detection limit for that sample. ND values are not included in totals or averages.
{ } Estimated Maximum Possible Concentration. EMPC values are not included in totals or averages.

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber A Outlet

	RUN NUMBER	M23-A-1	M23-A-2	M23-A-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1510-2038	1140-1630	1100-1543	
	EMISSIONS DATA -Continued				
	DIOXINS - Continued				
	123789 HxCDD				
(ng)	Catch, ng	{0.0070}	(0.020)	(0.020)	0.00
(ng/dscm)	Concentration, ng/dscm, as measured	{0.0020}	(0.0064)	(0.0061)	0.00
(µg/hr)	Emission Rate, µg/hr	{0.0606}	(0.1881)	(0.1932)	0.00
	Total HxCDD				
(ng)	Catch, ng	0.20	0.12	0.16	0.16
(ng/dscm)	Concentration, ng/dscm, as measured	0.056	0.038	0.049	0.048
(µg/hr)	Emission Rate, µg/hr	1.7313	1.1287	1.5454	1.468
	1234678 HpCDD				
(ng)	Catch, ng	0.040	0.18	0.030	0.083
(ng/dscm)	Concentration, ng/dscm, as measured	0.011	0.058	0.0092	0.026
(µg/hr)	Emission Rate, µg/hr	0.3463	1.6930	0.2898	0.776
	Total HpCDD				
(ng)	Catch, ng	0.070	0.34	0.070	0.16
(ng/dscm)	Concentration, ng/dscm, as measured	0.020	0.11	0.021	0.050
(µg/hr)	Emission Rate, µg/hr	0.6059	3.1979	0.6761	1.493
	Octa CDD				
(ng)	Catch, ng	0.090	0.62	0.13	0.28
(ng/dscm)	Concentration, ng/dscm, as measured	0.025	0.20	0.040	0.088
(µg/hr)	Emission Rate, µg/hr	0.7791	5.8314	1.2557	2.62
	Total CDD				
(ng)	Catch, ng	0.54	1.4	1.1	1.0
(ng/dscm)	Concentration, ng/dscm, as measured	0.15	0.43	0.35	0.31
(µg/hr)	Emission Rate, µg/hr	4.6744	12.6975	10.9145	9.43

( ) Not Detected. Value shown is the detection limit for that sample. ND values are not included in totals or averages.
{ } Estimated Maximum Possible Concentration. EMPC values are not included in totals or averages.

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber A Outlet

	RUN NUMBER	M23-A-1	M23-A-2	M23-A-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1510-2038	1140-1630	1100-1543	
	EMISSIONS DATA - Continued				
	FURANS				
	2378 TCDF				
(ng)	Catch, ng	0.030	0.020	0.030	0.027
(ng/dscm)	Concentration, ng/dscm, as measured	0.0084	0.0064	0.0092	0.0080
(µg/hr)	Emission Rate, µg/hr	0.2597	0.1881	0.2898	0.246
	Total TCDF				
(ng)	Catch, ng	0.99	0.40	1.1	0.83
(ng/dscm)	Concentration, ng/dscm, as measured	0.28	0.13	0.34	0.25
(µg/hr)	Emission Rate, µg/hr	8.5698	3.7622	10.6248	7.65
	12378 PeCDF				
(ng)	Catch, ng	0.010	(0.010)	0.010	0.010
(ng/dscm)	Concentration, ng/dscm, as measured	0.0028	(0.0032)	0.0031	0.0029
(µg/hr)	Emission Rate, µg/hr	0.0866	(0.0941)	0.0966	0.0916
	23478 PeCDF				
(ng)	Catch, ng	0.010	0.010	0.020	0.013
(ng/dscm)	Concentration, ng/dscm, as measured	0.0028	0.0032	0.0061	0.0040
(µg/hr)	Emission Rate, µg/hr	0.0866	0.0941	0.1932	0.1246
	Total PeCDF				
(ng)	Catch, ng	0.22	0.040	0.27	0.18
(ng/dscm)	Concentration, ng/dscm, as measured	0.061	0.013	0.082	0.05
(µg/hr)	Emission Rate, µg/hr	1.9044	0.3762	2.6079	1.63
	123478 HxCDF				
(ng)	Catch, ng	0.030	0.050	{0.020}	0.040
(ng/dscm)	Concentration, ng/dscm, as measured	0.0084	0.016	{0.006}	0.012
(µg/hr)	Emission Rate, µg/hr	0.2597	0.4703	{0.1932}	0.36

( ) Not Detected. Value shown is the detection limit for that sample. ND values are not included in totals or averages.
{ } Estimated Maximum Possible Concentration. EMPC values are not included in totals or averages.

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber A Outlet

	RUN NUMBER	M23-A-1	M23-A-2	M23-A-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1510-2038	1140-1630	1100-1543	
	EMISSIONS DATA - Continued				
	Furans - Continued				
	123678 HxCDF				
(ng)	Catch, ng	0.010	0.020	0.010	0.013
(ng/dscm)	Concentration, ng/dscm, as measured	0.0028	0.0064	0.0031	0.0041
(µg/hr)	Emission Rate, µg/hr	0.0866	0.1881	0.0966	0.1238
	234678 HxCDF				
(ng)	Catch, ng	0.010	0.050	0.010	0.023
(ng/dscm)	Concentration, ng/dscm, as measured	0.0028	0.016	0.0031	0.0073
(µg/hr)	Emission Rate, µg/hr	0.0866	0.4703	0.0966	0.218
	123789 HxCDF				
(ng)	Catch, ng	(0.020)	(0.020)	(0.020)	0.00
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0056)	(0.0064)	(0.0061)	0.00
(µg/hr)	Emission Rate, µg/hr	(0.1731)	(0.1881)	(0.1932)	0.00
	Total HxCDF				
(ng)	Catch, ng	0.10	0.17	0.050	0.11
(ng/dscm)	Concentration, ng/dscm, as measured	0.028	0.054	0.015	0.033
(µg/hr)	Emission Rate, µg/hr	0.8656	1.5989	0.4829	0.983
	1234678 HpCDF				
(ng)	Catch, ng	0.040	0.20	0.020	0.087
(ng/dscm)	Concentration, ng/dscm, as measured	0.011	0.064	0.0061	0.027
(µg/hr)	Emission Rate, µg/hr	0.3463	1.8811	0.1932	0.807
	1234789 HpCDF				
(ng)	Catch, ng	(0.020)	0.060	(0.020)	0.060
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0056)	0.019	(0.0061)	0.019
(µg/hr)	Emission Rate, µg/hr	(0.1731)	0.5643	(0.1932)	0.564

) Not Detected. Value shown is the detection limit for that sample. ND values are not included in totals or averages.

} Estimated Maximum Possible Concentration. EMPC values are not included in totals or averages.

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber A Outlet

	RUN NUMBER	M23-A-1	M23-A-2	M23-A-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1510-2038	1140-1630	1100-1543	
	EMISSIONS DATA - Continued				
	Furans - Continued				
	Total HpCDF				
(ng)	Catch, ng	0.060	0.42	0.020	0.17
(ng/dscm)	Concentration, ng/dscm, as measured	0.017	0.13	0.0061	0.052
(µg/hr)	Emission Rate, µg/hr	0.5194	3.9503	0.1932	1.554
	Octa CDF				
(ng)	Catch, ng	0.060	0.61	0.030	0.23
(ng/dscm)	Concentration, ng/dscm, as measured	0.017	0.20	0.0092	0.074
(µg/hr)	Emission Rate, µg/hr	0.5194	5.7374	0.2898	2.18
	Total CDF				
(ng)	Catch, ng	1.4	1.6	1.5	1.5
(ng/dscm)	Concentration, ng/dscm, as measured	0.40	0.51	0.45	0.45
(µg/hr)	Emission Rate, µg/hr	12.3786	15.0489	14.1986	13.88
	Total CDD + CDF				
(ng)	Catch, ng	2.0	3.0	2.6	2.5
(ng/dscm)	Concentration, ng/dscm, as measured	0.55	0.95	0.79	0.76
(µg/hr)	Emission Rate, µg/hr	17.0530	27.7463	25.1131	23.3

( ) Not Detected. Value shown is the detection limit for that sample. ND values are not included in totals or averages.

{ } Estimated Maximum Possible Concentration. EMPC values are not included in totals or averages.

CDD/CDF Corrected Stack Gas Concentrations and 2378 TCDD Toxic Equivalent Concentrations
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber A Outlet

	CONCENTRATION (ng/dscmm, adjusted to 7% O2)				2378-TCDD	2378 TOXIC EQUIVALENCIES (ng/dscmm, adjusted to 7% O2)			
RUN NUMBER	M23-A-1	M23-A-2	M23-A-3		Toxic	M23-A-1	M23-A-2	M23-A-3	
RUN DATE	10/16/96	10/17/96	10/18/96	Average	Equivalent	10/16/96	10/17/96	10/18/96	Average
JN TIME	1510-2038	1140-1630	1100-1543		Factor	1510-2038	1140-1630	1100-1543	
DIOXINS:									
378 TCDD	(0.0027)	(0.0028)	(0.0030)	0.00	1.000	(0.0027)	(0.0028)	(0.0030)	0.00
otal TCDD	0.041	0.059	0.141	0.080					
12378 PeCDD	(0.0054)	(0.0056)	(0.0060)	0.00	0.500	(0.0027)	(0.0028)	(0.0030)	0.00
tal PeCDD	0.0081	0.017	0.090	0.038					
23478 HxCDD	(0.0054)	(0.0056)	(0.0060)	0.00	0.100	(0.00054)	(0.00056)	(0.00060)	0.00
123678 HxCDD	(0.0054)	(0.0056)	(0.0060)	0.00	0.100	(0.00054)	(0.00056)	(0.00060)	0.00
123789 HxCDD	{0.0019}	(0.0056)	(0.0060)	0.00	0.100	{0.00019}	(0.00056)	(0.00060)	0.00
tal HxCDD	0.054	0.034	0.048	0.045					
1234678 HpCDD	0.011	0.050	0.0090	0.023	0.010	0.00011	0.00050	0.000090	0.00023
Total HpCDD	0.019	0.095	0.021	0.045					
cta CDD	0.024	0.17	0.039	0.079	0.001	0.000024	0.00017	0.000039	0.000079
otal CDD	0.15	0.38	0.34	0.29					
JRANS									
2378 TCDF	0.0081	0.0056	0.0090	0.0076	0.100	0.00081	0.00056	0.00090	0.00076
tal TCDF	0.27	0.11	0.33	0.24					
378 PeCDF	0.0027	(0.0028)	0.0030	0.0028	0.050	0.00014	(0.00014)	0.00015	0.00014
23478 PeCDF	0.0027	0.0028	0.0060	0.0038	0.500	0.0014	0.0014	0.0030	0.0019
tal PeCDF	0.060	0.011	0.081	0.051					
3478 HxCDF	0.0081	0.014	{0.0060}	0.011	0.100	0.00081	0.0014	{0.00060}	0.0011
123678 HxCDF	0.0027	0.0056	0.0030	0.0038	0.100	0.00027	0.00056	0.0003	0.0004
234678 HxCDF	0.0027	0.014	0.0030	0.0066	0.100	0.00027	0.0014	0.0003	0.0007
3789 HxCDF	(0.0054)	(0.0056)	(0.0060)	0.00	0.100	(0.00054)	(0.00056)	(0.00060)	0.00
otal HxCDF	0.027	0.048	0.015	0.030					
1234678 HpCDF	0.011	0.056	0.0060	0.024	0.010	0.00011	0.00056	0.000060	0.00024
34789 HpCDF	(0.0054)	0.017	(0.0060)	0.017	0.010	(0.000054)	0.00017	(0.000060)	0.00017
tal HpCDF	0.016	0.12	0.0060	0.047					
Octa CDF	0.016	0.17	0.0090	0.065	0.001	0.000016	0.00017	0.0000090	0.000065
tal CDF	0.39	0.45	0.44	0.43					
tal CDD + CDF	0.53	0.83	0.78	0.71					

Program

ISOKINETIC CALCULATION 23A 1

SITE KILN NO. 2 SCRUBBER "A" OUTLET TEST NO. _____

			RUN 1	RUN 2	RUN 3
1. Volume of dry gas sampled corrected to standard conditions. Note: V_m must be corrected for leakage if any leakage rates exceed L_a). $V_{m_{std}} = 17.65 \times V_m \times Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] =$	A	V_m, ft^3	138.187	121.991	130.841
	B	Y	1.008	1.008	1.008
	C	P_{bar}, in.Hg	28.65	28.54	28.32
	D	$\overline{\Delta H}$, in.H_2O	1.07	0.829	0.984
	E	$\overline{T}_m$, °R 544	~~598~~	550	541.5
	F	$V_{m_{std}}$, dscf	129.834 ~~118.110~~	112.863	122.054
2. Volume of water vapor at standard conditions, ft^3. $V_{w_{std}} = 0.04707 V_{lc} =$	G	V_{lc}, g +36.2	653.3 ~~617.1~~	606.3	~~615.2~~ 556
	H	$V_{w_{std}}$, ft^3	30.757 ~~29.~~	28.539	26.171 ~~28.95~~
3. Moisture content in stack gas. $B_{ws} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} =$	I	B_{ws}	0.1915 ~~0.2066~~	0.2018 (0.1810)	~~0.19180~~ ~~0.1824~~
	J	$1-B_{ws}$	0.8085	0.8190	0.8082 0.8176
4. Dry molecular weight of stack gas, lb/lb-mole. $M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO) =$		% CO_2	21.1	23.7	21.0
		% O_2	6.6	5.0	6.7
		% N_2 + % CO	72.3	71.3	72.3
	K	M_d, lb/lb-mole	31.64	31.99	31.63
5. Molecular weight of stack gas. $M_s = M_d\ (1-B_{ws}) + 18\ B_{ws} =$	L	M_s, lb/lb-mole	29.03 ~~28.82~~	29.46	29.~~74~~ 22
6. Stack velocity at stack conditions, fps. $V_s = 85.49\ Cp\ (avg.\ \sqrt{\Delta P}) \sqrt{\frac{T_s}{P_s M_s}} =$	M	P_{static}, in.H_2O	-0.07	-.07	-.07
	N	P_s, in.Hg ~~29.03~~	28.64 ~~28.64~~	28.53	28.31
	O	$\overline{T}_s$, °R	598.	595	595
	P	$\overline{\sqrt{\Delta P}}$	0.583	0.547	0.5885
NOTE: $P_s = P_{bar} + \left(\frac{P_{static}}{13.6}\right)$	Q	Cp	0.84	0.84	0.84
	R	V_s, fps	35.51	33.05	35.84 42
7. Isokinetic variation $\%\ I = \frac{V_{m_{std}} \times T_s \times 17.32}{V_s \times D_n^2 \times \theta \times P_s \times (1-B_{ws})}$	S	Dn, in.	0.257	0.247	0.247
	T	θ, min.	240	240	240
	U	% I	101.8	102.9	~~103.4~~ 102.8

EMISSION CALCULATIONS*

SITE _____ TEST NO. _____

			RUN 1	RUN 2	RUN 3
8. Stack gas volumetric flow rate at stack conditions, acfm $Q_s = 0.3272 \times V_s \times D_s^2 =$	R	V_s, fps	35.51	33.05	35.8~~1~~42
	V	D_s, in.	48	48	48
	W	Q_s, acfm	26770	24,915	27,05~~7~~20
9. Dry stack gas volumetric flow rate at standard conditions, dscfm $Q_{s_{std}} = 17.65\ Q_s \frac{P_s}{T_s}\left(1-B_{ws}\right) =$	N	P_s, in.Hg	29.03	28.53	28.31
	O	T_s, °R	598	595	595
	J	$(1-B_{ws})$	0.8085	0.8190	~~0.8176~~ .8234
	X	$Q_{s_{std}}$, dscfm	18,545 ~~26770~~	17,270	18,~~578~~ 684
10. Concentration, gr/dscf $C_s = 0.01543\left(\frac{Mn}{V_{m_{std}}}\right) =$	Y	Mn, mg			
	F	$V_{m_{std}}$, dscf			
	Z	C_s, gr/dscf			
11. Concentration, ppm $ppm = \frac{5.595 \times 10^4}{M_w} \times C_s =$	AA	M_w, lb/lb-mole			
	BB	ppm			
12. Mass emission rate, lb/h a) $E = (8.573 \times 10^{-3}) \times C_s \times Q_{s_{std}} =$	EA	E, lb/h			
b) $E = (1.532 \times 10^{-7}) \times ppm \times M_w \times Q_{s_{std}} =$	EB				

*Continuation of isokinetic calculations

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 29 - Metals and Particulate Matter
Kiln No. 2 - Scrubber A Outlet

	RUN NUMBER	M29-A-1	M29-A-2	M29-A-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1510-2038	1140-1630	1100-1548	
	MEASURED DATA				
(Y)	Meter Box Correction Factor, Y	1.009	1.009	1.009	1.009
(dH)	Avg Meter Orifice Pressure, in. H2O	1.127	1.219	1.265	1.204
(Pbar)	Barometric Pressure, in. Hg	28.65	28.54	28.32	28.50
(Vm)	Sample Volume, ft^3	135.198	140.750	142.241	139.396
(Tm)	Average Meter Temperature, °F	75	86	77	79
(Pg)	Stack Static Pressure, in. H2O	-0.07	-0.10	-0.10	-0.09
(Ts)	Average Stack Temperature, °F	128	126	129	128
(Vlc)	Condensate Collected, ml	632.6	632.3	615.2	626.7
(%CO2)	Carbon Dioxide content, % by volume	21.1	23.7	21.0	21.9
(%O2)	Oxygen content, % by volume	6.6	5.0	6.7	6.1
(%N2)	Nitrogen content, % by volume	72.3	71.3	72.3	72.0
(Cp)	Pitot Tube Coefficient	0.84	0.84	0.84	0.84
(dP)	Avg Sqrt Delta P, (in. H2O)½	0.5706	0.5680	0.6210	0.5865
(Theta)	Sample Time, min	240	240	240	240
(Dn)	Nozzle Diameter, in.	0.254	0.259	0.250	0.254
	CALCULATED DATA				
(An)	Nozzle Area, square feet	0.000352	0.000366	0.000341	0.000353
(Vmstd, cf)	Standard Meter Volume, ft^3	129.347	131.430	134.001	131.593
(Vmstd, cm)	Standard Meter Volume, m^3	3.663	3.722	3.794	3.726
(Qm)	Average Sampling Rate, dscfm	0.539	0.548	0.558	0.548
(Ps)	Stack Pressure, inches Hg	28.64	28.53	28.31	28.50
(%H2O)	Moisture, %	18.7	18.5	17.8	18.3
(%H2Osat)	Moisture (at saturation), %	15.0	14.2	15.4	14.9
(Vwstd)	Standard Water Vapor Volume, ft^3	29.778	29.762	28.957	29.499
(Mfd)	Dry Mole Fraction	0.850	0.858	0.846	0.851
(Md)	Molecular Weight-dry, lb/lb-mole	31.64	31.99	31.63	31.75
(Ms)	Molecular Weight-wet, lb/lb-mole	29.59	30.00	29.53	29.71
(Vs)	Stack Gas Velocity, ft/s	34.1	33.7	37.4	35.1
(A)	Stack Area, ft^2	12.57	12.57	12.57	12.57
(Qa)	Stack Gas Volumetric flow, acfm	25,740	25,454	28,226	26,473
(Qs, cfm)	Stack Gas Volumetric flow, dscfm	18,799	18,754	20,250	19,268
(Qs, cmm)	Stack Gas Volumetric flow, dscmm	532	531	573	546
(I)	Isokinetic Sampling Ratio, %	102.4	100.3	101.7	101.5

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 29 - Metals and Particulate Matter
Kiln No. 2 - Scrubber A Outlet

	RUN NUMBER	M29-A-1	M29-A-2	M29-A-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1510-2038	1140-1630	1100-1548	
	EMISSIONS DATA				
	Particulate Matter				
(g)	Catch, grams	0.3803	0.5850	0.4113	0.4589
(gr/dscf)	Concentration, gr/dscf	0.0454	0.0687	0.0474	0.0538
(gr/dscf@7%)	Concentration, gf/dscf @ 7% O2	0.0301	0.0455	0.0314	0.0356
(g/dscm)	Concentration, g/dscm	0.104	0.157	0.108	0.123
(g/dscm@7%)	Concentration, g/dscm @ 7% O2	0.0688	0.104	0.0717	0.0815
(lb/hr)	Emission Rate, lb/hr	7.31	11.0	8.22	8.86
(kg/hr)	Emission Rate, kg/hr	3.32	5.01	3.73	4.02
	Antimony				
(µg)	Catch, micrograms	23.5	17.3	11.4	17.4
(µg/dscm)	Concentration, µg/dscm	6.42	4.65	3.00	4.69
(µg/dscm @ 7%)	Concentration, µg/dscm @ 7% O2	6.24	4.06	2.94	4.41
(g/hr)	Emission Rate, g/hr	0.205	0.148	0.103	0.152
	Arsenic				
(µg)	Catch, micrograms	9.17	7.53	4.77	7.16
(µg/dscm)	Concentration, µg/dscm	2.50	2.02	1.26	1.93
(µg/dscm @ 7%)	Concentration, µg/dscm @ 7% O2	2.43	1.77	1.23	1.81
(g/hr)	Emission Rate, g/hr	0.0800	0.0645	0.0432	0.0626
	Beryllium				
(µg)	Catch, micrograms	38.1	76.6	63.2	59.3
(µg/dscm)	Concentration, µg/dscm	10.4	20.6	16.7	15.9
(µg/dscm @ 7%)	Concentration, µg/dscm @ 7% O2	10.1	18.0	16.3	14.8
(g/hr)	Emission Rate, g/hr	0.332	0.656	0.573	0.520
	Cadmium				
(µg)	Catch, micrograms	3.79	19.4	5.82	9.67
(µg/dscm)	Concentration, µg/dscm	1.03	5.21	1.53	2.59
(µg/dscm @ 7%)	Concentration, µg/dscm @ 7% O2	1.01	4.56	1.50	2.35
(g/hr)	Emission Rate, g/hr	0.0330	0.166	0.0528	0.0840
	Chromium				
(µg)	Catch, micrograms	56.2	53.9	27.9	46.0
(µg/dscm)	Concentration, µg/dscm	15.3	14.5	7.35	12.4
(µg/dscm @ 7%)	Concentration, µg/dscm @ 7% O2	14.9	12.7	7.20	11.6
(g/hr)	Emission Rate, g/hr	0.490	0.461	0.253	0.402

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - APG Lime Company
US EPA Test Method 29 - Metals and Particulate Matter
Kiln No. 2 - Cooler Stack

	RUN NUMBER	M29-A-1	M29-A-2	M29-A-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1510-2038	1140-1630	1100-1548	
	EMISSIONS DATA - Continued				
	Cobalt				
(µg)	Catch, micrograms	38.4	56.4	63.6	52.8
(µg/dscm)	Concentration, µg/dscm	10.5	15.2	16.8	14.1
(µg/dscm @ 7%)	Concentration, µg/dscm @ 7% O2	10.2	13.2	16.4	13.3
(g/hr)	Emission Rate, g/hr	0.335	0.483	0.577	0.465
	Lead				
(µg)	Catch, micrograms	74.2	158	44.4	92.2
(µg/dscm)	Concentration, µg/dscm	20.3	42.5	11.7	24.8
(µg/dscm @ 7%)	Concentration, µg/dscm @ 7% O2	19.7	37.1	11.5	22.8
(g/hr)	Emission Rate, g/hr	0.647	1.35	0.403	0.801
	Manganese				
(µg)	Catch, micrograms	78.4	199	76.1	118
(µg/dscm)	Concentration, µg/dscm	21.4	53.5	20.1	31.6
(µg/dscm @ 7%)	Concentration, µg/dscm @ 7% O2	20.8	46.7	19.6	29.1
(g/hr)	Emission Rate, g/hr	0.684	1.70	0.690	1.03
	Mercury				
(µg)	Catch, micrograms	10.2	6.28	6.99	7.82
(µg/dscm)	Concentration, µg/dscm	2.78	1.69	1.84	2.10
(µg/dscm @ 7%)	Concentration, µg/dscm @ 7% O2	2.71	1.48	1.80	2.00
(g/hr)	Emission Rate, g/hr	0.0889	0.0538	0.0634	0.0687
	Nickel				
(µg)	Catch, micrograms	95.9	85.7	67.9	83.2
(µg/dscm)	Concentration, µg/dscm	26.2	23.0	17.9	22.4
(µg/dscm @ 7%)	Concentration, µg/dscm @ 7% O2	25.5	20.1	17.5	21.0
(g/hr)	Emission Rate, g/hr	0.836	0.734	0.616	0.729
	Selenium				
(µg)	Catch, micrograms	194	106	74.1	125
(µg/dscm)	Concentration, µg/dscm	53.0	28.5	19.5	33.7
(µg/dscm @ 7%)	Concentration, µg/dscm @ 7% O2	51.5	24.9	19.1	31.8
(g/hr)	Emission Rate, g/hr	1.69	0.908	0.672	1.09

PES

Program

ISOKINETIC CALCULATION 29A-1

SITE KILN NO. 2 SCRUBBER A OUTLET TEST NO. _____

			RUN 1	RUN 2	RUN 3
1. Volume of dry gas sampled corrected to standard conditions. Note: V_m must be corrected for leakage if any leakage rates exceed L_a). $V_{m_{std}} = 17.65 \times V_m \times Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] =$	A	V_m, ft^3	135.198	140.750 ~~99.722~~	142.241
	E	Y	1.009	1.009	1.009
	C	P_{bar}, in.Hg	28.65	28.54	28.32
	D	$\overline{\Delta H}$, in.H_2O 1.127	~~0.07~~	1.219	1.26
	E	$\overline{T_m}$, °R	531	546	530
	F	$V_{m_{std}}$, dscf	130.284	131.434	135.799
2. Volume of water vapor at standard conditions, ft^3. $V_{w_{std}} = 0.04707 V_{lc} =$	G	V_{lc}, g	632.6	632.3	615.2
	H	$V_{w_{std}}$, ft^3	29.776	29.762	28.957
3. Moisture content in stack gas. $B_{ws} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} =$	I	B_{ws}	0.1860	.1846 (0.1424) ✓	0.1758 0.1556
	J	$1-B_{ws}$	.8140	.8154 (0.8576) ✓	0.8242 0.8444
4. Dry molecular weight of stack gas, lb/lb-mole. $M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO) =$		% CO_2	19.0	23.7	21.0
		% O_2	7.8	5.0	6.7
		% N_2 + % CO	73.3	71.3	72.3
	K	M_d, lb/lb-mole	31.38	31.99	31.63
5. Molecular weight of stack gas. $M_s = M_d\ (1-B_{ws}) + 18\ B_{ws} =$	L	M_s, lb/lb-mole	28.89	30.00	29.51
6. Stack velocity at stack conditions, fps. $V_s = 85.49\ Cp\ \left(avg.\ \sqrt{\Delta P}\right) \sqrt{\frac{T_s}{P_s M_s}} =$	M	P_{static}, in.H_2O	-0.07	-.10	-0.10
	N	P_s, in.Hg	28.64	28.53	28.31
	O	$\overline{T_s}$, °R	588	586	589
	P	$\overline{\sqrt{\Delta P}}$	0.5706	0.5680	0.6210
NOTE: $P_s = P_{bar} + \left(\frac{P_{static}}{13.6}\right)$	Q	Cp	0.84	0.84	0.84
	R	V_s, fps	34.54	33.75	37.445
Isokinetic variation $\% I = \frac{V_{m_{std}} \times T_s \times 17.32}{V_s \times D_n^2 \times \theta \times P_s \times (1-B_{ws})}$	S	Dn, in.	0.254	0.259	0.250
	T	θ, min.	240	240	240
	U	% I	106.4	100.3	103.2

EMISSION CALCULATIONS*

SITE _____ TEST NO. _____

			RUN 1	RUN 2	RUN 3
8. Stack gas volumetric flow rate at stack conditions, acfm	R	V_s, fps	34.54	33.75	37.445
$Q_s = 0.3272 \times V_s \times D_s^2 =$	V	D_s, in.	48.0	48	48
	W	Q_s, acfm	26,039	25,443	28,229
9. Dry stack gas volumetric flow rate at standard conditions, dscfm	N	P_s, in.Hg	28.64	28.53	28.31
$Q_{s_{std}} = 17.65\ Q_s \frac{P_s}{T_s}\left(1-B_{ws}\right) =$	O	T_s, °R	588	586	589
	J	$(1-B_{ws})$	0.8140	0.8576	0.8444
	X	$Q_{s_{std}}$, dscfm	18221	18,750	20,221
10. Concentration, gr/dscf	Y	Mn, mg	---.-		
$C_s = 0.01543\left(\frac{Mn}{V_{m_{std}}}\right) =$	F	$V_{m_{std}}$, dscf	--.--		
	Z	C_s, gr/dscf	-.----		
11. Concentration, ppm	AA	M_w, lb/lb-mole	---.-		
$ppm = \frac{5.595 \times 10^4}{M_w} \times C_s =$	BB	ppm			
12. Mass emission rate, lb/h		E, lb/h			
a) $E = (8.573 \times 10^{-3}) \times C_s \times Q_{s_{std}} =$	EA				
b) $E = (1.532 \times 10^{-7}) \times ppm \times M_w \times Q_{s_{std}} =$	EB				

*Continuation of isokinetic calculations

Appendix D.1.3

Calculations

Kiln No. 2 - Scrubber "B"

Circular Stack Method 1 Calculation Results

Date: 11/01/96 Time: 16:35:58

Facility:	EASTERN RIDGE LIME
Source ID:	KILN NO. 2
Source Name:	SCRUBBER 'B'
Date:	10/14/96
Calculated By:	MARC HAMILTON

Input Values

Traverse Point Type:	Sample - M5	
Inside of far wall to outside of nipple:	51 1/4	(inches)
Nipple Length:	3 1/4	(inches)
Distance from Upstream Disturbance:	142 even	(inches)
Distance from Downstream Disturbance:	98 even	(inches)
Number of ports:	2 ports at 90 degrees	

Calculated Values

Inside Diameter:	48.0000	(inches)
Upstream Duct Diameters:	2.95	
Downstream Duct Diameters:	2.04	
Mininum Traverse Points:	24	

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3	Nipple Length (inches)	Traverse Point Location Sum of Col. 4 & 5
	0.021	48 even	1 even	3 1/4	4 1/4
	0.067	48 even	3 3/16	3 1/4	6 7/16
	0.118	48 even	5 11/16	3 1/4	8 15/16
	0.177	48 even	8 1/2	3 1/4	11 3/4
	0.250	48 even	12 even	3 1/4	15 1/4
	0.356	48 even	17 1/16	3 1/4	20 5/16
	0.644	48 even	30 15/16	3 1/4	34 3/16
8	0.750	48 even	36 even	3 1/4	39 1/4
9	0.823	48 even	39 1/2	3 1/4	42 3/4
10	0.882	48 even	42 5/16	3 1/4	45 9/16
11	0.933	48 even	44 13/16	3 1/4	48 1/16
12	0.979	48 even	47 even	3 1/4	50 1/4

Method 3 Calculation Results

Date: 12/16/96 Time: 15:39:18

Facility:	EASTERN RIDGE LIME		
Source ID:	KILN NO. 2		
Source Name:	SCRUBBER 'B'		
Date:	10/16/96	Time: 15:10	Run: 3B-1
Operators:	F. MEADOWS		

Method 3 Data

Sample Type: Multipoint Integrated
Analytical Method: Orsat
Ambient Temperature: 70 (oF)

GAS	1st Reading	2nd Reading	3rd Reading
CO_2 (%)	19.00	19.00	18.90
O_2 (%)	7.70	7.80	7.80
CO (%)	0.00	0.00	0.00
N_2 (%)	73.30	73.20	73.30
Calculated Dry Molecular Weight (lb/lb-mole)	31.35	31.35	31.34
Variation from Mean	0.00 √	0.00 √	0.01 √

Average Calculated Dry Molecular Weight
(Average of three readings)
31.35 lb/lb-mole

NOTE: Zero values are non-detectable

Method 3 Calculation Results

Date: 12/16/96 Time: 15:41:26

Facility:	EASTERN RIDGE LIME		
Source ID:	KILN NO. 2		
Source Name:	SCRUBBER 'B'		
Date:	10/17/96	Time: 11:40	Run: 3B-2
Operators:	F. MEADOWS		

Method Data

Sample Type: Multipoint Integrated

Analytical Method: Orsat

Ambient Temperature: 70 (oF)

GAS	1st Reading	2nd Reading	3rd Reading
CO_2 (%)	20.00	20.10	20.00
O_2 (%)	7.70	7.70	7.80
CO (%)	0.00	0.00	0.00
N_2 (%)	72.30	72.20	72.20
Calculated Dry Molecular Weight (lb/lb-mole)	31.51	31.52	31.51
Variation from Mean	0.00 √	0.01 √	0.00 √

Average Calculated Dry Molecular Weight

(Average of three readings)

31.51 lb/lb-mole

NOTE: Zero values are non-detectable

Method 3 Calculation Results

Date: 12/16/96 Time: 15:43:42

Facility:	EASTERN RIDGE LIME		
Source ID:	KILN NO. 2		
Source Name:	SCRUBBER 'B'		
Date:	10/18/96	Time: 11:00	Run: 3B-3
Operators:	F. MEADOWS		

Method 3 Data

Sample Type: Multipoint Integrated

Analytical Method: Orsat

Ambient Temperature: 70 (oF)

GAS	1st Reading	2nd Reading	3rd Reading
CO_2 (%)	19.70	19.80	19.70
O_2 (%)	7.60	7.50	7.60
CO (%)	0.00	0.00	0.00
N_2 (%)	72.70	72.70	72.70
Calculated Dry Molecular Weight (lb/lb-mole)	31.46	31.47	31.46
Variation from Mean	0.00 √	0.01 √	0.00 √

Average Calculated Dry Molecular Weight

(Average of three readings)

31.46 lb/lb-mole

NOTE: Zero values are non-detectable

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber B Outlet

	RUN NUMBER	M23-B1	M23-B2	M23-B3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1511-2027	1140-1630	1100-1540	
	MEASURED DATA				
(Y)	Meter Box Correction Factor, Y	1.003	1.003	1.003	1.003
(dH)	Avg Meter Orifice Pressure, in. H2O	2.292	0.808	1.476	1.525
(Pbar)	Barometric Pressure, in. Hg	28.65	28.54	28.30	28.50
(Vm)	Sample Volume, ft^3	187.909	116.621	151.944	152.158
(Tm)	Average Meter Temperature, °F	94	95	81	90
(Pg)	Stack Static Pressure, in. H2O	-0.06	0.05	0.12	0.04
(Ts)	Average Stack Temperature, °F	135	131	134	133
(Vlc)	Condensate Collected, ml	783.0	415.4	614.4	604.3
(%CO2)	Carbon Dioxide content, % by volume	19.0	20.0	19.7	19.6
(%O2)	Oxygen content, % by volume	7.8	7.7	7.6	7.7
(%N2)	Nitrogen content, % by volume	73.2	72.3	72.7	72.7
(Cp)	Pitot Tube Coefficient	0.84	0.84	0.84	0.84
(dP)	Avg Sqrt Delta P, (in. H2O)½	0.363	0.312	0.425	0.367
(Theta)	Sample Time, min	240	240	240	240
(Dn)	Nozzle Diameter, in.	0.375	0.310	0.310	0.332
	CALCULATED DATA				
(An)	Nozzle Area, ft^2	0.000767	0.000524	0.000524	0.000605
(Vmstd, cf)	Standard Meter Volume, dscf	172.998	106.346	141.244	140.196
(Vmstd, cm)	Standard Meter Volume, dscm	4.873	2.996	3.979	3.949
(Qm)	Average Sampling Rate, dscfm	0.721	0.443	0.589	0.584
(Ps)	Stack Pressure, in. Hg	28.65	28.54	28.31	28.50
(%H2O)	Moisture, % by volume	17.6	15.5	17.0	16.7
(%H2Osat)	Moisture (at saturation), %	17.8	16.3	17.6	17.3
(Vwstd)	Standard Water Vapor Volume, ft^3	36.856	19.553	28.920	28.443
(Mfd)	Dry Mole Fraction	0.82	0.84	0.83	0.83
(Md)	Molecular Weight-dry, lb/lb-mole	31.35	31.51	31.46	31.44
(Ms)	Molecular Weight-wet, lb/lb-mole	29.01	29.41	29.17	29.20
(Vs)	Stack Gas Velocity, ft/s	22.1	18.8	25.9	22.3
(A)	Stack Area, ft^2	12.57	12.57	12.57	12.57
(Qa)	Stack Gas Volumetric flow, acfm	16,653	14,168	19,530	16,783
(Qs,cmm)	Stack Gas Volumetric flow, dscfm	11,667	10,192	13,633	11,831
(Qs,cfm)	Stack Gas Volumetric flow, dscmm	330.4	288.6	386.0	335.0
(I)	Isokinetic Sampling Ratio, %	101.3	104.3	103.5	103.0

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber B Outlet

	RUN NUMBER	M23-B1	M23-B2	M23-B3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1511-2027	1140-1630	1100-1540	
	EMISSIONS DATA				
	DIOXINS:				
	2378 TCDD				
(ng)	Catch, ng	(0.010)	(0.010)	(0.010)	0.000
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0021)	(0.0033)	(0.0025)	0.000
(µg/hr)	Emission Rate, µg/hr	(0.0407)	(0.0578)	(0.0582)	0.000
	Total TCDD				
(ng)	Catch, ng	0.20	0.27	0.61	0.36
(ng/dscm)	Concentration, ng/dscm, as measured	0.041	0.090	0.15	0.095
(µg/hr)	Emission Rate, µg/hr	0.81	1.6	3.6	2.0
	12378 PeCDD				
(ng)	Catch, ng	(0.020)	(0.020)	(0.0080)	0.00
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0041)	(0.0067)	(0.0020)	0.00
(µg/hr)	Emission Rate, µg/hr	(0.08)	(0.12)	(0.05)	0.00
	Total PeCDD				
(ng)	Catch, ng	0.080	0.090	0.12000	0.097
(ng/dscm)	Concentration, ng/dscm, as measured	0.016	0.030	0.030	0.026
(µg/hr)	Emission Rate, µg/hr	0.33	0.52	0.70	0.51
	123478 HxCDD				
(ng)	Catch, ng	(0.020)	(0.020)	(0.030)	0.00
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0041)	(0.0067)	(0.0075)	0.00
(µg/hr)	Emission Rate, µg/hr	(0.081)	(0.12)	(0.17)	0.00
	123678 HxCDD				
(ng)	Catch, ng	(0.020)	(0.020)	(0.020)	0.00
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0041)	(0.0067)	(0.0050)	0.00
(µg/hr)	Emission Rate, µg/hr	(0.081)	(0.12)	(0.12)	0.00

( ) Not Detected. Value shown is the detection limit for that sample. ND values are not included in totals or averages.
{ } Estimated Maximum Possible Concentration. EMPC values are not included in totals or averages.

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber B Outlet

	RUN NUMBER	M23-B1	M23-B2	M23-B3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1511-2027	1140-1630	1100-1540	
	EMISSIONS DATA -Continued				
	DIOXINS - Continued				
	123789 HxCDD				
(ng)	Catch, ng	(0.020)	(0.020)	(0.020)	0.00
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0041)	(0.0067)	(0.0050)	0.00
(µg/hr)	Emission Rate, µg/hr	(0.08)	(0.12)	(0.12)	0.00
	Total HxCDD				
(ng)	Catch, ng	0.20	0.12	0.13	0.15
(ng/dscm)	Concentration, ng/dscm, as measured	0.041	0.040	0.033	0.038
(µg/hr)	Emission Rate, µg/hr	0.81	0.69	0.76	0.75
	1234678 HpCDD				
(ng)	Catch, ng	0.050	0.030	0.040	0.040
(ng/dscm)	Concentration, ng/dscm, as measured	0.010	0.010	0.010	0.010
(µg/hr)	Emission Rate, µg/hr	0.20	0.17	0.23	0.20
	Total HpCDD				
(ng)	Catch, ng	0.090	0.050	0.040	0.060
(ng/dscm)	Concentration, ng/dscm, as measured	0.018	0.017	0.010	0.015
(µg/hr)	Emission Rate, µg/hr	0.37	0.29	0.23	0.30
	Octa CDD				
(ng)	Catch, ng	0.34	{0.090}	{0.34}	0.34
(ng/dscm)	Concentration, ng/dscm, as measured	0.070	{0.030}	{0.085}	0.070
(µg/hr)	Emission Rate, µg/hr	1.4	{0.52}	{2.0}	1.4
	Total CDD				
(ng)	Catch, ng	0.91	0.53	0.90	0.78
(ng/dscm)	Concentration, ng/dscm, as measured	0.19	0.18	0.23	0.20
(µg/hr)	Emission Rate, µg/hr	3.7	3.1	5.2	4.0

( ) Not Detected. Value shown is the detection limit for that sample. ND values are not included in totals or averages.
Estimated Maximum Possible Concentration. EMPC values are not included in totals or averages.

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber B Outlet

	RUN NUMBER	M23-B1	M23-B2	M23-B3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1511-2027	1140-1630	1100-1540	
	EMISSIONS DATA				
	FURANS				
	2378 TCDF				
(ng)	Catch, ng	0.040	0.020	0.040	0.033
(ng/dscm)	Concentration, ng/dscm, as measured	0.0082	0.0067	0.0101	0.0083
(µg/hr)	Emission Rate, µg/hr	0.16	0.12	0.23	0.17
	Total TCDF				
(ng)	Catch, ng	1.4	0.37	1.2	1.0
(ng/dscm)	Concentration, ng/dscm, as measured	0.29	0.12	0.30	0.24
(µg/hr)	Emission Rate, µg/hr	5.7	2.1	7.0	4.9
	12378 PeCDF				
(ng)	Catch, ng	0.02	(0.01)	(0.01)	0.02
(ng/dscm)	Concentration, ng/dscm, as measured	0.0041	(0.0033)	(0.0025)	0.0041
(µg/hr)	Emission Rate, µg/hr	0.081	(0.058)	(0.058)	0.081
	23478 PeCDF				
(ng)	Catch, ng	0.030	(0.010)	(0.010)	0.030
(ng/dscm)	Concentration, ng/dscm, as measured	0.0062	(0.0033)	(0.0025)	0.0062
(µg/hr)	Emission Rate, µg/hr	0.12	(0.058)	(0.058)	0.12
	Total PeCDF				
(ng)	Catch, ng	0.43	0.060	0.26	0.25
(ng/dscm)	Concentration, ng/dscm, as measured	0.088	0.020	0.065	0.058
(µg/hr)	Emission Rate, µg/hr	1.7	0.35	1.5	1.2
	123478 HxCDF				
(ng)	Catch, ng	0.04	0.02	0.03	0.03
(ng/dscm)	Concentration, ng/dscm, as measured	0.0082	0.0067	0.0075	0.0075
(µg/hr)	Emission Rate, µg/hr	0.16	0.12	0.17	0.15

( ) Not Detected. Value shown is the detection limit for that sample. ND values are not included in totals or averages.
{ } Estimated Maximum Possible Concentration. EMPC values are not included in totals or averages.

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber B Outlet

	RUN NUMBER	M23-B1	M23-B2	M23-B3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1511-2027	1140-1630	1100-1540	
	EMISSIONS DATA - Continued				
	FURANS - Continued				
	123678 HxCDF				
(ng)	Catch, ng	0.020	0.0060	0.0080	0.011
(ng/dscm)	Concentration, ng/dscm, as measured	0.0041	0.0020	0.0020	0.0027
(µg/hr)	Emission Rate, µg/hr	0.081	0.035	0.047	0.054
	234678 HxCDF				
(ng)	Catch, ng	0.020	(0.010)	{0.010}	0.020
(ng/dscm)	Concentration, ng/dscm, as measured	0.0041	(0.0033)	{0.0025}	0.0041
(µg/hr)	Emission Rate, µg/hr	0.081	(0.058)	{0.058}	0.081
	123789 HxCDF				
(ng)	Catch, ng	(0.020)	(0.020)	(0.020)	0.00
(ng/dscm)	Concentration, ng/dscm, as measured	(0.0041)	(0.0067)	(0.0050)	0.00
(µg/hr)	Emission Rate, µg/hr	(0.081)	(0.116)	(0.116)	0.00
	Total HxCDF				
(ng)	Catch, ng	0.16	0.060	0.050	0.090
(ng/dscm)	Concentration, ng/dscm, as measured	0.033	0.020	0.013	0.022
(µg/hr)	Emission Rate, µg/hr	0.65	0.35	0.29	0.43
	1234678 HpCDF				
(ng)	Catch, ng	0.070	{0.020}	0.030	0.050
(ng/dscm)	Concentration, ng/dscm, as measured	0.014	{0.0067}	0.0075	0.011
(µg/hr)	Emission Rate, µg/hr	0.28	{0.12}	0.17	0.23
	1234789 HpCDF				
(ng)	Catch, ng	0.010	(0.020)	(0.030)	0.010
(ng/dscm)	Concentration, ng/dscm, as measured	0.0021	(0.0067)	(0.0075)	0.0021
(µg/hr)	Emission Rate, µg/hr	0.041	(0.12)	(0.17)	0.041

(Not Detected. Value shown is the detection limit for that sample. ND values are not included in totals or averages.

{ Estimated Maximum Possible Concentration. EMPC values are not included in totals or averages.

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber B Outlet

	RUN NUMBER	M23-B1	M23-B2	M23-B3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1511-2027	1140-1630	1100-1540	
	EMISSIONS DATA - Continued				
	FURANS+B216 - Continued				
	Total HpCDF				
(ng)	Catch, ng	0.080	{0.020}	0.030	0.055
(ng/dscm)	Concentration, ng/dscm, as measured	0.016	{0.0067}	0.0075	0.012
(µg/hr)	Emission Rate, µg/hr	0.33	{0.12}	0.17	0.25
	Octa CDF				
(ng)	Catch, ng	0.060	{0.020}	0.060	0.060
(ng/dscm)	Concentration, ng/dscm, as measured	0.012	{0.0067}	0.015	0.014
(µg/hr)	Emission Rate, µg/hr	0.24	{0.12}	0.35	0.30
	Total CDF				
(ng)	Catch, ng	2.1	0.49	1.6	1.4
(ng/dscm)	Concentration, ng/dscm, as measured	0.42	0.16	0.39	0.33
(µg/hr)	Emission Rate, µg/hr	8.3	2.8	9.1	6.8
	Total CDD + CDF				
(ng)	Catch, ng	3.0	1.0	2.5	2.2
(ng/dscm)	Concentration, ng/dscm, as measured	0.61	0.34	0.62	0.52
(µg/hr)	Emission Rate, µg/hr	12	5.9	14	11

( ) Not Detected. Value shown is the detection limit for that sample. ND values are not included in totals or averages.
{ } Estimated Maximum Possible Concentration. EMPC values are not included in totals or averages.

CDD/CDF Corrected Stack Gas Concentrations and 2378 TCDD Toxic Equivalent Concentrations
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 23 - CDD/CDF
Kiln No. 2 - Scrubber B Outlet

	CONCENTRATION (ng/dscmm, adjusted to 7% O2)				2378-TCDD Toxic Equivalent Factor	2378 TOXIC EQUIVALENCIES (ng/dscmm, adjusted to 7% O2)			
..JN NUMBER	M23-B1	M23-B2	M23-B3			M23-B1	M23-B2	M23-B3	
RUN DATE	10/16/96	10/17/96	10/18/96	Average		10/16/96	10/17/96	10/18/96	Average
.JN TIME	1511-2027	1140-1630	1100-1540			1511-2027	1140-1630	1100-1540	
OXINS:									
2378 TCDD	(0.0022)	(0.0035)	(0.0026)	0.000	1.000	(0.0022)	(0.004)	(0.003)	0.000
tal TCDD	0.044	0.095	0.160	0.10					
12378 PeCDD	(0.0044)	(0.0070)	(0.0021)	0.0000	0.500	(0.0022)	(0.004)	(0.0011)	0.000
Total PeCDD	0.017	0.032	0.032	0.027					
3478 HxCDD	(0.0044)	(0.0070)	(0.0079)	0.000	0.100	(0.00044)	(0.00070)	(0.00079)	0.000
3678 HxCDD	(0.0044)	(0.0070)	(0.0053)	0.000	0.100	(0.00044)	(0.00070)	(0.00053)	0.000
123789 HxCDD	(0.0044)	(0.0070)	(0.0053)	0.000	0.100	(0.00044)	(0.00070)	(0.00053)	0.000
tal HxCDD	0.044	0.042	0.034	0.04					
34678 HpCDD	0.011	0.011	0.011	0.011	0.010	0.00011	0.00011	0.00011	0.00011
Total HpCDD	0.020	0.018	0.011	0.016					
cta CDD	0.074	{0.032}	{0.089}	0.074	0.001	0.000074	{0.000032}	{0.000089}	0.000074
tal CDD	0.20	0.19	0.24	0.21					
FURANS									
78 TCDF	0.0087	0.0070	0.011	0.0087	0.100	0.00087	0.00070	0.0011	0.00087
Total TCDF	0.30	0.13	0.32	0.25					
378 PeCDF	0.0044	(0.0035)	(0.0026)	0.0044	0.050	0.00022	(0.00018)	(0.00013)	0.00022
478 PeCDF	0.0065	(0.0035)	(0.0026)	0.0065	0.500	0.0033	(0.0018)	(0.0013)	0.0033
Total PeCDF	0.094	0.021	0.068	0.061					
3478 HxCDF	0.0087	0.0070	0.0079	0.0079	0.100	0.00087	0.00070	0.00079	0.00079
3678 HxCDF	0.0044	0.0021	0.0021	0.0029	0.100	0.00044	0.00021	0.00021	0.00029
234678 HxCDF	0.0044	(0.0035)	0.0026	0.0035	0.100	0.00044	(0.00035)	0.00026	0.00035
123789 HxCDF	(0.0044)	(0.0070)	(0.0053)	0.000	0.100	(0.00044)	(0.00070)	(0.00053)	0.000
tal HxCDF	0.035	0.021	0.013	0.023					
234678 HpCDF	0.014	{0.0067}	0.0075	0.011	0.010	0.00014	{0.000067}	0.00008	0.00011
1234789 HpCDF	0.0022	(0.0070)	(0.0079)	0.0022	0.010	0.000022	(0.000070)	(0.000079)	0.000022
tal HpCDF	0.017	{0.0070}	0.0079	0.013					
ta CDF	0.013	{0.0070}	0.016	0.014	0.001	0.000013	{0.0000070}	0.000016	0.000014
Total CDF	0.45	0.17	0.41	0.34					
tal CDD + CDF	0.64	0.36	0.65	0.55					

Program

ISOKINETIC CALCULATION 23B1

SITE KILN NO. 2 SCRUBBER "B" OUTLET TEST NO.

			RUN 1	RUN 2	RUN 3
1. Volume of dry gas sampled corrected to standard conditions. Note: V_m must be corrected for leakage if any leakage rates exceed L_a). $V_{m_{std}} = 17.65 \times V_m \times Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] =$	A	V_m, ft^3	187.909	116.621	151.944
	B	Y	1.003	1.003	1.003
	C	P_{bar}, in.Hg	28.65	28.54	28.30
	D	$\overline{\Delta H}$, in.H_2O	2.29	0.81	1.48
	E	$\overline{T_m}$, °R	554	551	541
	F	$V_{m_{std}}$, dscf	186.988	107.159	141.249
2. Volume of water vapor at standard conditions, ft^3. $V_{w_{std}} = 0.04707 V_{lc} =$	G	V_{lc}, g	783.0	415.4	614.4
	H	$V_{w_{std}}$, ft^3	36.856	19.553	28.920
3. Moisture content in stack gas. $B_{ws} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} =$	I	B_{ws}	0.1647	0.1543	0.1699 0.1777
	J	$1-B_{ws}$	0.8353	.8457	0.8301
4. Dry molecular weight of stack gas, lb/lb-mole. $M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO) =$		% CO_2	19.0	20.0	19.7
		% O_2	7.8	7.7	7.6
		% N_2 + % CO	73.3	72.3	72.7
	K	M_d, lb/lb-mole	31.38	31.508	31.46
5. Molecular weight of stack gas. $M_s = M_d\ (1-B_{ws}) + 18\ B_{ws} =$	L	M_s, lb/lb-mole	29.18	29.42	29.17
6. Stack velocity at stack conditions, fps. $V_s = 85.49\ Cp\ (avg.\ \sqrt{\Delta P}) \sqrt{\frac{T_s}{P_s M_s}} =$	M	P_{static}, in.H_2O	-0.06	+0.05	+0.12
	N	P_s, in.Hg	28.65	28.54	28.31
	O	$\overline{T_s}$, °R 595	535	591	594
	P	$\overline{\sqrt{\Delta P}}$	0.3635	0.3117	0.4252
NOTE: $P_s = P_{bar} + \left(\frac{P_{static}}{13.6}\right)$	Q	Cp	0.84	0.84	0.84
	R	V_s, fps	22.02	18.779	25.897
7. Isokinetic variation $\%\ I = \frac{V_{m_{std}} \times T_s \times 17.32}{V_s \times D_n^2 \times \theta \times P_s \times (1-B_{ws})}$	S	Dn, in.	0.375	0.310	0.310
	T	θ, min.	240.0	240	240
	U	% I	108.3	104.9	103.5

EMISSION CALCULATIONS*

SITE _____ TEST NO. _____

			RUN 1	RUN 2	RUN 3
8. Stack gas volumetric flow rate at stack conditions, acfm	R	V_s, fps	22.02	18,779	25,897
$Q_s = 0.3272 \times V_s \times D_s^2 =$	V	D_s, in.	48.	48	48
	W	Q_s, acfm	16600.	14,157	19,523
9. Dry stack gas volumetric flow rate at standard conditions, dscfm	N	P_s, in.Hg	28.65	28.54	28.31
$Q_{s_{std}} = 17.65\ Q_s \frac{P_s}{T_s}\left(1-B_{ws}\right) =$	O	T_s, °R	595.	591	594
	J	$(1-B_{ws})$	0.8353	.8457	0.8301
	X	$Q_{s_{std}}$, dscfm	11,784	10,205	13,632
10. Concentration, gr/dscf	Y	Mn, mg	---.		
$C_s = 0.01543\left(\frac{Mn}{V_{m_{std}}}\right) =$	F	$V_{m_{std}}$, dscf	---.		
	Z	C_s, gr/dscf	---.		
11. Concentration, ppm	AA	M_w, lb/lb-mole	---.		
$ppm = \frac{5.595 \times 10^4}{M_w} \times C_s =$	BB	ppm			
12. Mass emission rate, lb/h		E, lb/h			
a) $E = (8.573 \times 10^{-3}) \times C_s \times Q_{s_{std}} =$	EA				
b) $E = (1.532 \times 10^{-7}) \times ppm \times M_w \times Q_{s_{std}} =$	EB				

*Continuation of isokinetic calculations

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 29 - Metals and Particulate Matter
Kiln No. 2 - Scrubber B Outlet

	RUN NUMBER	M29-B-1	M29-B-2	M29-B-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1514-2037	1140-1630	1100-1550	
	MEASURED DATA				
(Y)	Meter Box Correction Factor, Y	1.003	1.003	1.003	1.003
(dH)	Avg Meter Orifice Pressure, in. H2O	2.004	0.670	1.043	1.239
(Pbar)	Barometric Pressure, in. Hg	28.65	28.54	28.30	28.50
(Vm)	Sample Volume, ft^3	187.128	109.837	132.495	143.153
(Tm)	Average Meter Temperature, °F	94	97	85	92
(Pg)	Stack Static Pressure, in. H2O	-0.06	0.05	0.12	0.04
(Ts)	Average Stack Temperature, °F	135	130	133	133
(Vlc)	Condensate Collected, ml	776.9	390.4	520.7	562.7
(%CO2)	Carbon Dioxide content, % by volume	19.0	20.0	19.7	19.6
(%O2)	Oxygen content, % by volume	7.8	7.7	7.6	7.7
(%N2)	Nitrogen content, % by volume	73.2	72.3	72.7	72.7
(Cp)	Pitot Tube Coefficient	0.84	0.84	0.84	0.84
(dP)	Avg Sqrt Delta P, (in. H2O)½	0.3587	0.3028	0.3745	0.3454
(Theta)	Sample Time, min	240	240	240	240
(Dn)	Nozzle Diameter, in.	0.378	0.310	0.310	0.333
	CALCULATED DATA				
(An)	Nozzle Area, square feet	0.00078	0.00052	0.00052	0.00061
(Vmstd, cf)	Standard Meter Volume, ft^3	172.068	99.783	122.085	131.312
(Vmstd, cm)	Standard Meter Volume, m^3	4.872	2.826	3.457	3.718
(Qm)	Average Sampling Rate, dscfm	0.717	0.416	0.509	0.547
(Ps)	Stack Pressure, inches Hg	28.65	28.54	28.31	28.50
(%H2O)	Moisture, %	17.5	15.6	16.7	16.6
(%H2Osat)	Moisture (at saturation), %	18.2	16.0	17.5	17.2
(Vwstd)	Standard Water Vapor Volume, ft^3	36.569	18.376	24.509	26.485
(Mfd)	Dry Mole Fraction	0.825	0.844	0.833	0.834
(Md)	Molecular Weight-dry, lb/lb-mole	31.35	31.51	31.46	31.44
(Ms)	Molecular Weight-wet, lb/lb-mole	29.01	29.41	29.21	29.21
(Vs)	Velocity, ft/s	21.8	18.2	22.8	20.9
(A)	Stack Area, ft^2	12.57	12.57	12.57	12.57
(Qa)	Stack Gas Volumetric flow, acfm	16,444	13,754	17,185	15,795
(Qs, cfm)	Stack Gas Volumetric flow, dscfm	11,510	9,907	12,044	11,153
(Qs, cmm)	Stack Gas Volumetric flow, dscmm	326	281	341	316
(I)	Isokinetic Sampling Ratio, %	100.5	100.7	101.3	100.8

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 29 - Metals and Particulate Matter
Kiln No. 2 - Scrubber B Outlet

	RUN NUMBER	M29-B-1	M29-B-2	M29-B-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1514-2037	1140-1630	1100-1550	
	EMISSIONS DATA				
	Particulate Matter				
(g)	Catch, grams	0.3619	0.3491	0.2988	0.3366
(gr/dscf)	Concentration, gr/dscf	0.0325	0.0540	0.0378	0.0414
(gr/dscf@7%)	Concentration, gf/dscf @ 7% O2	0.0215	0.0360	0.0253	0.0276
(g/dscm)	Concentration, g/dscm	0.0743	0.124	0.0864	0.0948
(g/dscm@7%)	Concentration, g/dscm @ 7% O2	0.0493	0.0824	0.0578	0.0631
(lb/hr)	Emission Rate, lb/hr	3.20	4.58	3.90	3.90
(kg/hr)	Emission Rate, kg/hr	1.45	2.08	1.77	1.77
	Antimony				
(µg)	Catch, micrograms	18.0	16.7	10.8	15.2
(µg/dscm)	Concentration, µg/dscm	3.69	5.91	3.12	4.24
µg/dscm @ 7%	Concentration, µg/dscm @ 7% O2	3.92	6.22	3.26	4.47
(g/hr)	Emission Rate, g/hr	0.0722	0.0995	0.0639	0.0785
	Arsenic				
(µg)	Catch, micrograms	7.35	5.90	3.56	5.60
(µg/dscm)	Concentration, µg/dscm	1.51	2.09	1.03	1.54
µg/dscm @ 7%	Concentration, µg/dscm @ 7% O2	1.60	2.20	1.08	1.63
(g/hr)	Emission Rate, g/hr	0.0295	0.0351	0.0211	0.0286
	Beryllium				
(µg)	Catch, micrograms	54.2	46.8	58.2	53.1
(µg/dscm)	Concentration, µg/dscm	11.1	16.6	16.8	14.8
µg/dscm @ 7%	Concentration, µg/dscm @ 7% O2	11.8	17.4	17.6	15.6
(g/hr)	Emission Rate, g/hr	0.218	0.279	0.344	0.280
	Cadmium				
(µg)	Catch, micrograms	9.67	13.3	4.74	9.24
(µg/dscm)	Concentration, µg/dscm	1.98	4.71	1.37	2.69
µg/dscm @ 7%	Concentration, µg/dscm @ 7% O2	2.11	4.96	1.43	2.83
(g/hr)	Emission Rate, g/hr	0.0388	0.0792	0.0281	0.0487
	Chromium				
(µg)	Catch, micrograms	37.9	47.3	24.2	36.5
(µg/dscm)	Concentration, µg/dscm	7.78	16.7	7.00	10.5
µg/dscm @ 7%	Concentration, µg/dscm @ 7% O2	8.25	17.6	7.32	11.1
(g/hr)	Emission Rate, g/hr	0.152	0.282	0.143	0.192

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 29 - Metals and Particulate Matter
Kiln No. 2 - Scrubber B Outlet

	RUN NUMBER	M29-B-1	M29-B-2	M29-B-3	
	RUN DATE	10/16/96	10/17/96	10/18/96	Average
	RUN TIME	1514-2037	1140-1630	1100-1550	
	EMISSIONS DATA - Continued				
	Cobalt				
(µg)	Catch, micrograms	71.6	45.1	56.7	57.8
(µg/dscm)	Concentration, µg/dscm	14.7	16.0	16.4	15.7
µg/dscm @ 7%	Concentration, µg/dscm @ 7% O2	15.6	16.8	17.1	16.5
(g/hr)	Emission Rate, g/hr	0.287	0.269	0.336	0.297
	Lead				
(µg)	Catch, micrograms	69.3	149	47.1	88.5
(µg/dscm)	Concentration, µg/dscm	14.2	52.7	13.6	26.9
µg/dscm @ 7%	Concentration, µg/dscm @ 7% O2	15.1	55.5	14.2	28.3
(g/hr)	Emission Rate, g/hr	0.278	0.888	0.279	0.482
	Manganese				
(µg)	Catch, micrograms	44.1	174	73.6	97.2
(µg/dscm)	Concentration, µg/dscm	9.05	61.6	21.3	30.6
µg/dscm @ 7%	Concentration, µg/dscm @ 7% O2	9.60	64.8	22.3	32.2
(g/hr)	Emission Rate, g/hr	0.177	1.04	0.436	0.550
	Mercury				
(µg)	Catch, micrograms	13.6	6.36	6.87	8.94
(µg/dscm)	Concentration, µg/dscm	2.79	2.25	1.99	2.34
µg/dscm @ 7%	Concentration, µg/dscm @ 7% O2	2.96	2.37	2.08	2.47
(g/hr)	Emission Rate, g/hr	0.0546	0.0379	0.0407	0.0444
	Nickel				
(µg)	Catch, micrograms	78.1	76.0	65.2	73.1
(µg/dscm)	Concentration, µg/dscm	16.0	26.9	18.9	20.6
µg/dscm @ 7%	Concentration, µg/dscm @ 7% O2	17.0	28.3	19.7	21.7
(g/hr)	Emission Rate, g/hr	0.313	0.453	0.386	0.384
	Selenium				
(µg)	Catch, micrograms	227	110	87.4	141
(µg/dscm)	Concentration, µg/dscm	46.6	38.9	25.3	36.9
µg/dscm @ 7%	Concentration, µg/dscm @ 7% O2	49.4	41.0	26.4	39.0
(g/hr)	Emission Rate, g/hr	0.911	0.655	0.517	0.695

PES Program

ISOKINETIC CALCULATION M29 B-1

SITE KILN NO. 2 SCRUBBER B OUTLET TEST NO. _____

			RUN 1	RUN 2	RUN 3
1. Volume of dry gas sampled corrected to standard conditions. Note: V_m must be corrected for leakage if any leakage rates exceed L_a). $V_{m_{std}} = 17.65 \times V_m \times Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] =$	A	V_m, ft^3	187.128	109.837	132.495
	B	Y	1.003	1.003	1.003
	C	P_{bar}, in.Hg	28.65	28.54	28.30
	D	$\overline{\Delta H}$, in.H_2O	2.00	0.67	1.04
	E	$\overline{T_m}$, °R	554	557	545
	F	$V_{m_{std}}$, dscf	172.195	99.803	122.126
2. Volume of water vapor at standard conditions, ft^3. $V_{w_{std}} = 0.04707 V_{lc} =$	G	V_{lc}, g	776.9	390.4	520.7
	H	$V_{w_{std}}$, ft^3	36.569	18.376	24.509
3. Moisture content in stack gas. $B_{ws} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} =$	I	B_{ws}	0.1752	0.1555 (.1585)	0.1671 0.1731
	J	$1-B_{ws}$	0.8248	0.8445 (.8415)	0.8329
4. Dry molecular weight of stack gas, lb/lb-mole. $M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO) =$		% CO_2	19.0	20.0	19.7
		% O_2	7.8	7.87	7.6
		% N_2 + % CO	73.3	72.83	72.7
	K	M_d, lb/lb-mole	31.38	31.51	31.46
5. Molecular weight of stack gas. $M_s = M_d\ (1-B_{ws}) + 18\ B_{ws} =$	L	M_s, lb/lb-mole	29.04	29.41	~~28.3~~ 29.21
6. Stack velocity at stack conditions, fps. $V_s = 85.49\ Cp\ (\text{avg.}\sqrt{\Delta P}) \sqrt{\frac{T_s}{P_s M_s}} =$	M	P_{static}, in.H_2O	-0.06	+.05	+0.12
	N	P_s, in.Hg	28.65	28.54	28.31
	O	$\overline{T_s}$, °R	595	590	593
	P	$\overline{\sqrt{\Delta P}}$	0.3587	0.3028	0.3745
NOTE: $P_s = P_{bar} + \left(\frac{P_{static}}{13.6}\right)$	Q	Cp	0.84	0.84	0.84
	R	V_s, fps	21.78	18.231	22.774
7. Isokinetic variation $\%\ I = \frac{V_{m_{std}} \times T_s \times 17.32}{V_s \times D_n^2 \times \theta \times P_s \times (1-B_{ws})}$	S	Dn, in.	0.378	0.310	0.310
	T	θ, min.	240.0	240	240
	U	% I	100.5	100.6	101.3

EMISSION CALCULATIONS*

SITE _____ TEST NO. _____

			RUN 1	RUN 2	RUN 3
8. Stack gas volumetric flow rate at stack conditions, acfm $Q_s = 0.3272 \times V_s \times D_s^2 =$	K	V_s, fps	21.78	18.231	22.774
	V	D_s, in.	48.0	48	48
	W	Q_s, acfm	16419.	13,743	17,169
9. Dry stack gas volumetric flow rate at standard conditions, dscfm $Q_{s_{std}} = 17.65\ Q_s \frac{P_s}{T_s}\left(1-B_{ws}\right) =$	N	P_s, in.Hg	28.65	28.54	28.31
	O	T_s, °R	595.	590	593
	J	$(1-B_{ws})$	0.8248	0.8445 (.8415)	0.8329
	X	$Q_{s_{std}}$, dscfm	11509	9910	12,049
10. Concentration, gr/dscf $C_s = 0.01543\left(\frac{Mn}{V_{m_{std}}}\right) =$	Y	Mn, mg	---.-		
	F	$V_{m_{std}}$, dscf	--.--		
	Z	C_s, gr/dscf	-.---		
11. Concentration, ppm $ppm = \frac{5.595 \times 10^4}{M_w} \times C_s =$	AA	M_w, lb/lb-mole	---.-		
	BB	ppm			
12. Mass emission rate, lb/h		E, lb/h			
a) $E = (8.573 \times 10^{-3}) \times C_s \times Q_{s_{std}} =$	EA				
b) $E = (1.532 \times 10^{-7}) \times ppm \times M_w \times Q_{s_{std}} =$	EB				

*Continuation of isokinetic calculations

Appendix D.1.4

Calculations

Kiln No. 2 - Total Hydrocarbons

Eastern Ridge Lime Company

Kiln No. 2 Inlet to Scrubbers

October 16, 1996

Calibration Gases	System Calibration
0.0 ppm	0.80
30.04 ppm	29.60
49.72 ppm	48.80
87.86 ppm	84.00

Direct Calibration
0.00
30.40
50.80
88.00

Correlation	0.9999234
Slope	0.9476922
Intercept	1.0869601

Sampling System Bias
0.80%
0.80%
2.00%
4.00%

Correlation	0.999919
Slope	1.002605
Intercept	0.285829

Calibration Error
1.20%
2.17%

13:20

Calibration Gases	System Calibration
0.0 ppm	0.80
30.04 ppm	31.20
49.72 ppm	51.20
87.86 ppm	88.00

Calibration Error
0.60%
1.30%

Correlation	0.9999027
Slope	0.9928036
Intercept	1.1965651

	Post Cal	Drift
14:50	1.20	0.40%
	51.20	0.00%

15:08-15:15	3.8	Corrected	2.6 ppm THC (wet)
15:15-15:30	4.1		2.9
15:30-15:45	4.1		2.9
15:45-16:06	4.5		3.3
16:06-16:21	4.6		3.4
16:21-16:36	4.7		3.5
16:36-16:51	4.5		3.3
16:51-17:06	4.0		2.8
17:06-17:21	3.4		2.2

	Post Cal	Drift
17:20	2.40	1.60%
	29.20	2.00%
	46.80	4.40%

Calibration Gases	System Calibration
0.0 ppm	2.40
30.04 ppm	29.20
49.72 ppm	46.80
87.86 ppm	80.00

Calibration Error
0.31%
0.67%

Correlation	0.9999739
Slope	0.8833756
Intercept	2.5821466

17:39-17:45	4.9	Corrected	2.6 ppm THC (wet)
17:45-18:00	4.5		2.2
18:00-18:15	4.2		1.8
18:15-18:30	4.1		1.7
18:30-18:45	3.9		1.5

Eastern Ridge Lime Company

Kiln No. 2 Inlet to Scrubbers

18:45-19:00	4.3	1.9	(wet)
19:00-19:15	3.4	0.9	
19:15-19:30	3.8	1.4	
19:30-19:45	3.6	1.2	
19:45-20:00	3.7	1.3	
20:00-20:05	3.8	1.4	

	Post Cal	Drift
20:10	1.20	1.20%
	45.60	1.20%

October 17, 1996

Calibration Gases	System Calibration
0.0 ppm	0.40
30.04 ppm	28.40
49.72 ppm	47.20
87.86 ppm	81.60

Direct Calibration
0.00
30.40
50.80
87.60

Correlation	0.9999313
Slope	0.9251364
Intercept	0.6321576

Sampling System Bias
0.40%
2.00%
3.60%
6.00%

Correlation	0.999877
Slope	0.998088
Intercept	0.375103

Calibration Error
1.20%
2.17%

	Post Cal	Drift
11:27	0.40	0.00%
	46.80	0.40%

11:40-12:00	6.3		Corrected	6.1	ppm THC (wet)
12:00-12:15	6.4			6.2	
12:15-12:30	5.8			5.6	
12:30-12:45	5.7			5.5	
12:45-13:00	6.7			6.6	
13:00-13:15	6.7			6.6	
13:15-13:30	7.2			7.1	

	Post Cal	Drift
13:32	1.60	1.20%
	49.20	2.00%

14:00-14:15	9.2		Corrected	9.3	ppm THC (wet)
14:15-14:30	6.9			6.8	
14:30-14:45	5.9			5.7	
14:45-15:00	6.0			5.8	
15:00-15:15	5.5			5.3	
15:15-15:30	5.3			5.0	
15:30-15:36	5.5			5.3	

	Post Cal	Drift
15:38	1.60	1.20%
	46.40	0.80%

15:45-16:00	6.3		Corrected	6.1	ppm THC (wet)
16:00-16:15	6.3			6.1	
16:15-16:30	6.5			6.3	

	Post Cal	Drift
17:06	1.60	1.20%
	46.80	0.40%

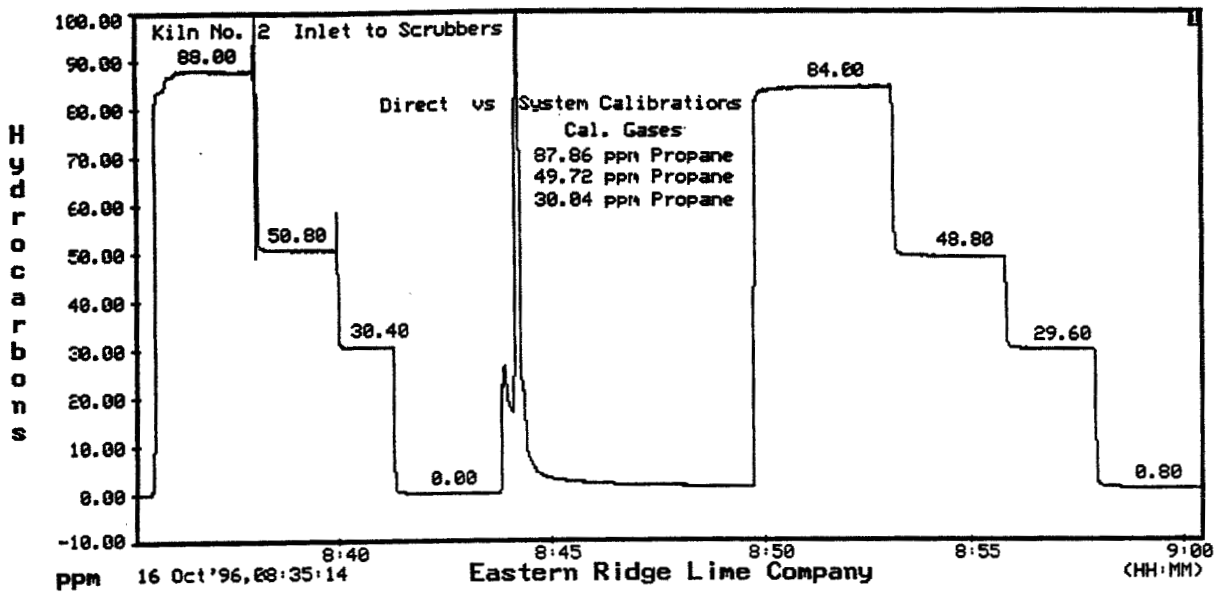
Eastern Ridge Lime Company
Kiln No. 2 Inlet to Scrubbers

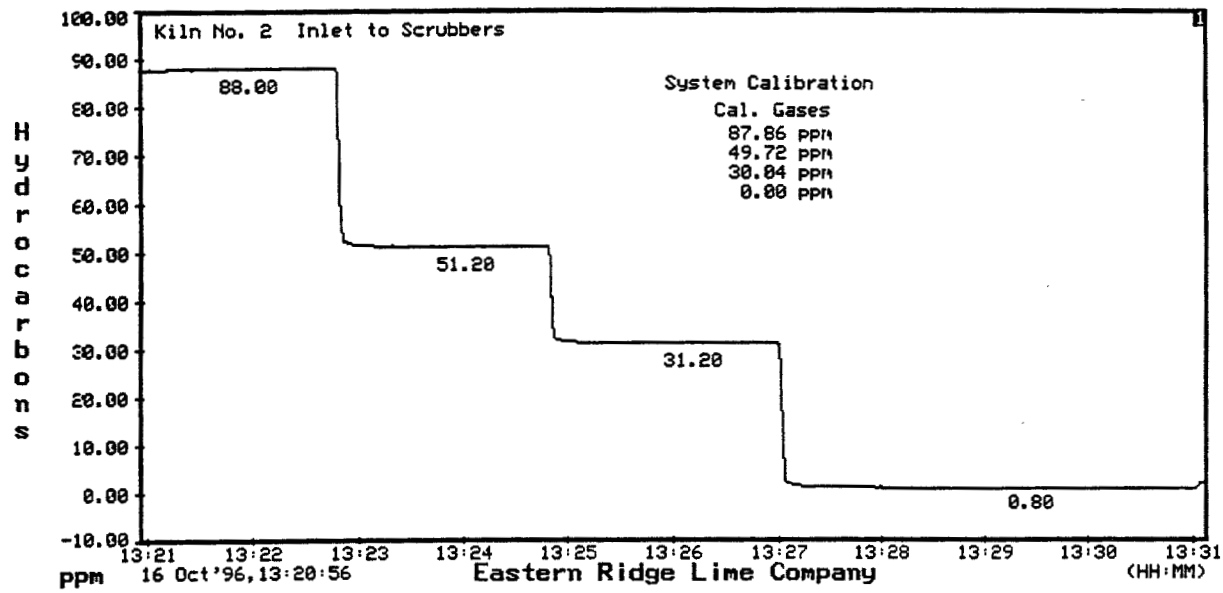
October 18, 1996

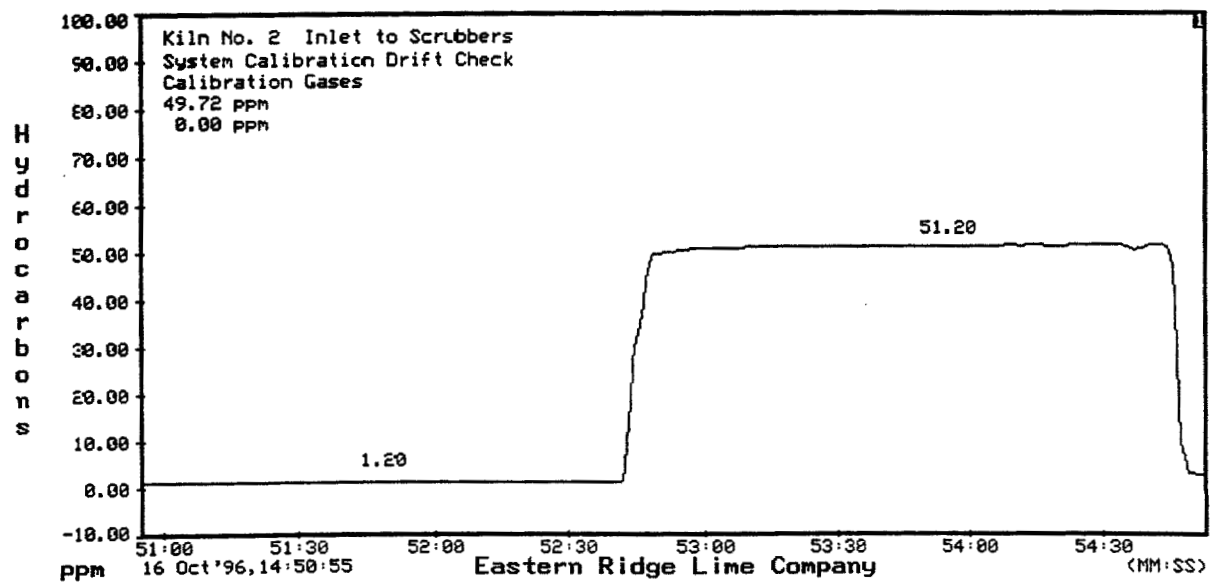
Calibration Gases	System Calibration	Direct Calibration
0.0 ppm	0.40	0.40
30.04 ppm	28.40	30.40
49.72 ppm	47.20	50.40
87.86 ppm	80.80	87.20

Correlation	0.9998347	Correlation	0.999935
Slope	0.9161029	Slope	0.988685
Intercept	0.8107061	Intercept	0.669159
Sampling System Bias		Calibration Error	
0.00%			
2.00%		1.20%	
3.20%		1.37%	
6.40%			

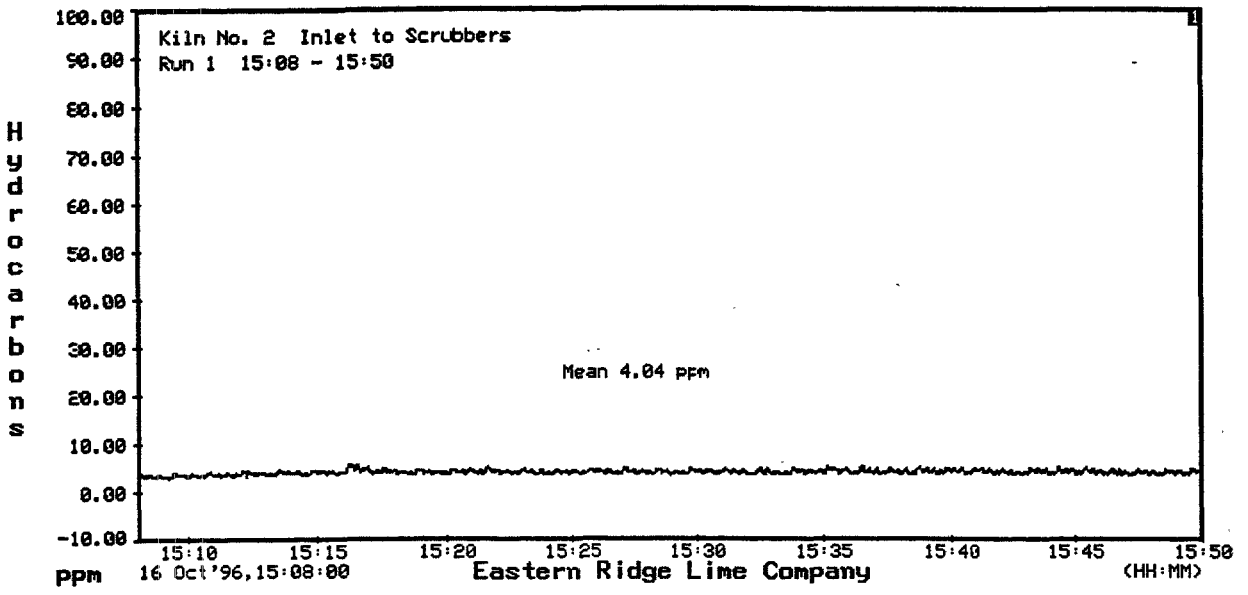
10:10-10:30	6.2			5.9	ppm THC (wet)
10:30-10:45	6.0			5.7	
10:45-11:00	5.3			4.9	
11:00-11:15	5.0			4.6	
11:15-11:30	4.7			4.2	
11:30-11:45	4.1			3.6	
11:45-12:00	3.8			3.3	
	Post Cal	Drift			
12:03	0.80	0.40%			
	46.00	1.20%			
12:15-12:30	4.9		Corrected	4.5	ppm THC (wet)
12:30-12:45	4.8			4.4	
12:45-13:05	4.5			4.0	
13:05-13:15	4.5			4.0	
13:15-13:30	4.4			3.9	
13:30-13:45	4.2			3.7	
13:45-14:00	4.2			3.7	
	Post Cal	Drift			
14:04	1.20	0.80%			
	44.40	2.80%			
14:15-14:30	6.9		Corrected	6.6	ppm THC (wet)
14:30-14:45	6.4			6.1	
14:45-15:00	5.9			5.6	
15:00-15:15	5.3			4.9	
15:15-15:30	4.1			3.6	
15:30-15:45	3.9			3.4	
15:45-16:00	3.0			2.4	
16:00-16:05	2.5			1.8	
	Post Cal	Drift			
16:08	0.00	0.40%			
	23.60	4.80%			
	39.20	8.00%			

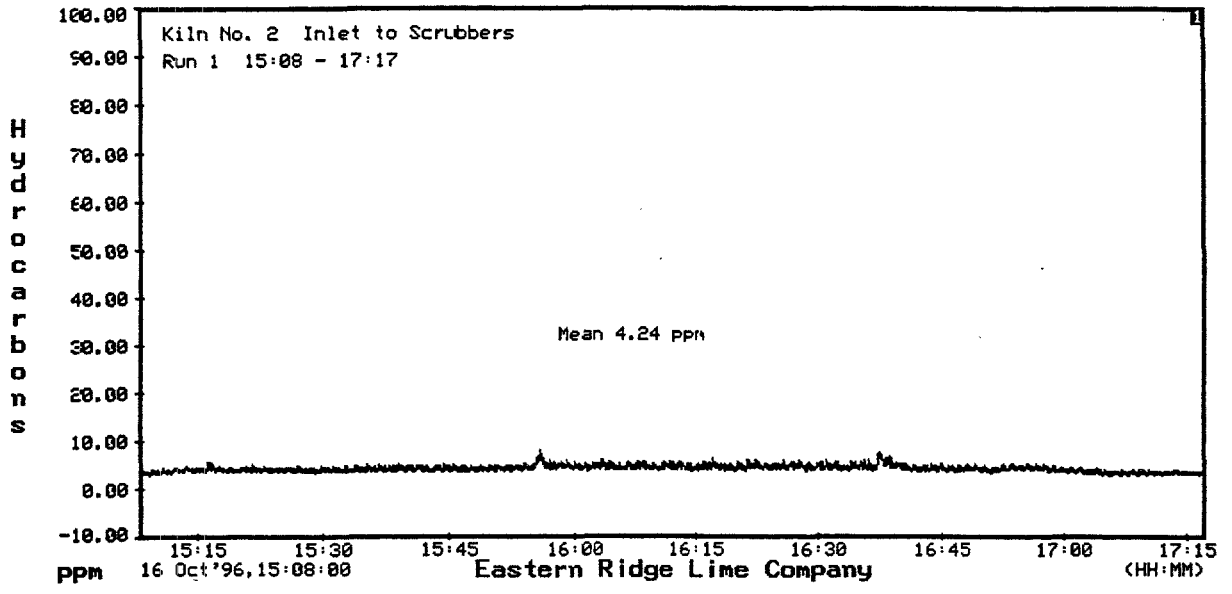

Kiln No. 2 Inlet to Scrubbers
Direct vs System Calibrations
Cal. Gases
87.86 ppm Propane
49.72 ppm Propane
30.04 ppm Propane
88.00
50.80
30.40
0.00
84.00
48.80
29.60
0.80
Hydrocarbons
ppm
16 Oct'96,08:35:14
Eastern Ridge Lime Company
(HH:MM)

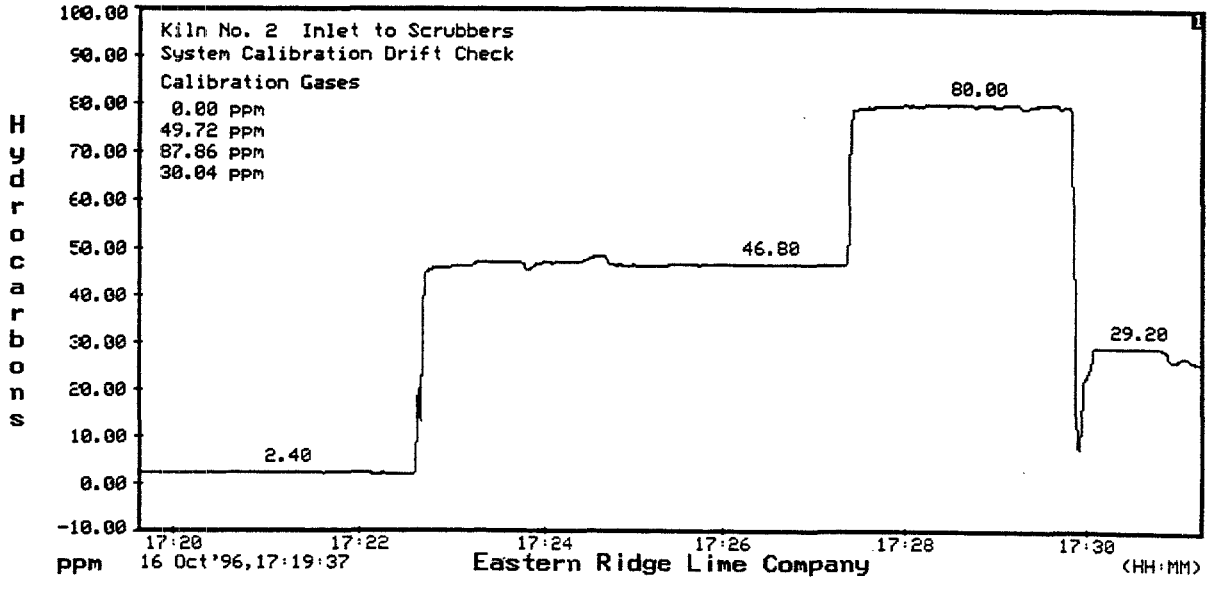

Kiln No. 2 Inlet to Scrubbers
System Calibration
Cal. Gases
87.86 ppm
49.72 ppm
30.04 ppm
0.00 ppm
88.00
51.20
31.20
0.80
Hydrocarbons
ppm
16 Oct'96,13:20:56
Eastern Ridge Lime Company
(HH:MM)

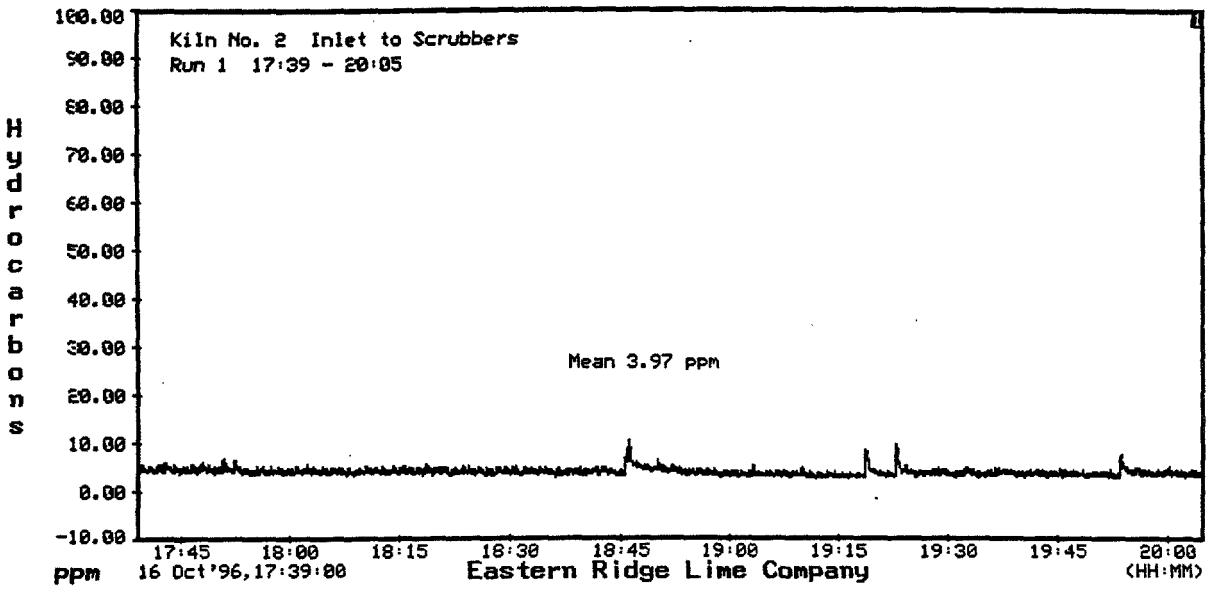

Kiln No. 2 Inlet to Scrubbers
System Calibration Drift Check
Calibration Gases
49.72 ppm
0.00 ppm
51.20
1.20
Hydrocarbons
ppm
16 Oct'96,14:50:55
Eastern Ridge Lime Company
(MM:SS)

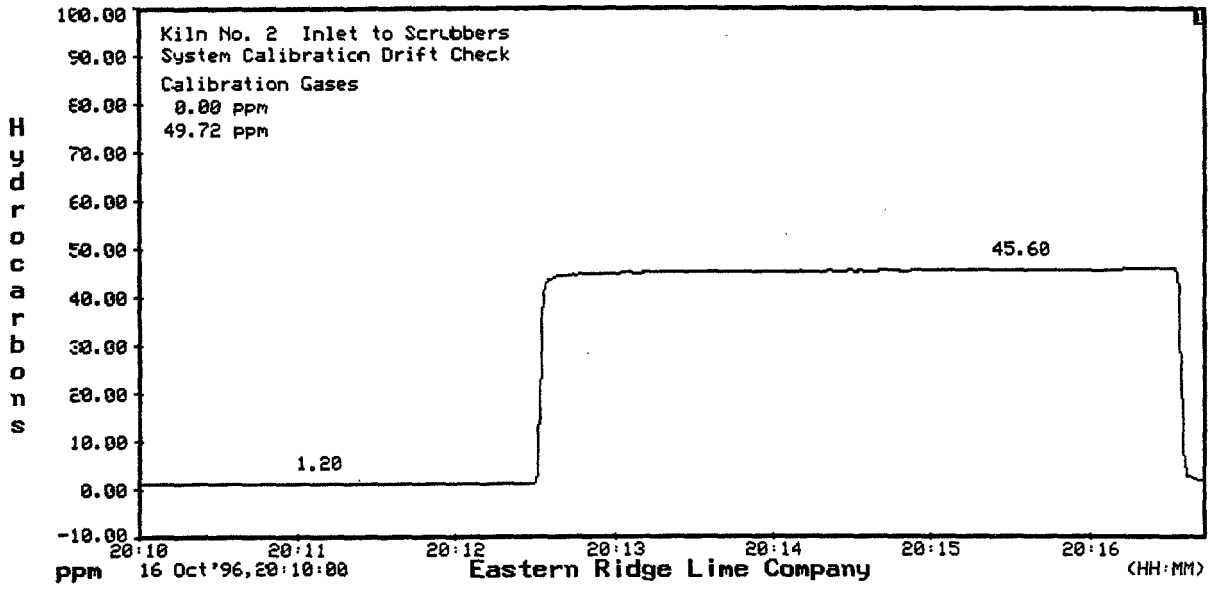
Key:


Kiln No. 2 Inlet to Scrubbers
Run 1 15:08 - 15:50
Mean 4.04 ppm
Hydrocarbons
ppm
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
15:10
15:15
15:20
15:25
15:30
15:35
15:40
15:45
15:50
16 Oct'96,15:08:00
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Inlet to Scrubbers
Run 1 15:08 - 17:17
Mean 4.24 ppm
Hydrocarbons
ppm
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
15:15
15:30
15:45
16:00
16:15
16:30
16:45
17:00
17:15
16 Oct'96,15:08:00
Eastern Ridge Lime Company
(HH:MM)

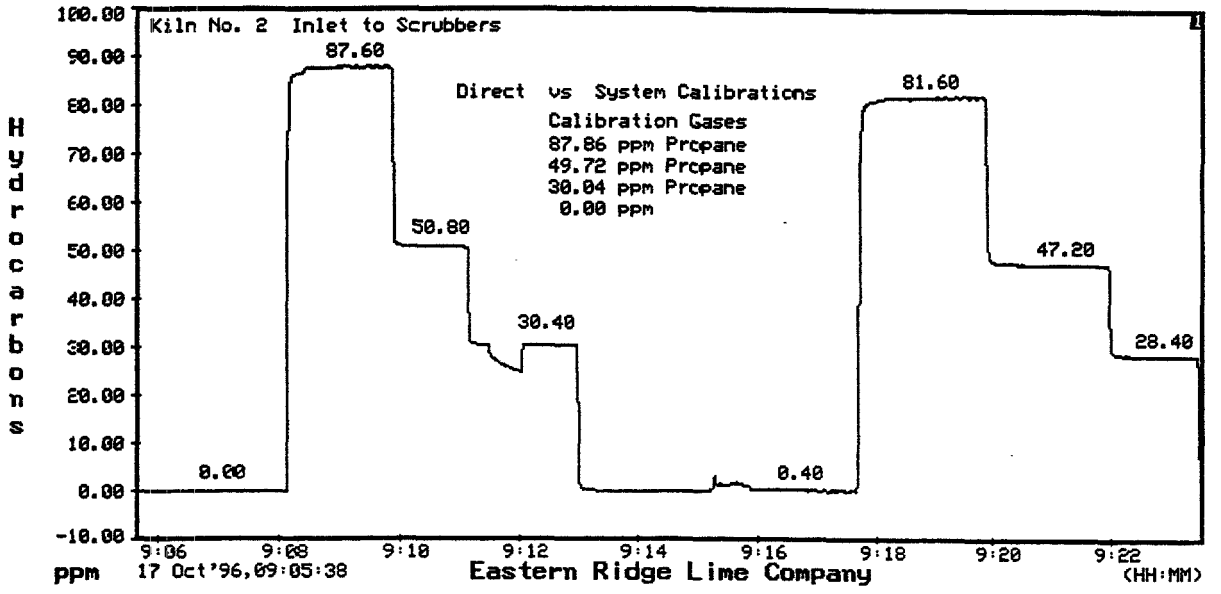

Kiln No. 2 Inlet to Scrubbers
System Calibration Drift Check
Calibration Gases
0.00 ppm
49.72 ppm
87.86 ppm
30.04 ppm
2.40
46.80
80.00
29.20
Hydrocarbons
ppm
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
17:20
17:22
17:24
17:26
17:28
17:30
16 Oct'96,17:19:37
Eastern Ridge Lime Company
(HH:MM)

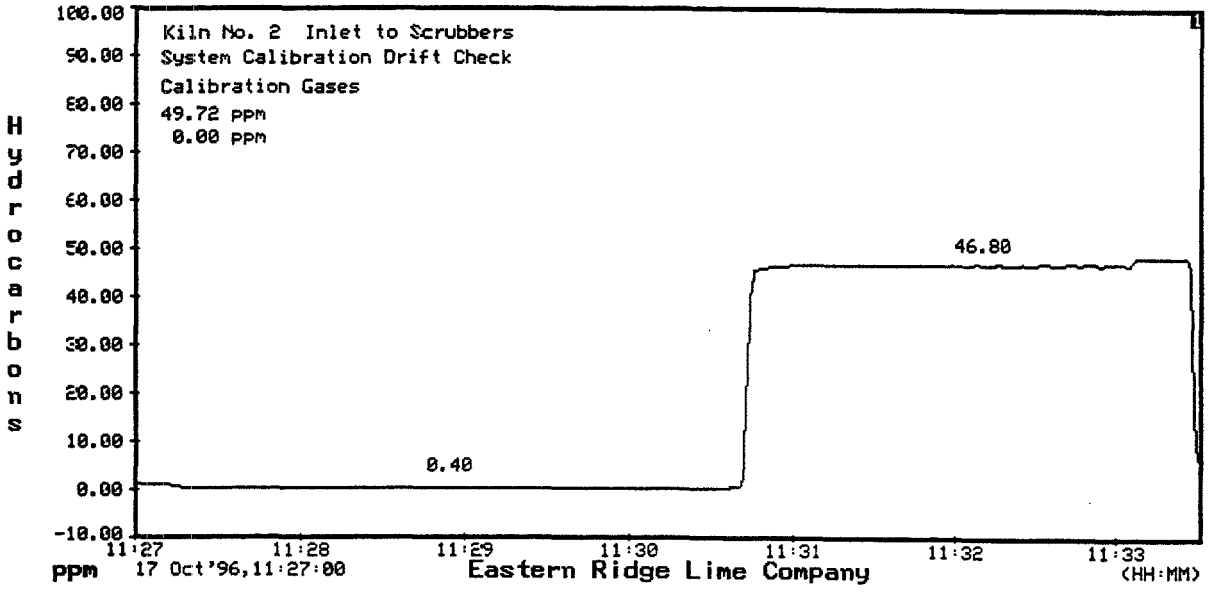


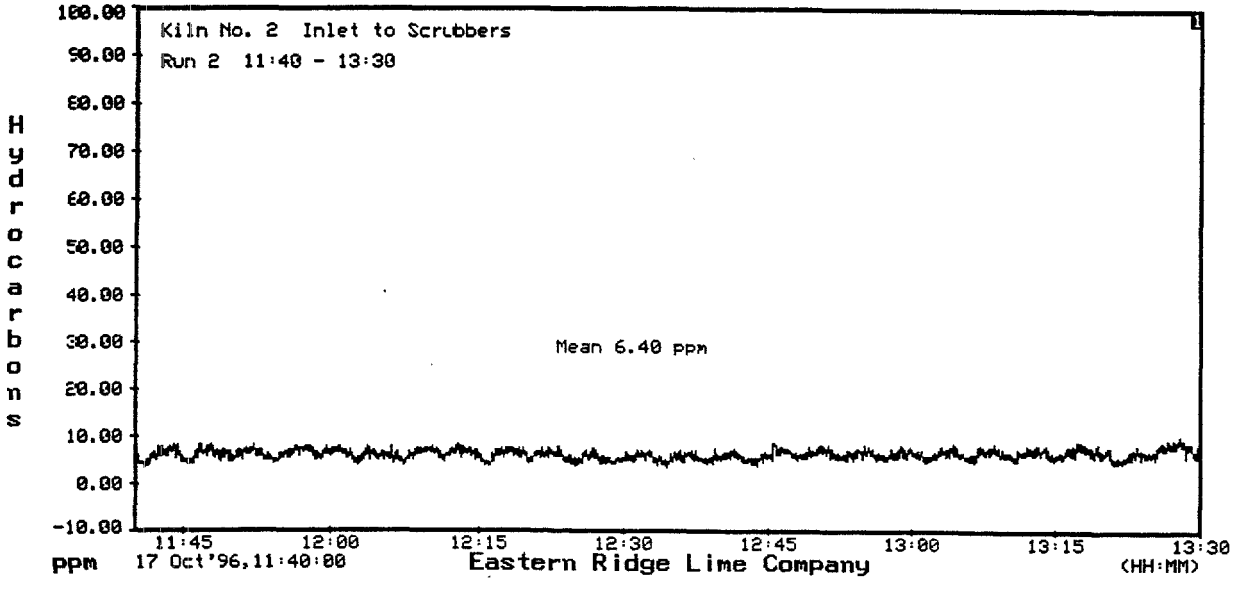


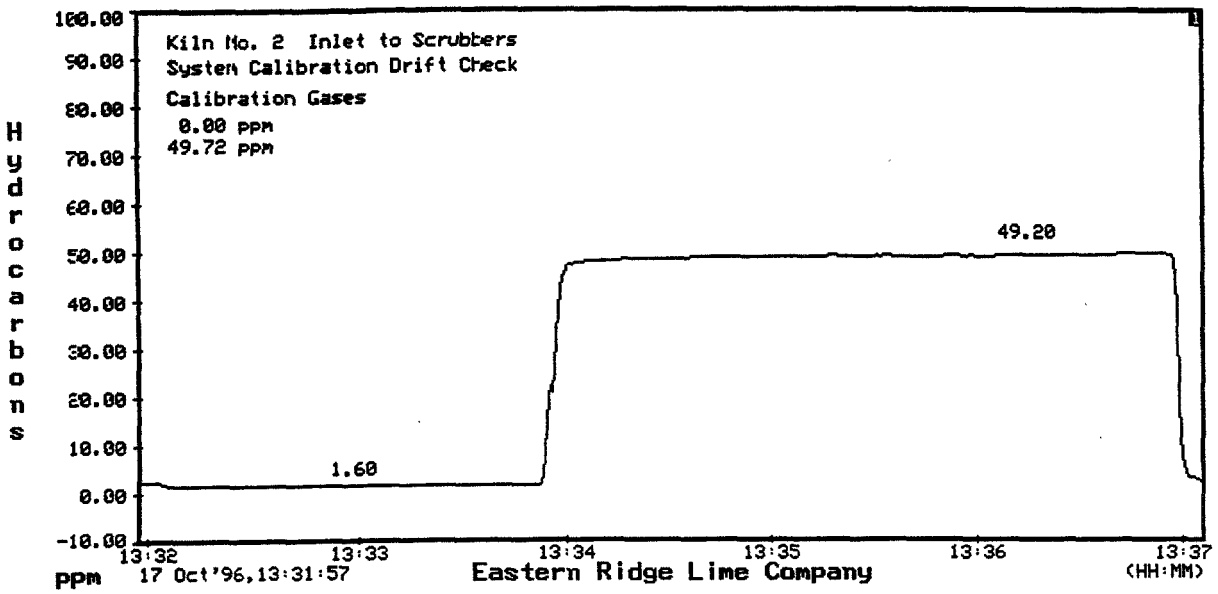
Key:

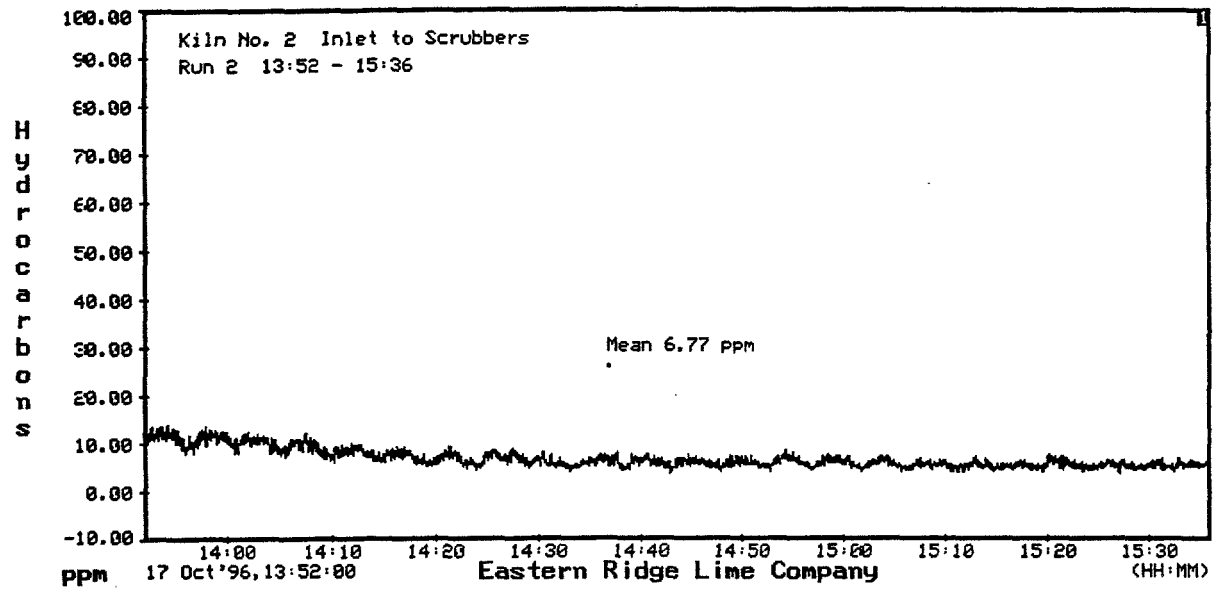
Graph 1 Trace 1 IN-16-B.DTA Adaptive Line 13 Sep 1995

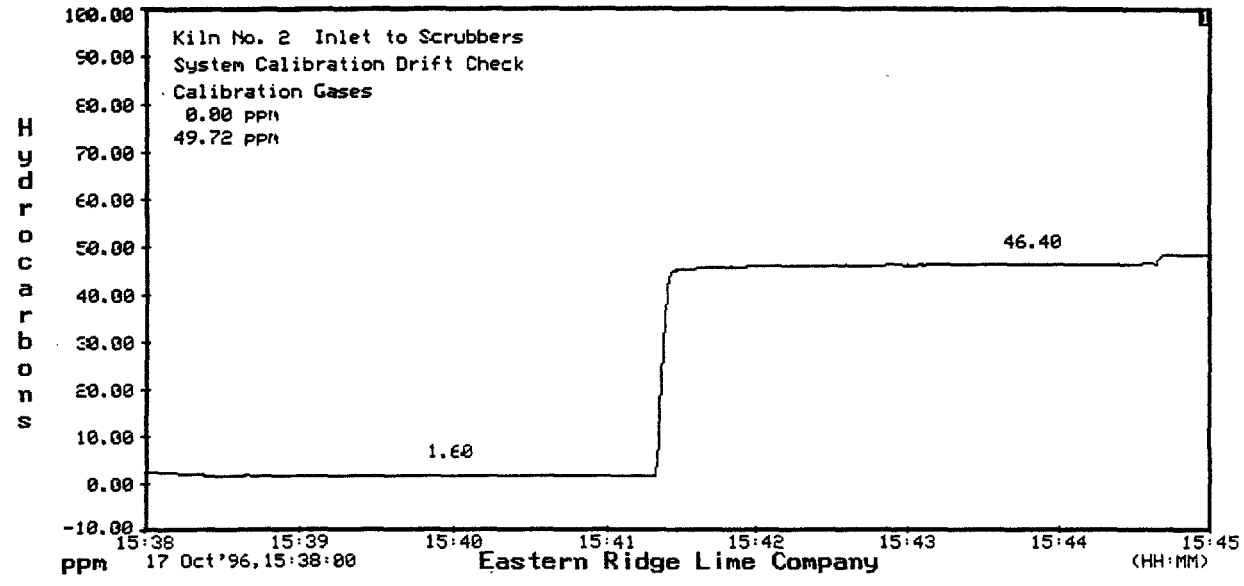

Kiln No. 2 Inlet to Scrubbers
Direct vs System Calibrations
Calibration Gases
87.86 ppm Propane
49.72 ppm Propane
30.04 ppm Propane
0.00 ppm
87.60
50.80
30.40
0.00
0.40
81.60
47.20
28.40
Hydrocarbons
ppm
17 Oct'96,09:05:38
Eastern Ridge Lime Company
(HH:MM)

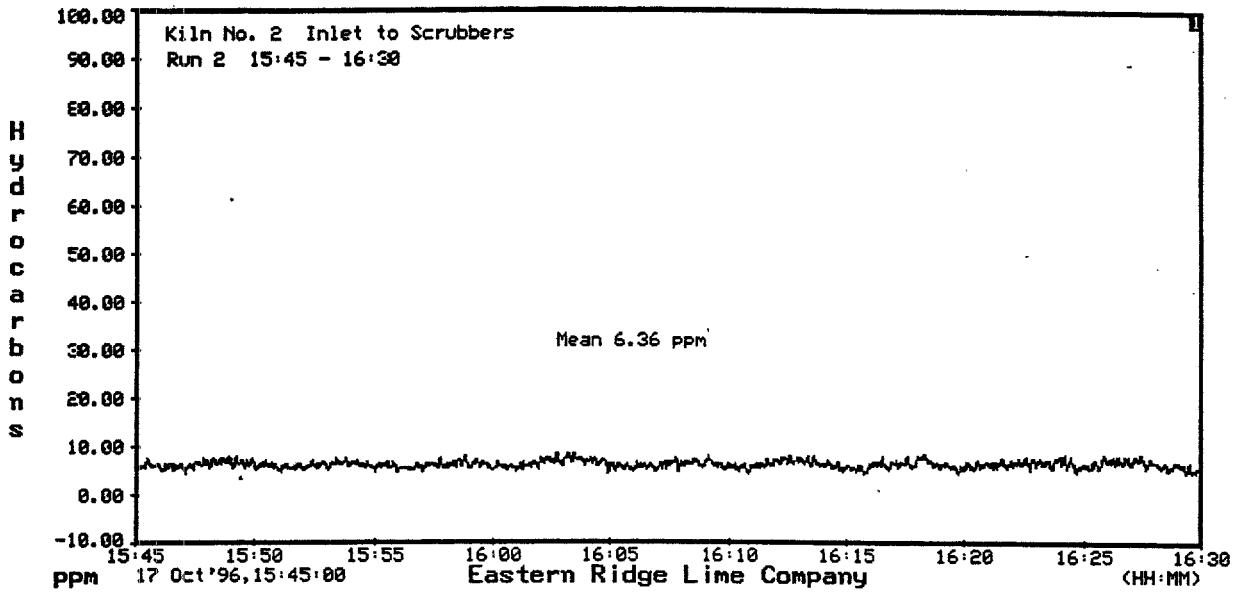

Kiln No. 2 Inlet to Scrubbers
System Calibration Drift Check
Calibration Gases
49.72 ppm
0.00 ppm
46.80
0.40
Hydrocarbons
ppm
17 Oct'96,11:27:00
Eastern Ridge Lime Company
(HH:MM)

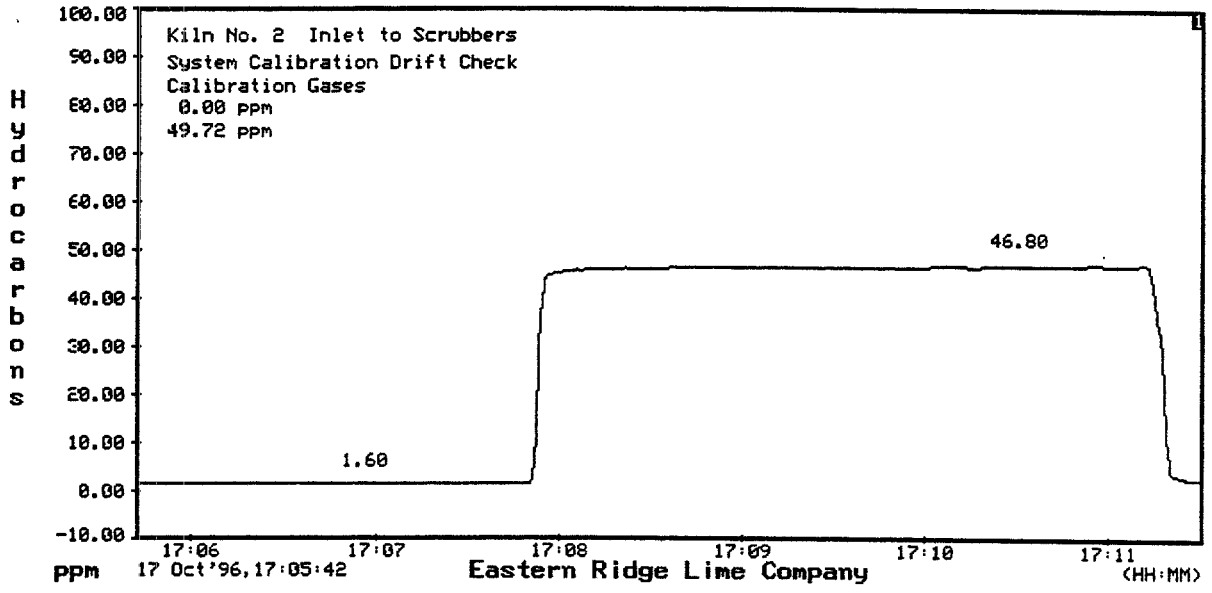

Kiln No. 2 Inlet to Scrubbers
Run 2 11:40 - 13:30
Mean 6.40 ppm
Hydrocarbons
ppm
17 Oct'96,11:40:00
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Inlet to Scrubbers
System Calibration Drift Check
Calibration Gases
0.00 ppm
49.72 ppm
49.20
1.60
Hydrocarbons
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
13:32
13:33
13:34
13:35
13:36
13:37
ppm
17 Oct'96,13:31:57
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Inlet to Scrubbers
Run 2 13:52 - 15:36
Mean 6.77 ppm
Hydrocarbons
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
14:00
14:10
14:20
14:30
14:40
14:50
15:00
15:10
15:20
15:30
ppm
17 Oct'96,13:52:00
Eastern Ridge Lime Company
(HH:MM)

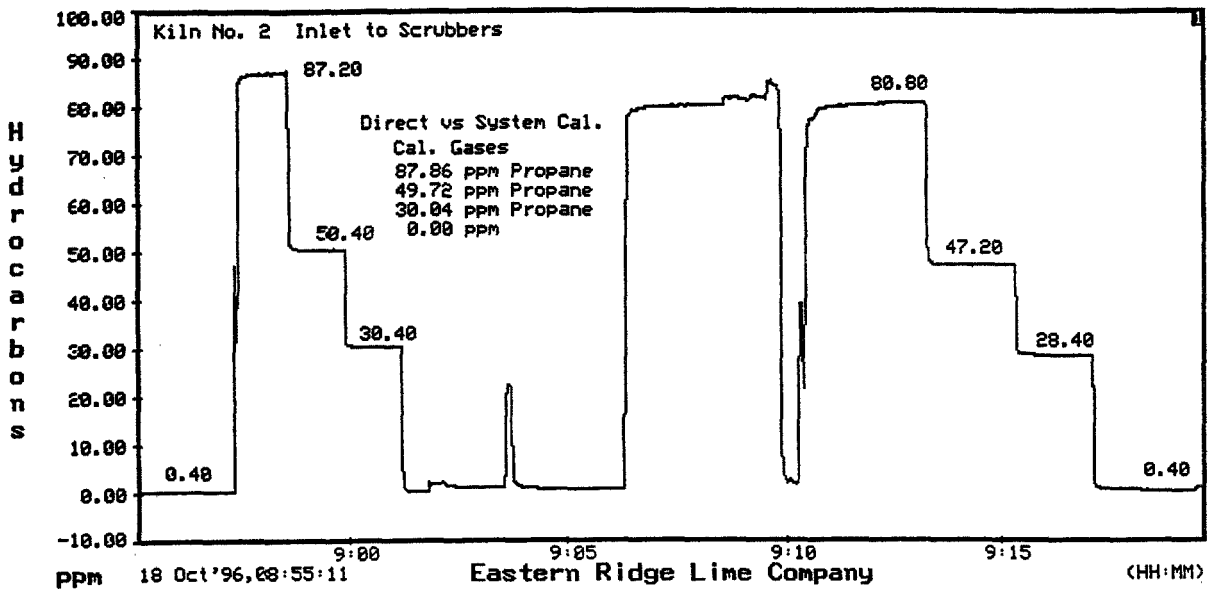

Kiln No. 2 Inlet to Scrubbers
System Calibration Drift Check
Calibration Gases
0.00 ppm
49.72 ppm
46.40
1.60
Hydrocarbons
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
15:38
15:39
15:40
15:41
15:42
15:43
15:44
15:45
ppm
17 Oct'96,15:38:00
Eastern Ridge Lime Company
(HH:MM)

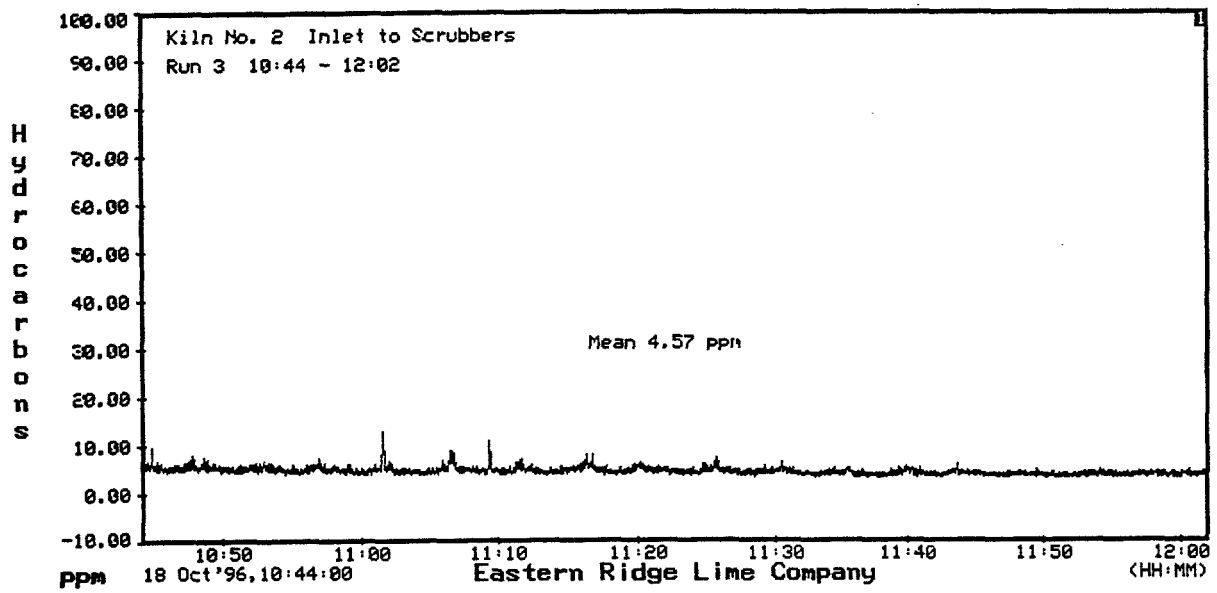


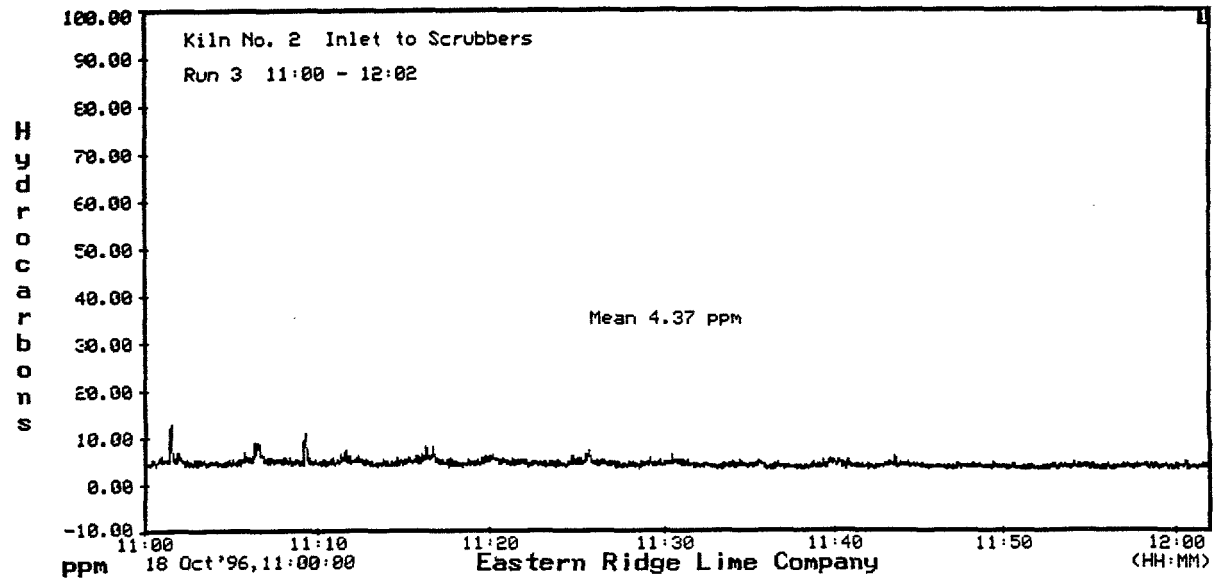


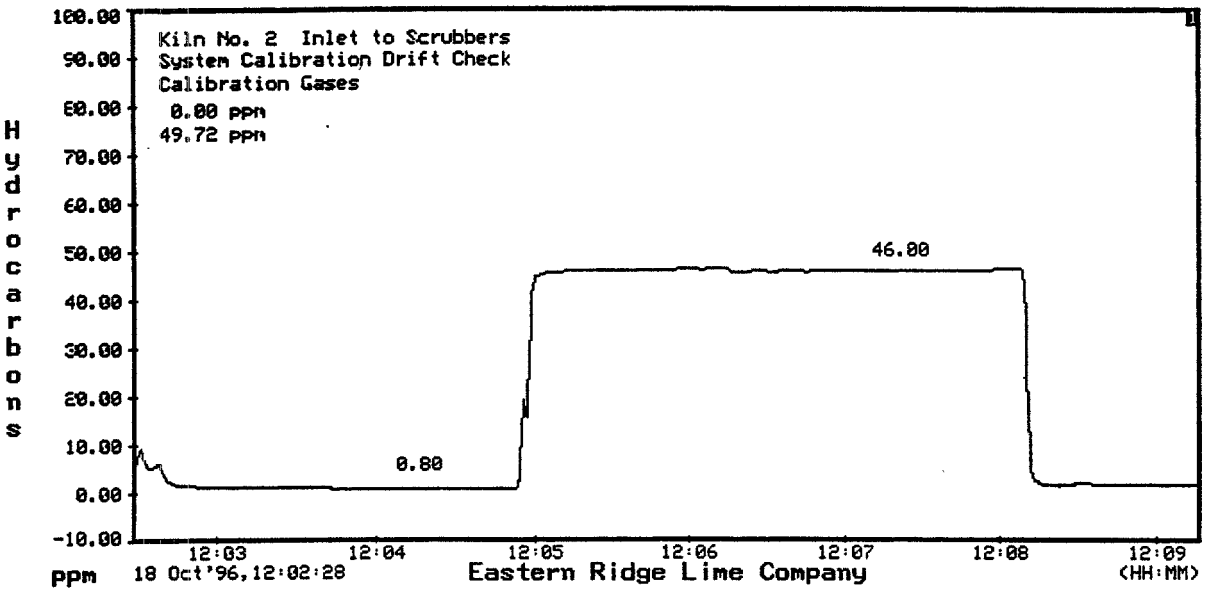
Key:

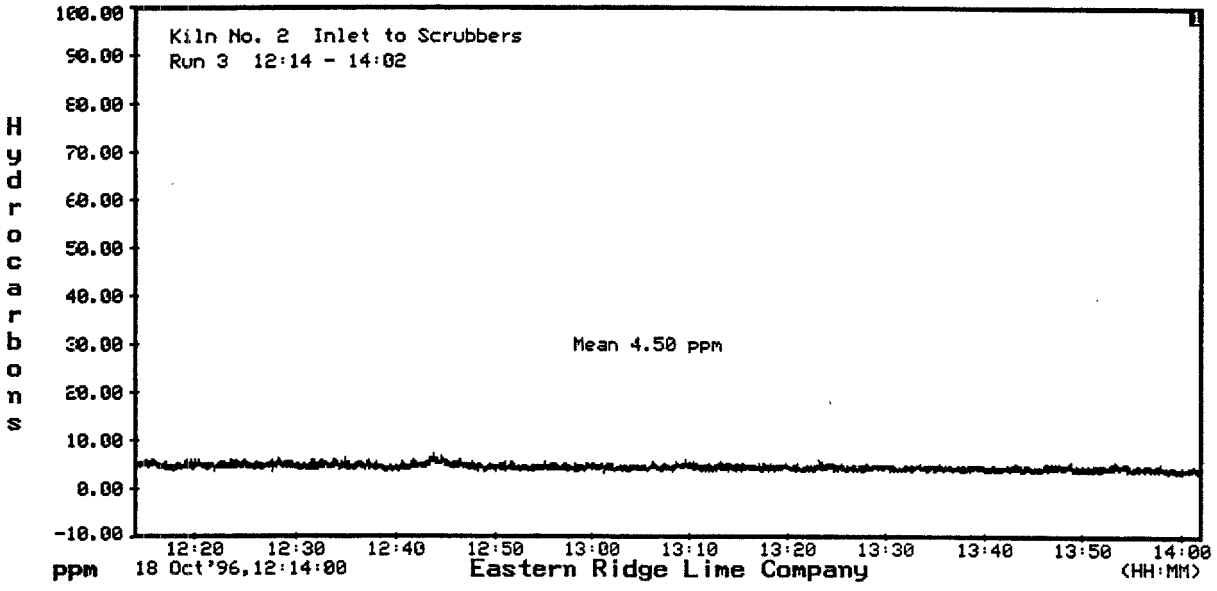
Graph 1 Trace 1 IN-17.DTA Adaptive Line 14 Sep 1995

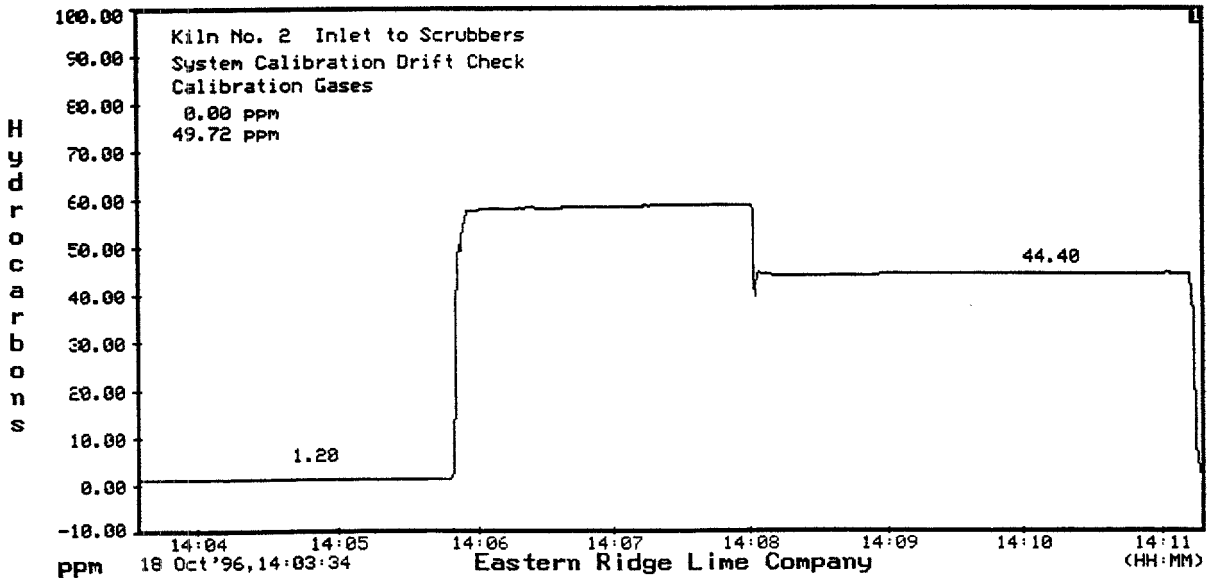

Kiln No. 2 Inlet to Scrubbers
Direct vs System Cal.
Cal. Gases
87.86 ppm Propane
49.72 ppm Propane
30.04 ppm Propane
0.00 ppm
87.20
50.40
30.40
0.40
80.80
47.20
28.40
0.40
Hydrocarbons
ppm
18 Oct'96,08:55:11
Eastern Ridge Lime Company
(HH:MM)

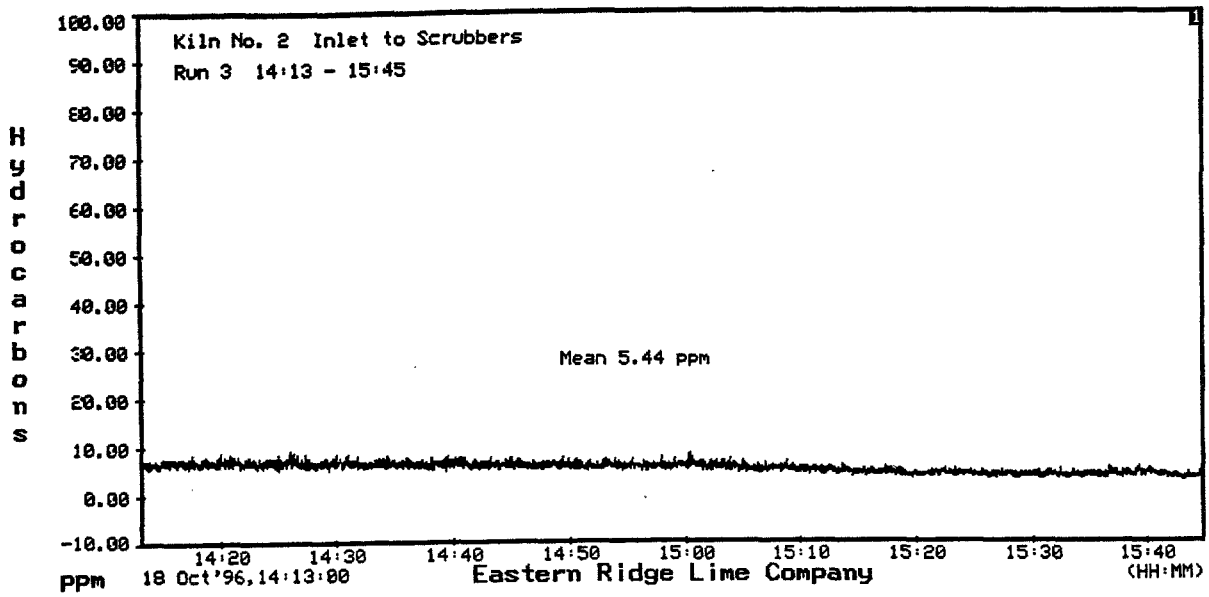

Kiln No. 2 Inlet to Scrubbers
Run 3 10:44 - 12:02
Mean 4.57 ppm
Hydrocarbons
ppm
18 Oct'96,10:44:00
Eastern Ridge Lime Company
(HH:MM)

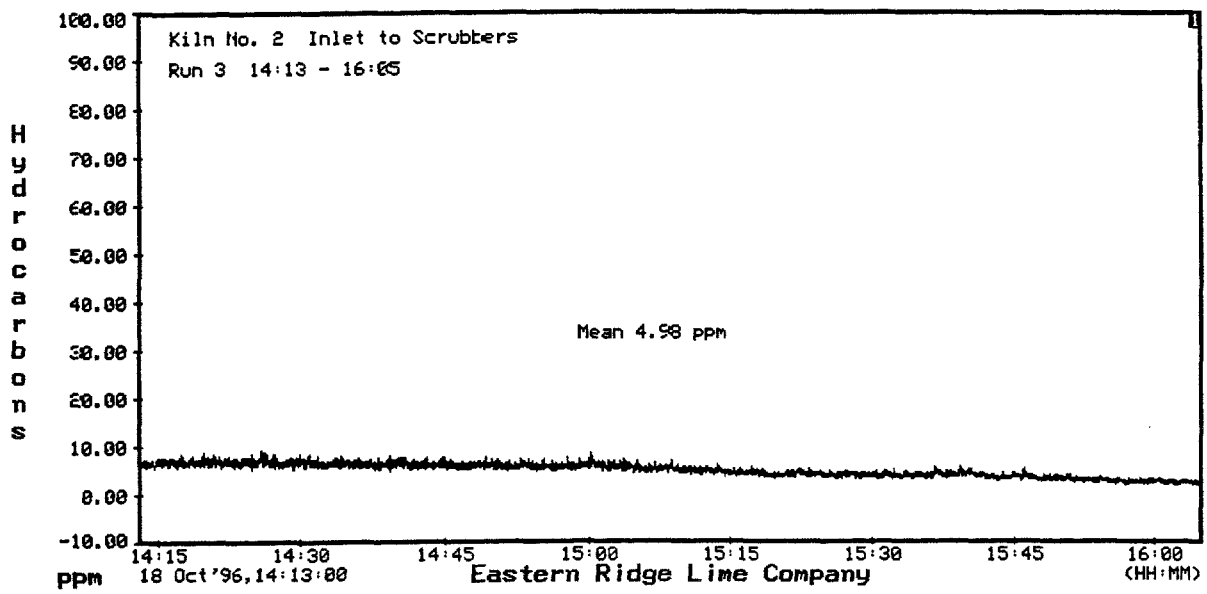

Kiln No. 2 Inlet to Scrubbers
Run 3 11:00 - 12:02
Mean 4.37 ppm
Hydrocarbons
ppm
18 Oct'96,11:00:00
Eastern Ridge Lime Company
(HH:MM)

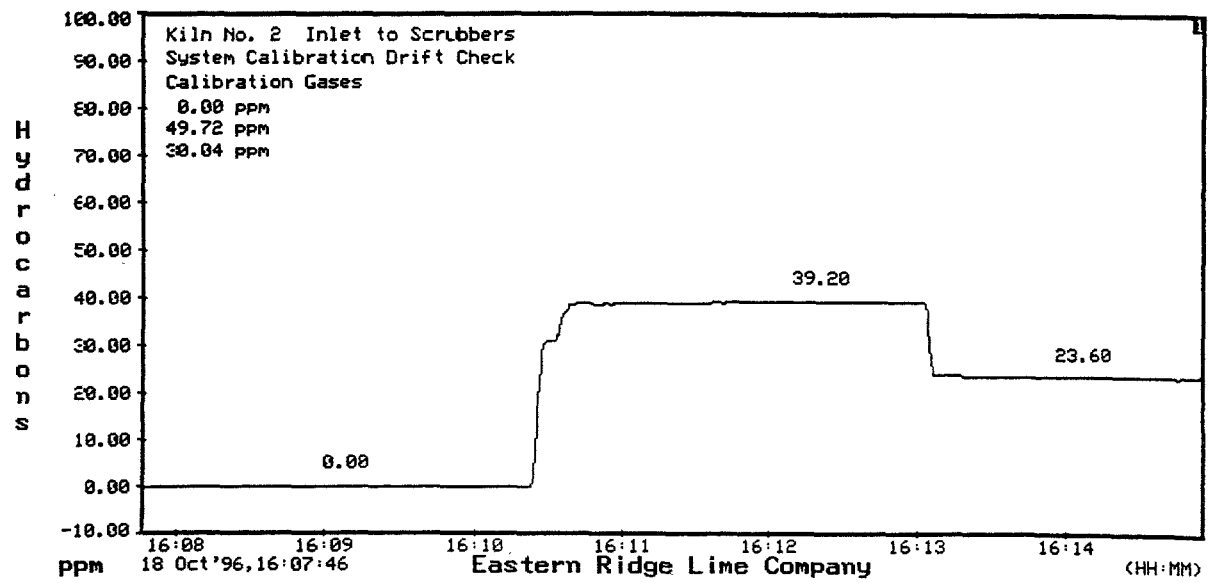

Kiln No. 2 Inlet to Scrubbers
System Calibration Drift Check
Calibration Gases
0.00 ppm
49.72 ppm
Hydrocarbons
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
46.00
0.80
12:03
12:04
12:05
12:06
12:07
12:08
12:09
ppm
18 Oct'96,12:02:28
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Inlet to Scrubbers
Run 3 12:14 - 14:02
Hydrocarbons
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
Mean 4.50 ppm
12:20
12:30
12:40
12:50
13:00
13:10
13:20
13:30
13:40
13:50
14:00
ppm
18 Oct'96,12:14:00
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Inlet to Scrubbers
System Calibration Drift Check
Calibration Gases
0.00 ppm
49.72 ppm
Hydrocarbons
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
44.40
1.20
14:04
14:05
14:06
14:07
14:08
14:09
14:10
14:11
ppm
18 Oct'96,14:03:34
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Inlet to Scrubbers
Run 3 14:13 - 15:45
Mean 5.44 ppm
Hydrocarbons
ppm
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
14:20
14:30
14:40
14:50
15:00
15:10
15:20
15:30
15:40
18 Oct'96,14:13:00
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Inlet to Scrubbers
Run 3 14:13 - 16:05
Mean 4.98 ppm
Hydrocarbons
ppm
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
14:15
14:30
14:45
15:00
15:15
15:30
15:45
16:00
18 Oct'96,14:13:00
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Inlet to Scrubbers
System Calibration Drift Check
Calibration Gases
0.00 ppm
49.72 ppm
30.04 ppm
39.20
23.60
0.00
Hydrocarbons
ppm
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
16:08
16:09
16:10
16:11
16:12
16:13
16:14
18 Oct'96,16:07:46
Eastern Ridge Lime Company
(HH:MM)

Eastern Ridge Lime Company

Kiln No. 2 Outlet of Scrubbers

October 16, 1996

Calibration Gases	Scrubber A System Calibration	Scrubber B System Calibration	Direct Calibration
0.0 ppm	2.35	0.80	0.00
30.04 ppm	30.25	30.00	30.40
49.72 ppm	49.38	49.20	50.80
87.86 ppm	83.66	84.40	88.00

Correlation	0.999897	Correlation	0.999886	Correlation	0.999919
Slope	0.9271117	Slope	0.9518108	Slope	1.002605
Intercept	2.5593823	Intercept	1.2143665	Intercept	0.285829
Sampling System Bias		Sampling System Bias		Calibration Error	
2.35%		0.80%			
0.15%		0.40%		1.20%	
1.42%		1.60%		2.17%	
4.34%		3.60%			

	Post Cal	Drift	Post Cal	Drift
13:00	1.60	0.75%	1.60	0.80%
	50.00	0.62%	50.40	1.20%

	Post Cal	Drift	Post Cal	Drift
14:57	2.00	0.35%	1.60	0.80%
	49.60	0.22%	50.00	0.80%

15:15-15:30	4.1	Corrected	A	1.7	ppm THC	(wet)
15:30-15:45	5.1		B	4.1		
15:45-16:06	5.7		A	3.4		
16:06-16:21	6.1		B	5.1		
16:21-16:36	5.9		A	3.6		
16:36-16:51	5.8		B	4.8		
16:51-17:06	5.7		A	3.4		
17:06-17:21	4.4		B	3.3		

	Post Cal	Drift	Post Cal	Drift
17:36	2.40	0.05%	1.60	0.80%
	44.80	4.58%	48.40	0.80%
	28.40	1.85%		

Calibration Gases	System Calibration
0.0 ppm	2.40
30.04 ppm	28.40
49.72 ppm	44.80
87.86 ppm	77.20
	Calibration Error
	1.13%
	0.11%
Correlation	0.9999797
Slope	0.8502501
Intercept	2.5702677

18:15-18:30	5.0	Corrected	A	2.9	ppm THC	(wet)
18:30-18:45	6.1		B	5.1		
18:45-19:00	4.8		A	2.6		
19:00-19:15	4.6		B	3.6		
19:15-19:30	4.9		A	2.7		
19:30-19:45	4.8		B	3.8		
19:45-20:00	4.7		A	2.5		
20:00-20:15	4.4		B	3.3		

	Post Cal	Drift	Post Cal	Drift
20:20	1.60	0.80%	1.20	0.40%
	44.00	0.80%	44.40	4.80%
			27.60	2.40%

Calibration Gases	System Calibration	System Calibration	Direct Calibration
0.0 ppm	0.80	0.80	0.00
30.04 ppm	29.60	30.00	30.40
49.72 ppm	48.40	49.20	50.40
87.86 ppm	83.20	84.40	87.20

Correlation	0.9999028	Correlation	0.999886	Correlation	0.999903
Slope	0.9378906	Slope	0.9518108	Slope	0.992804
Intercept	1.1976962	Intercept	1.2143665	Intercept	0.396565
Sampling System Bias		Sampling System Bias		Calibration Error	
0.80%		0.80%			
0.80%		0.40%		1.20%	
2.00%		1.20%		1.37%	
4.00%		2.80%			

	Post Cal	Drift	Post Cal	Drift
11:10	1.20	0.40%	0.80	0.00%
	45.60	2.80%	48.80	0.40%

Calibration Gases	System Calibration
0.0 ppm	1.20
30.04 ppm	28.40
49.72 ppm	45.60
87.86 ppm	78.80
	Calibration Error
	1.39%
	0.47%
Correlation	0.9999455
Slope	0.8822094
Intercept	1.5310148

11:40-12:00	6.4	Corrected	A	5.5	ppm THC	(wet)
12:00-12:15			B			
12:15-12:30	5.7		B	4.7		
12:30-12:45	7.1		A	6.3		
12:45-13:00	5.8		B	4.8		
13:00-13:15	7.7		A	7.0		
13:15-13:30	6.5		B	5.6		

	Post Cal	Drift	Post Cal	Drift
13:38	1.60	0.40%	1.20	0.40%
	44.00	1.60%	44.40	4.80%
			27.60	2.40%

14:00-14:15	9.9	Corrected	A	9.5	ppm THC	(wet)
14:15-14:30	7.5		B	6.6		
14:30-14:45	7.3		A	6.5		
14:45-15:00	6.4		B	5.4		
15:00-15:15	6.8		A	6.0		
15:15-15:30	5.6		B	4.6		
15:30-15:45	6.0		A	5.1		
15:45-16:00	5.2		B	4.2		
16:00-16:15	6.2		A	5.3		
16:15-16:30	5.5		B	4.5		

	Post Cal	Drift	Post Cal	Drift
16:35	2.40	1.20%	1.60	0.80%
	42.80	2.80%	46.00	3.20%
	27.20	1.20%	28.40	1.60%

Eastern Ridge Lime Company

Kiln No. 2 Outlet of Scrubbers

October 18, 1996

Calibration Gases	Scrubber A System Calibration	Scrubber B System Calibration	Direct Calibration
0.0 ppm	1.20	1.20	0.40
30.04 ppm	29.60	29.60	29.60
49.72 ppm	48.00	48.80	49.60
87.86 ppm	82.40	83.20	85.60

Correlation	0.9999174	Correlation	0.9999174	Correlation	0.999911
Slope	0.9239703	Slope	0.93454	Slope	0.971414
Intercept	1.5810258	Intercept	1.5381022	Intercept	0.592894
Sampling System Bias		Sampling System Bias		Calibration Error	
0.80%		0.80%			
0.00%		0.00%		1.46%	
1.60%		0.80%		0.24%	
3.20%		2.40%			

10:10-10:30	6.1	Corrected	A	4.9	ppm THC	(wet)
10:30-10:45	5.9		B	4.7		
10:45-11:00	6.2		A	5.0		
11:00-11:15	5.6		B	4.3		
11:15-11:30	6.3		A	5.1		
11:30-11:45	4.9		B	3.6		
11:45-12:00	5.2		A	3.9		
12:00-12:15	4.6		B	3.3		

	Post Cal	Drift	Post Cal	Drift
12:20	1.60	0.40%	1.60	0.40%
	26.80	2.80%	27.20	2.40%
	42.00	6.00%	44.00	4.80%

Calibration Gases	System Calibration	System Calibration
0.0 ppm	1.60	1.60
30.04 ppm	26.80	27.20
49.72 ppm	42.00	44.00
87.86 ppm	76.40	78.40
	Calibration Error	Calibration Error
	0.67%	0.98%
	3.16%	1.72%

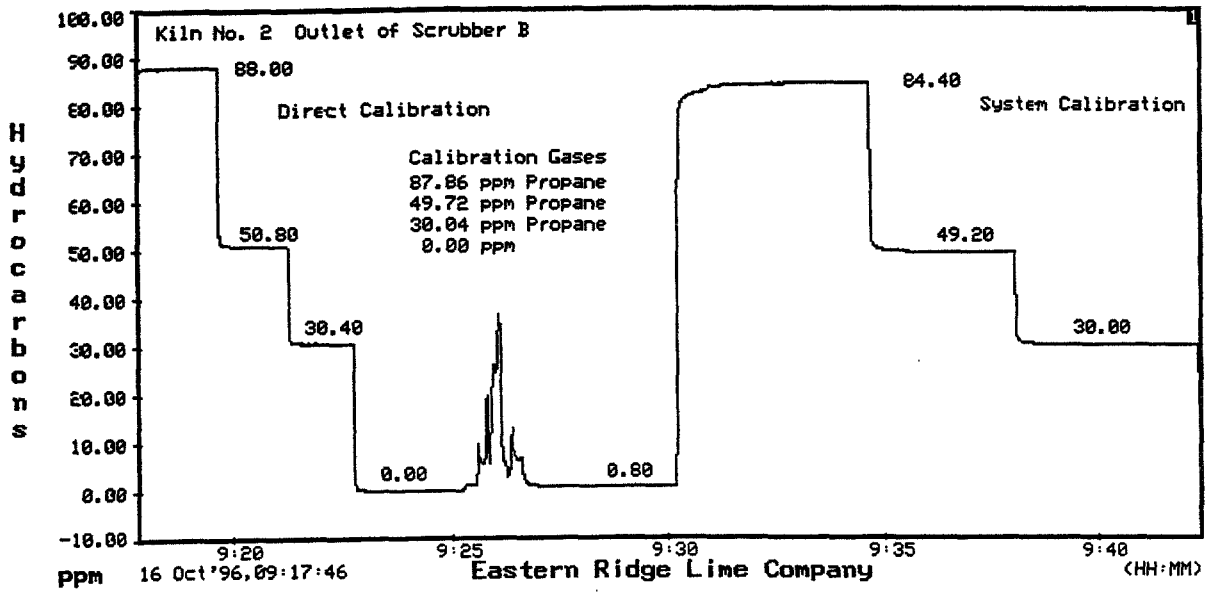
Correlation	0.9995726	Correlation	0.9998681
Slope	0.8487419	Slope	0.874
Intercept	1.1334689	Intercept	1.1750281

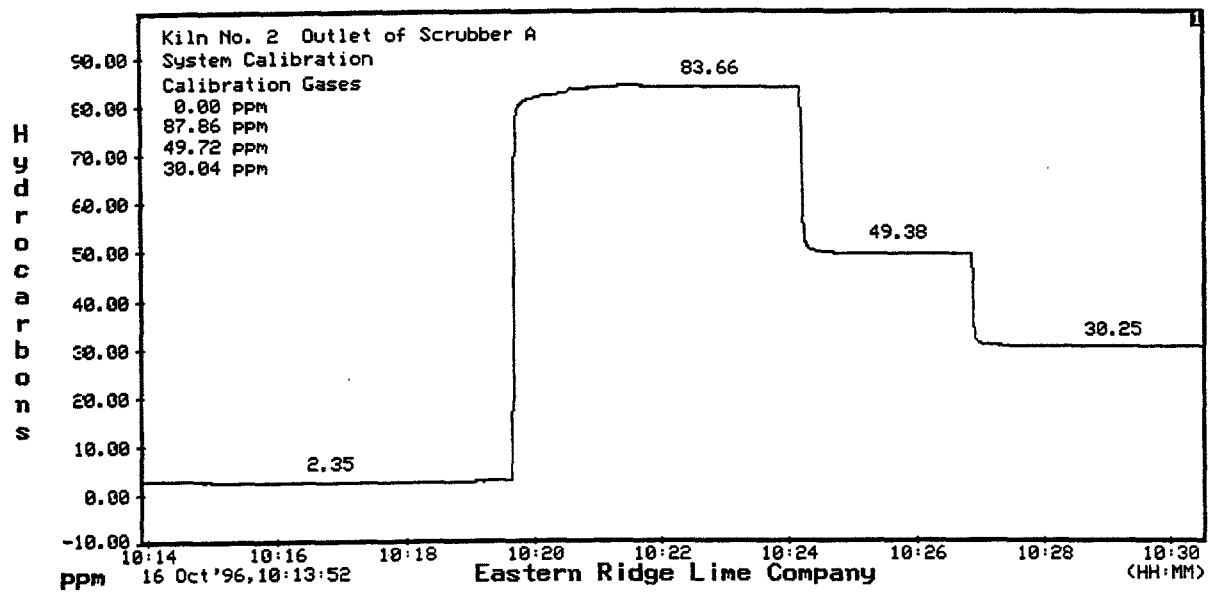
13:05-13:15	5.6	Corrected	A	5.3	ppm THC	(wet)
13:15-13:30	5.6		A	5.3		
13:30-13:45	4.7		B	4.0		
13:45-14:00	5.5		A	5.1		
14:00-14:15	4.6		B	3.9		
14:15-14:30	6.3		A	6.1		
14:30-14:45	4.8		B	4.1		

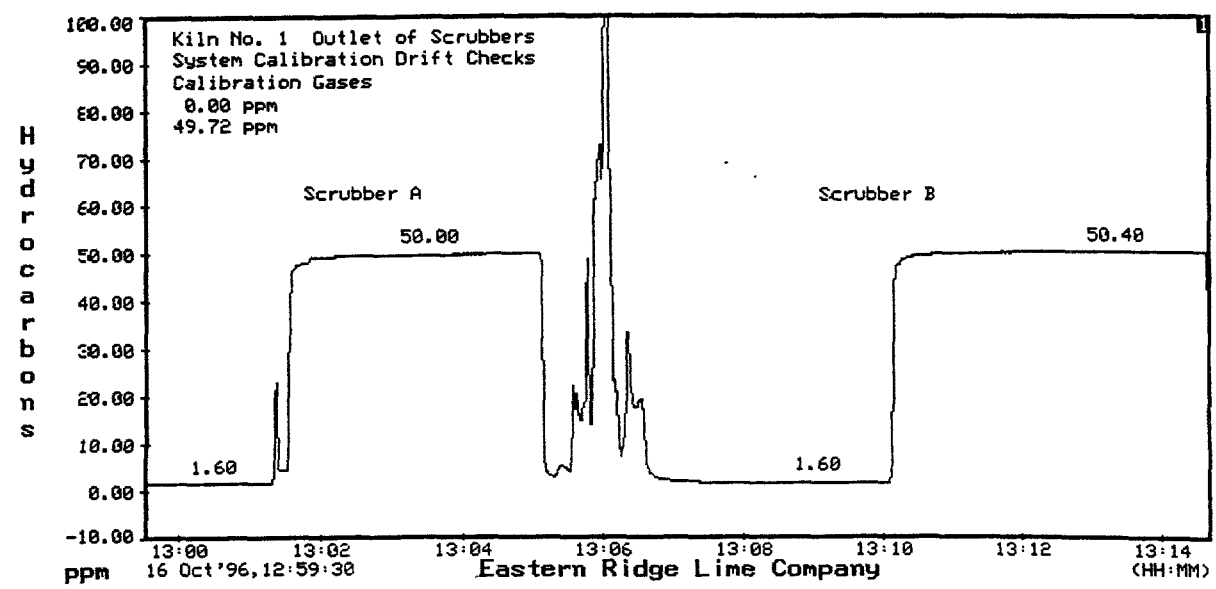
	Post Cal	Drift	Post Cal	Drift
14:50	1.20	0.40%	0.80	0.80%
	26.40	0.40%	27.20	0.00%
	43.20	1.20%	44.00	0.00%

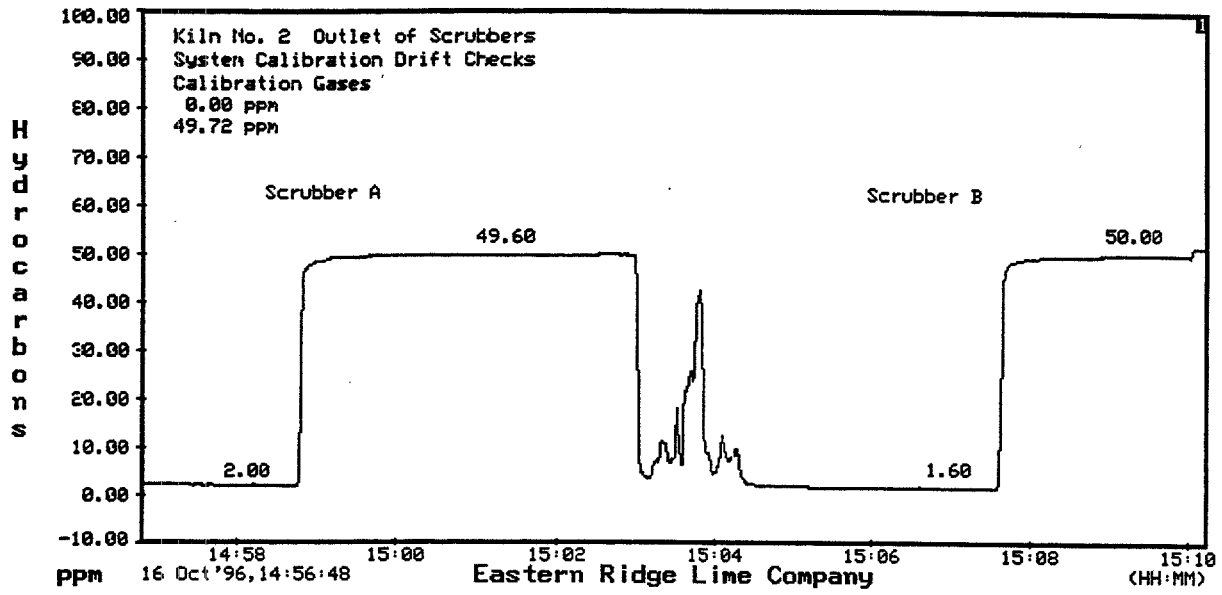
15:15-15:30	5.6	Corrected	A	5.3	ppm THC	(wet)
15:30-15:45	4.8		B	4.1		
15:45-16:00	5.1		A	4.7		
16:00-16:15	4.0		B	3.2		

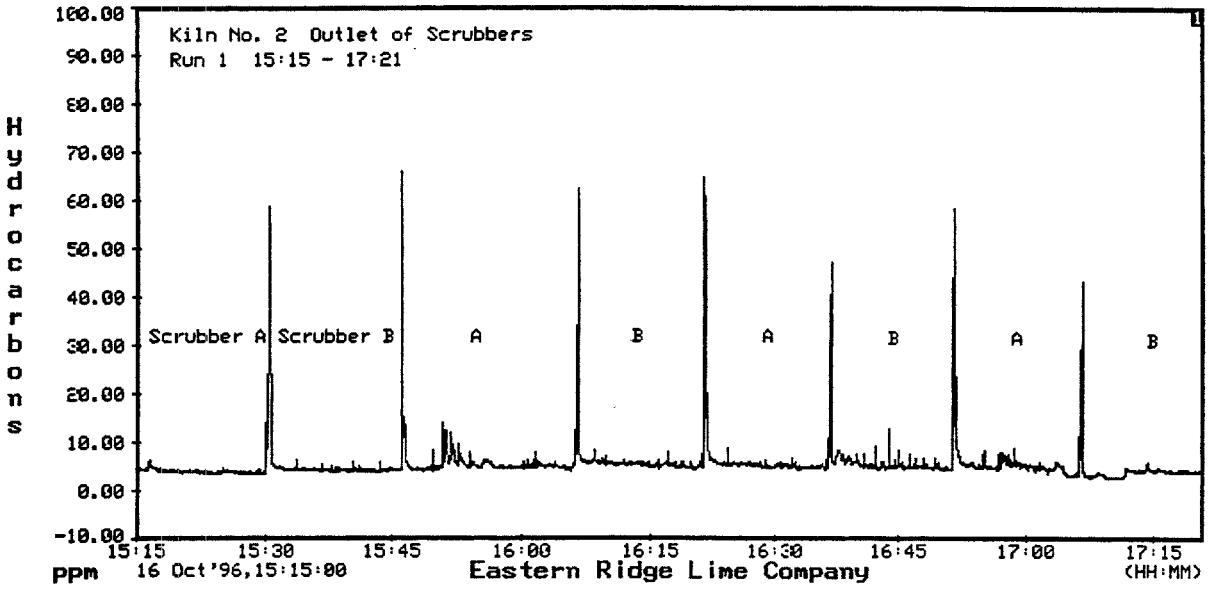
	Post Cal	Drift	Post Cal	Drift
16:18	0.80	0.80%	0.40	1.20%
	24.00	2.80%	26.00	1.20%
	40.00	2.00%	42.40	1.60%

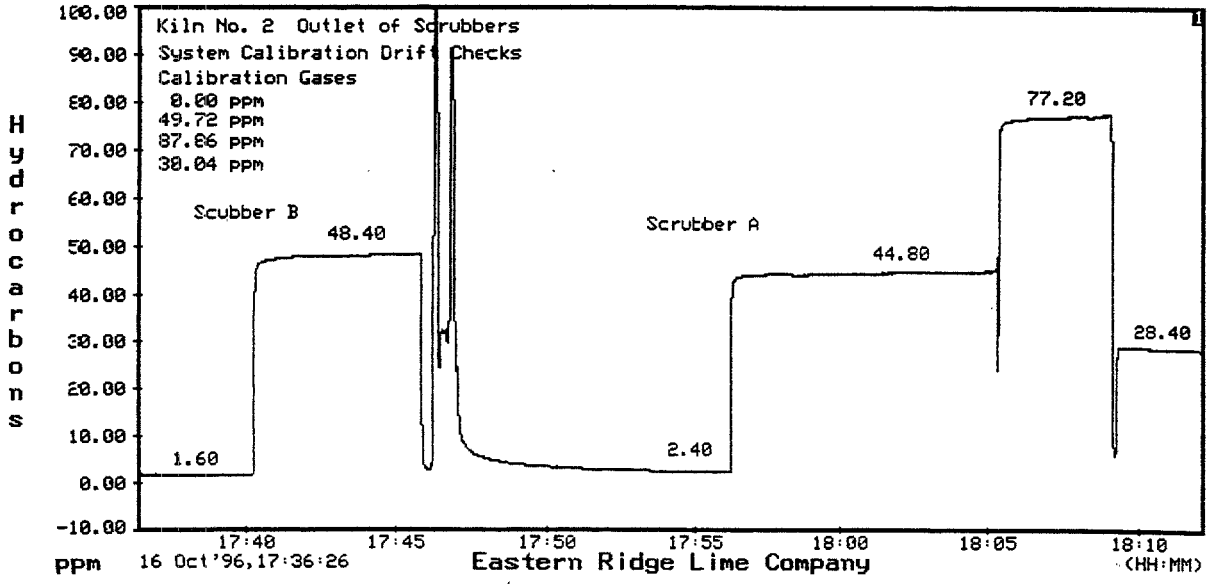

Kiln No. 2 Outlet of Scrubber B
Direct Calibration
Calibration Gases
87.86 ppm Propane
49.72 ppm Propane
30.04 ppm Propane
0.00 ppm
System Calibration
88.00
50.80
30.40
0.00
0.80
84.40
49.20
30.00
Hydrocarbons
ppm
16 Oct'96,09:17:46
Eastern Ridge Lime Company
(HH:MM)

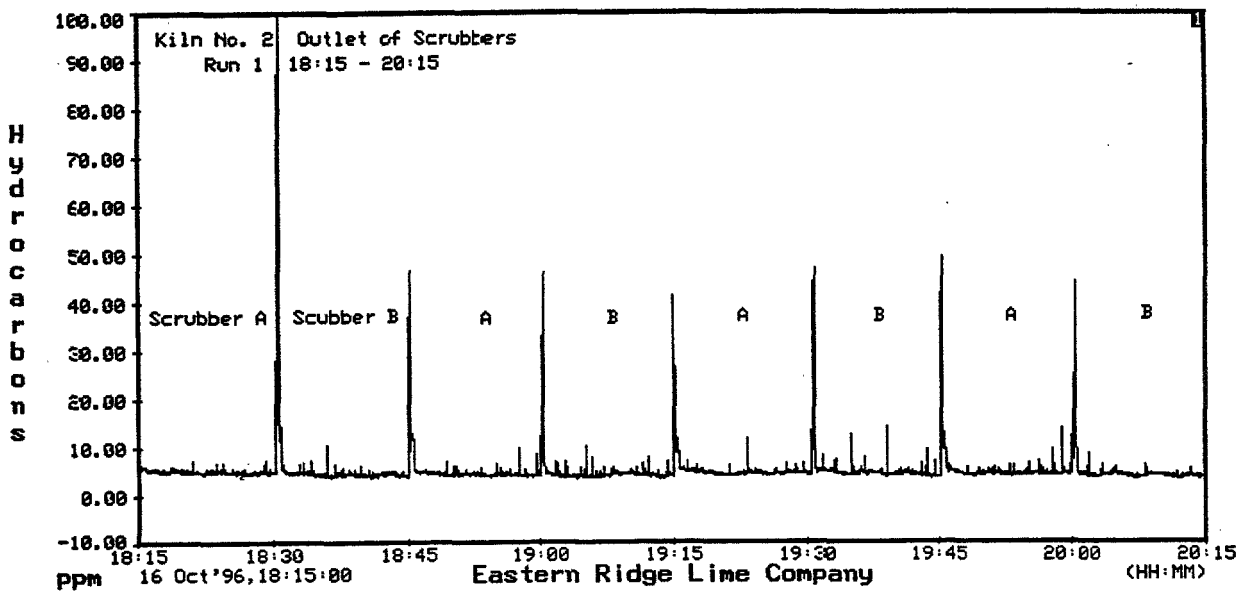

Kiln No. 2 Outlet of Scrubber A
System Calibration
Calibration Gases
0.00 ppm
87.86 ppm
49.72 ppm
30.04 ppm
83.66
49.38
30.25
2.35
Hydrocarbons
ppm
16 Oct'96,10:13:52
Eastern Ridge Lime Company
(HH:MM)

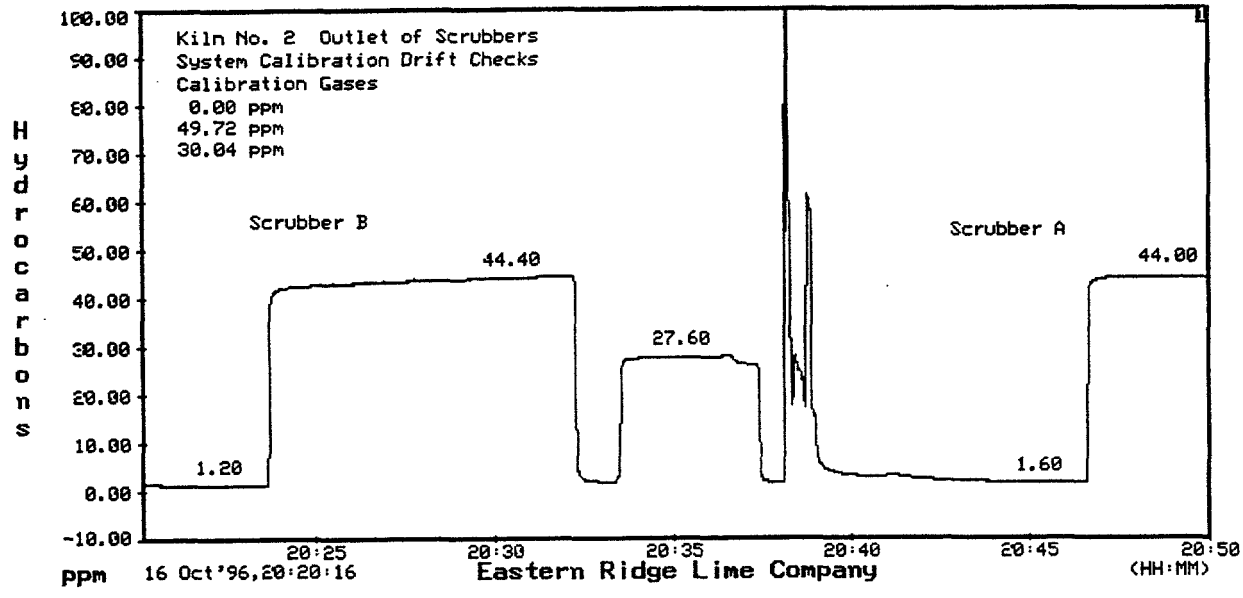

Kiln No. 1 Outlet of Scrubbers
System Calibration Drift Checks
Calibration Gases
0.00 ppm
49.72 ppm
Scrubber A
Scrubber B
50.00
50.40
1.60
1.60
Hydrocarbons
ppm
16 Oct'96,12:59:30
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Outlet of Scrubbers
System Calibration Drift Checks
Calibration Gases
0.00 ppm
49.72 ppm
Scrubber A
Scrubber B
49.60
50.00
2.00
1.60
Hydrocarbons
ppm
16 Oct'96,14:56:48
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Outlet of Scrubbers
Run 1 15:15 - 17:21
Scrubber A
Scrubber B
A
B
A
B
A
B
Hydrocarbons
ppm
16 Oct'96,15:15:00
Eastern Ridge Lime Company
(HH:MM)

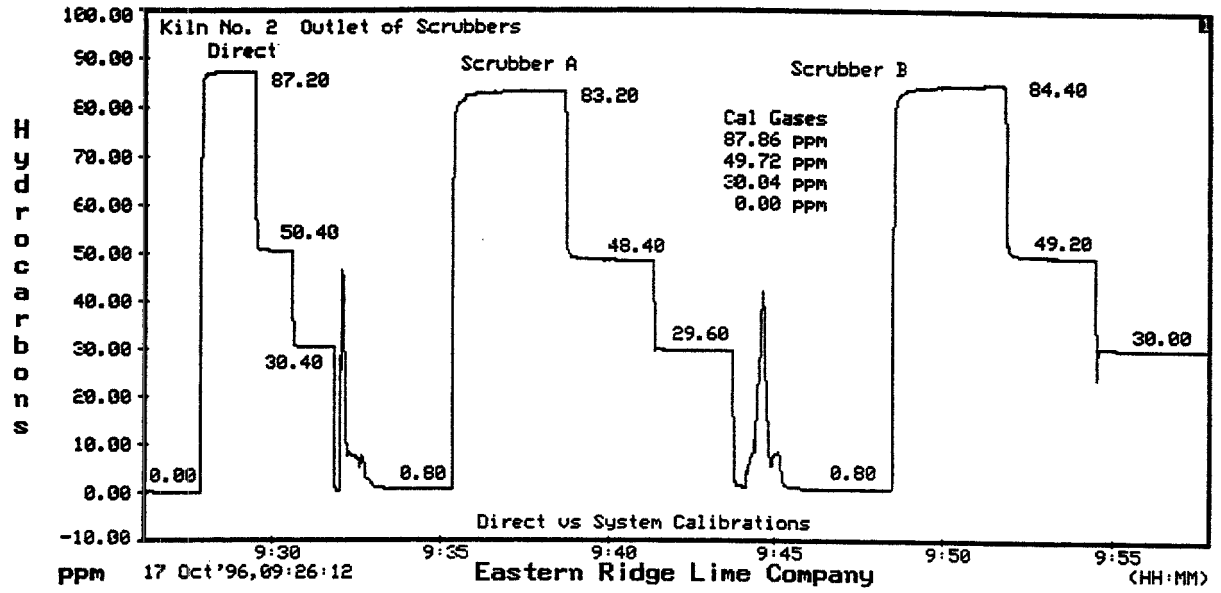

Kiln No. 2 Outlet of Scrubbers
System Calibration Drift Checks
Calibration Gases
0.00 ppm
49.72 ppm
87.86 ppm
30.04 ppm
Scubber B
48.40
Scrubber A
44.80
77.20
28.40
1.60
2.40
Hydrocarbons
ppm
16 Oct'96,17:36:26
Eastern Ridge Lime Company
(HH:MM)

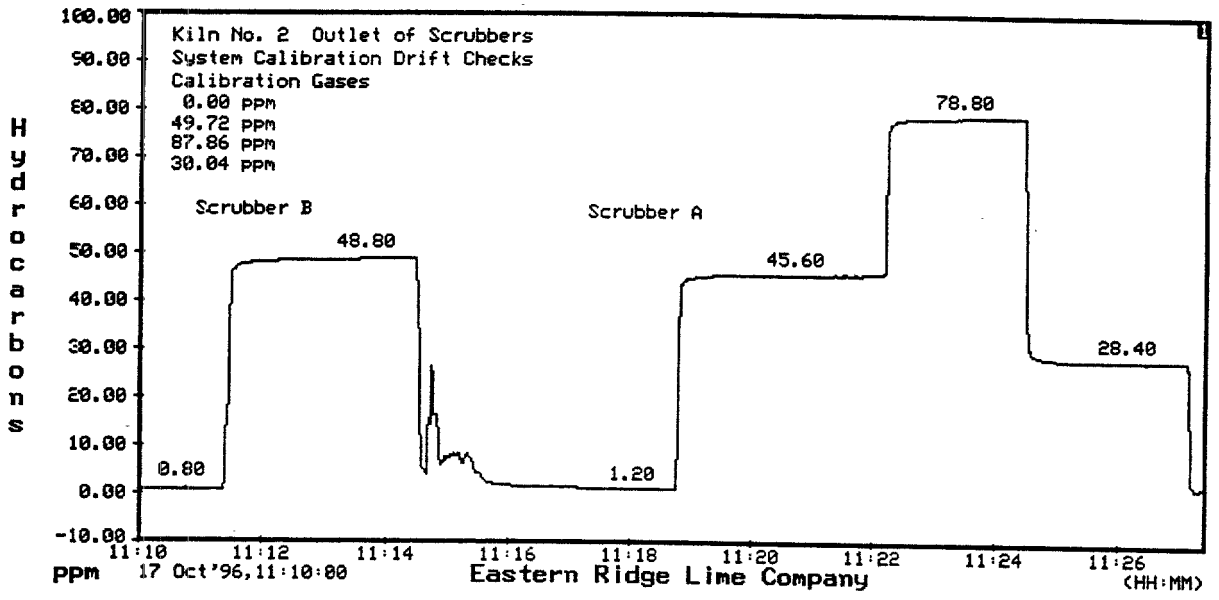


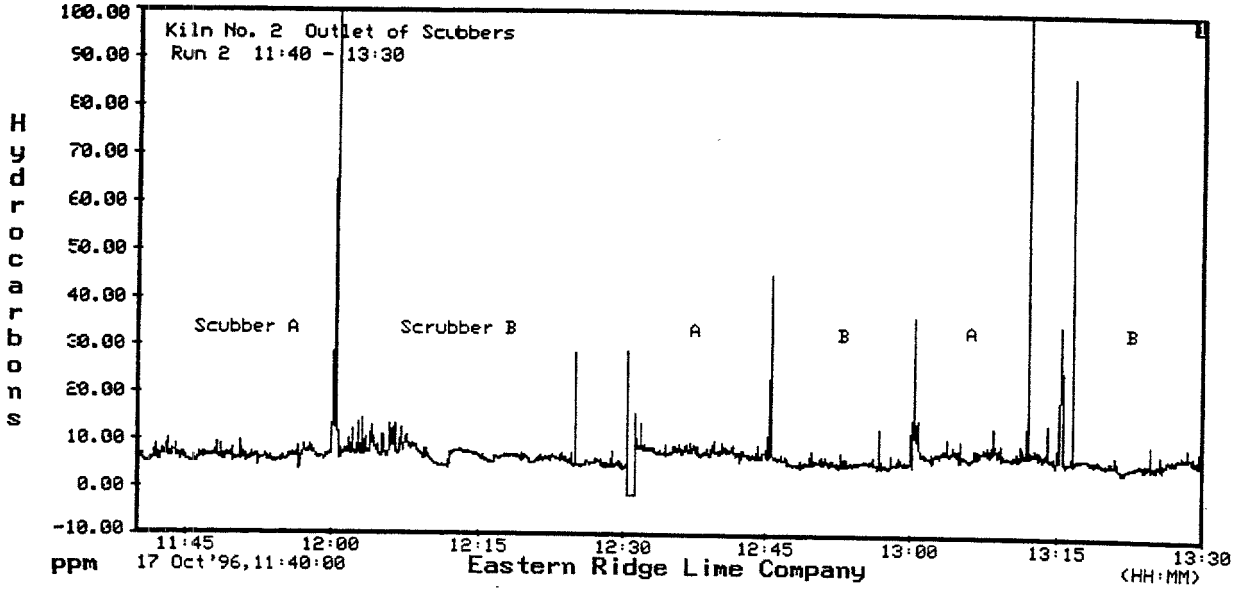


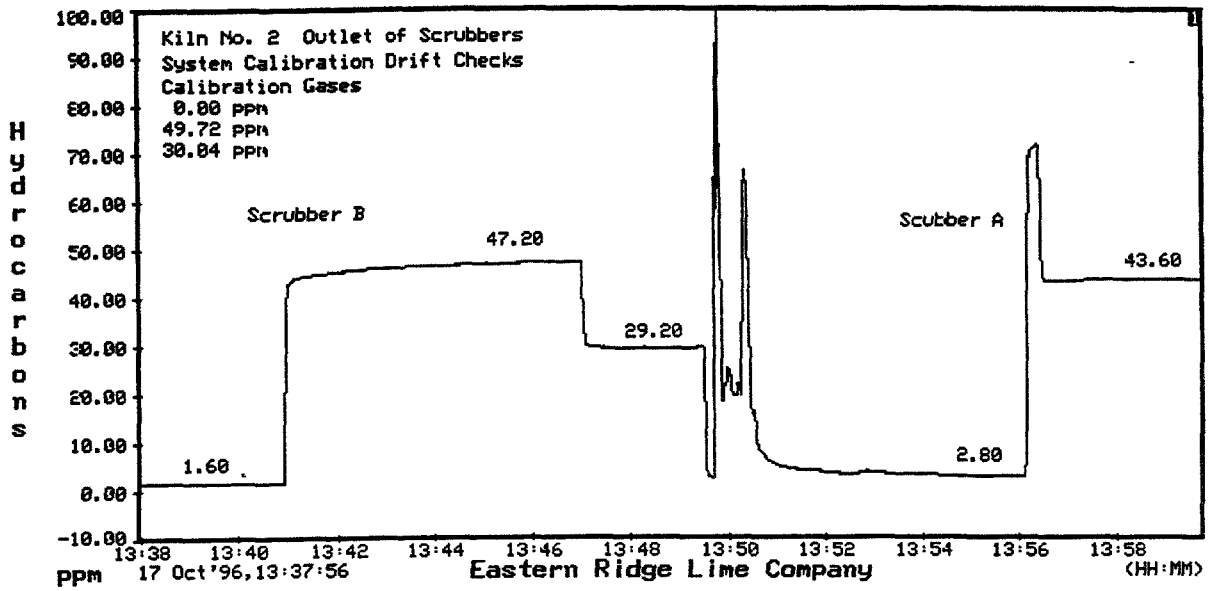
Key:

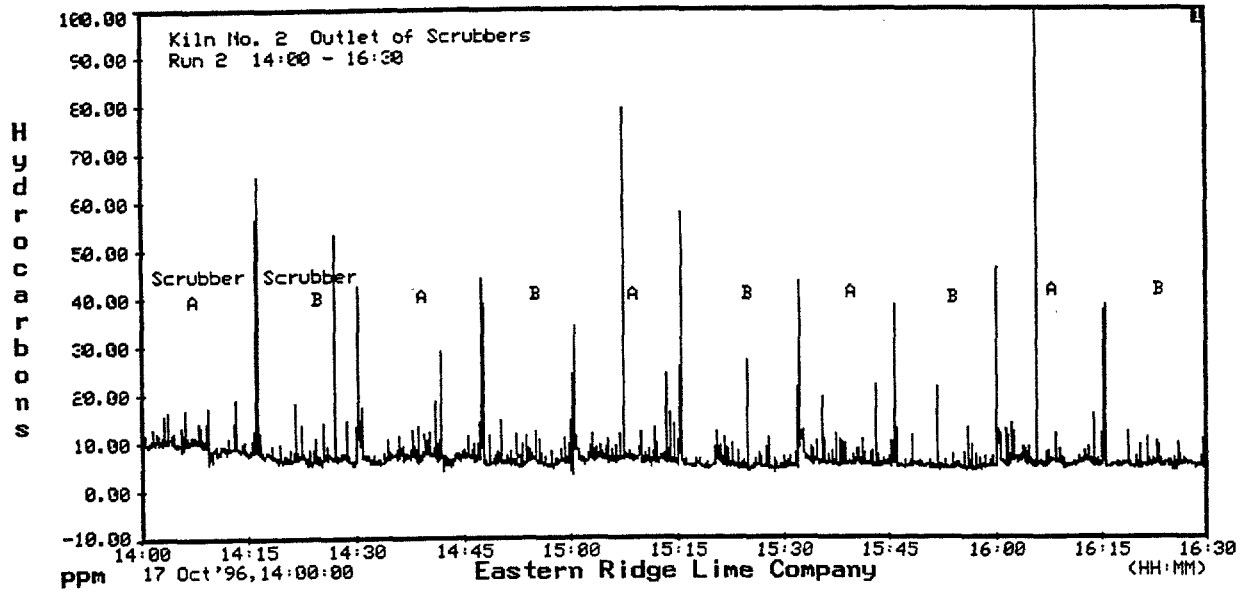
Graph 1 Trace 1 OUT-16-B.DTA Adaptive Line 13 Sep 1995

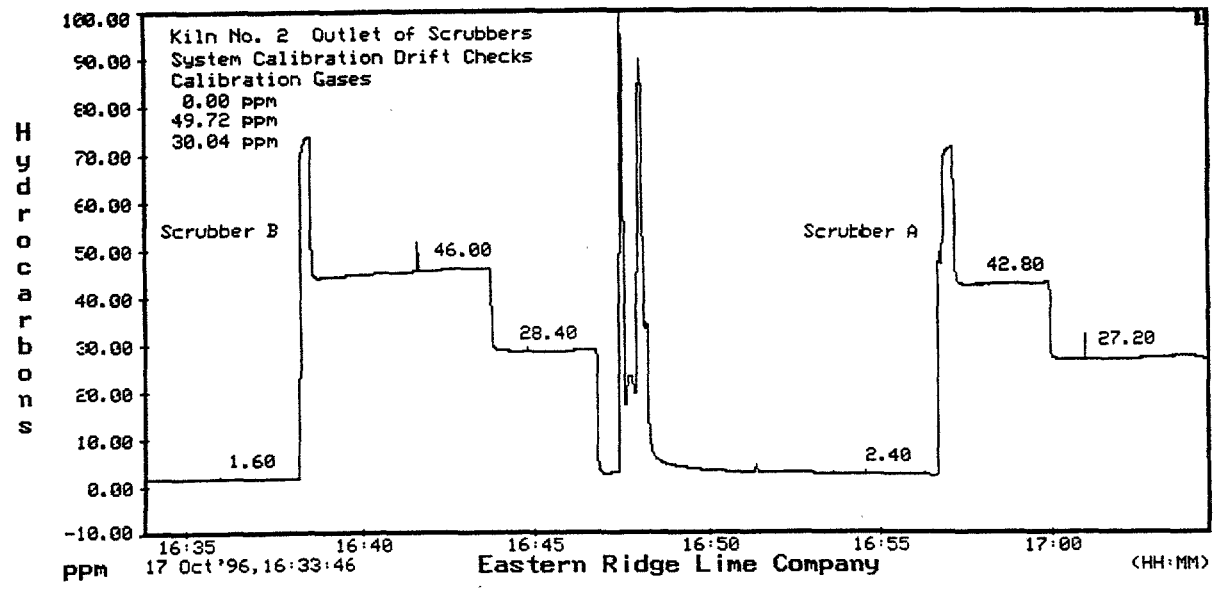

Kiln No. 2 Outlet of Scrubbers
Direct
87.20
50.40
30.40
0.00
0.80
Scrubber A
83.20
48.40
29.60
Cal Gases
87.86 ppm
49.72 ppm
30.04 ppm
0.00 ppm
0.80
Scrubber B
84.40
49.20
30.00
Direct vs System Calibrations
Hydrocarbons
ppm
17 Oct'96,09:26:12
Eastern Ridge Lime Company
(HH:MM)

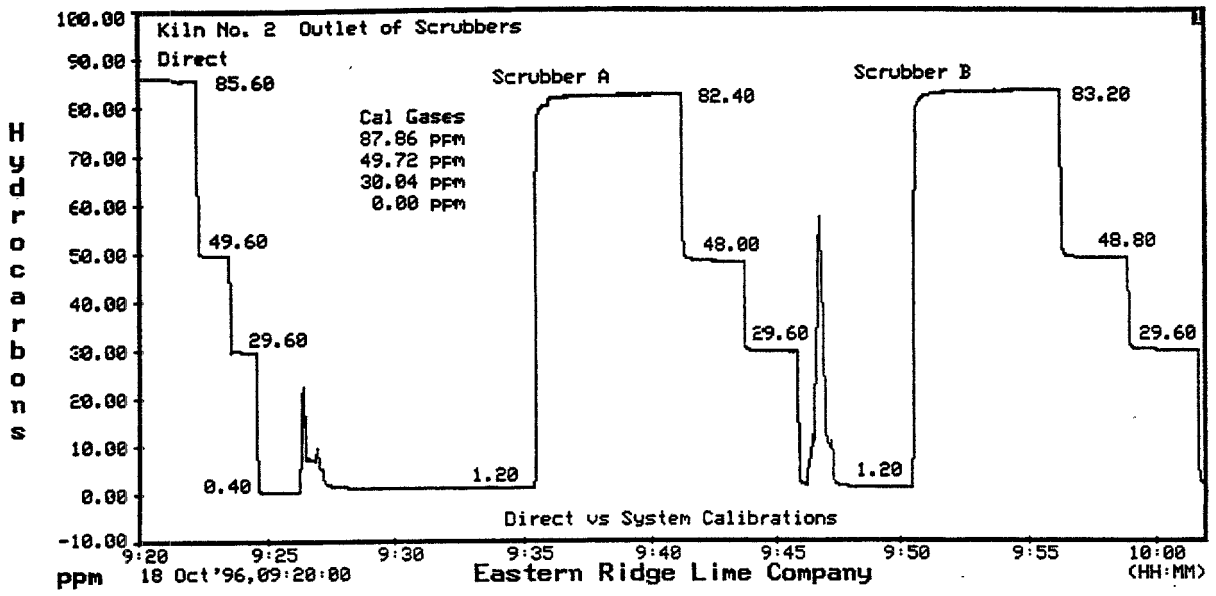

Kiln No. 2 Outlet of Scrubbers
System Calibration Drift Checks
Calibration Gases
0.00 ppm
49.72 ppm
87.86 ppm
30.04 ppm
Scrubber B
48.80
0.80
Scrubber A
45.60
1.20
78.80
28.40
Hydrocarbons
ppm
17 Oct'96,11:10:00
Eastern Ridge Lime Company
(HH:MM)

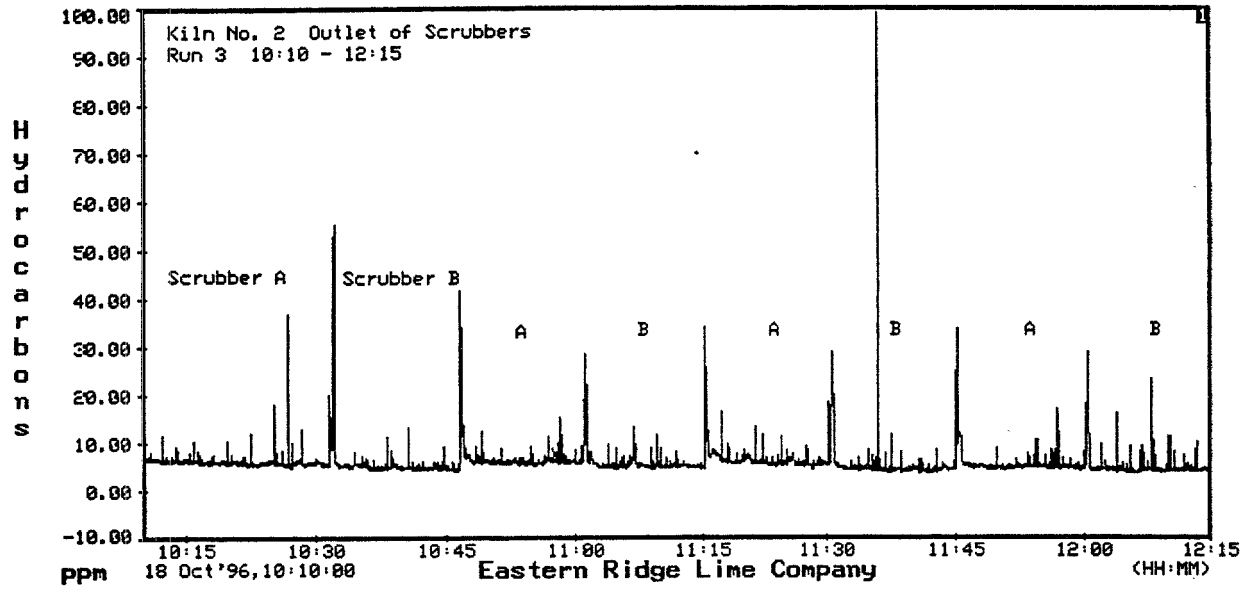

Kiln No. 2 Outlet of Scubbers
Run 2 11:40 - 13:30
Scubber A
Scrubber B
A
B
A
B
Hydrocarbons
ppm
17 Oct'96,11:40:00
Eastern Ridge Lime Company
(HH:MM)

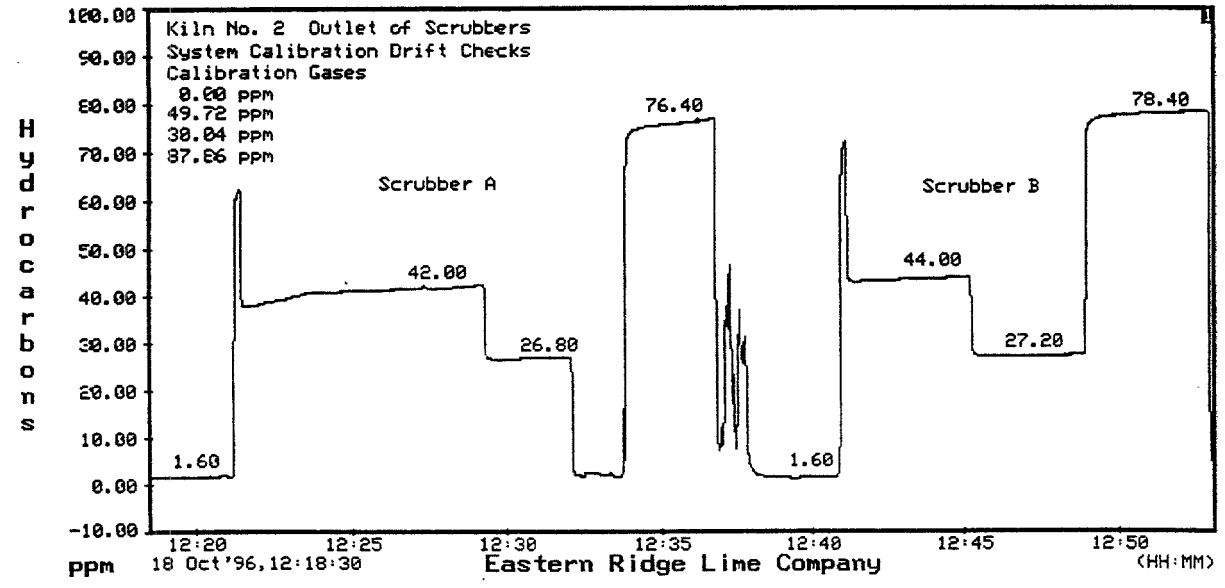

Kiln No. 2 Outlet of Scrubbers
System Calibration Drift Checks
Calibration Gases
0.00 ppm
49.72 ppm
30.04 ppm
Scrubber B
47.20
29.20
Scubber A
43.60
2.80
1.60
Hydrocarbons
ppm
17 Oct'96,13:37:56
Eastern Ridge Lime Company
(HH:MM)

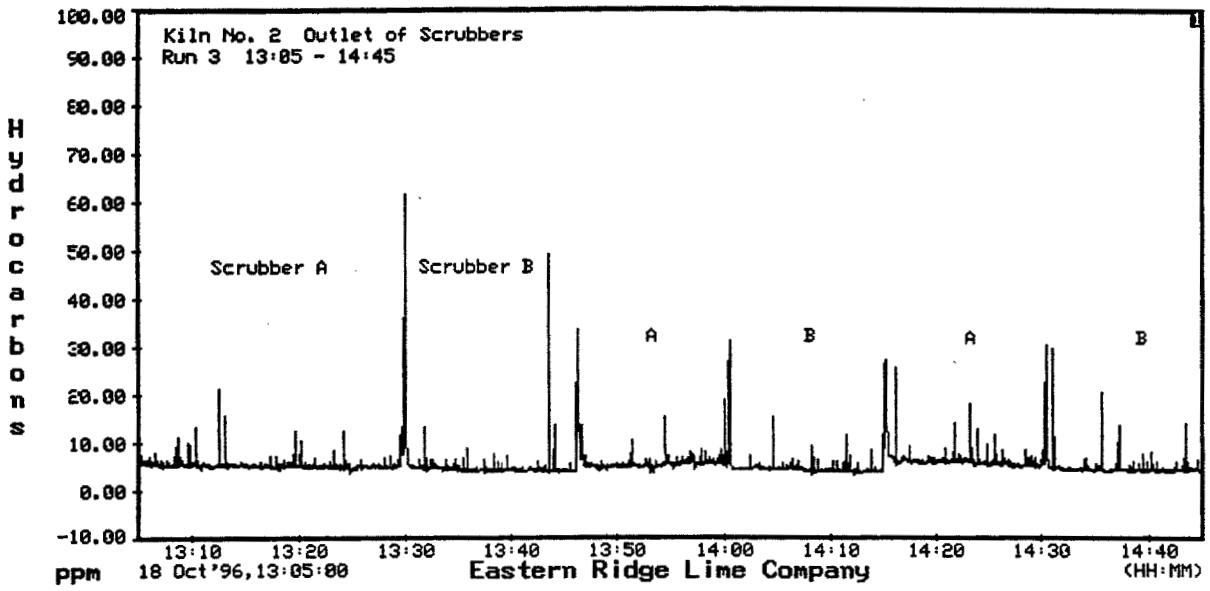

Kiln No. 2 Outlet of Scrubbers
Run 2 14:00 - 16:30
Scrubber A
Scrubber B
A
B
A
B
A
B
A
B
Hydrocarbons
ppm
17 Oct'96,14:00:00
Eastern Ridge Lime Company
(HH:MM)

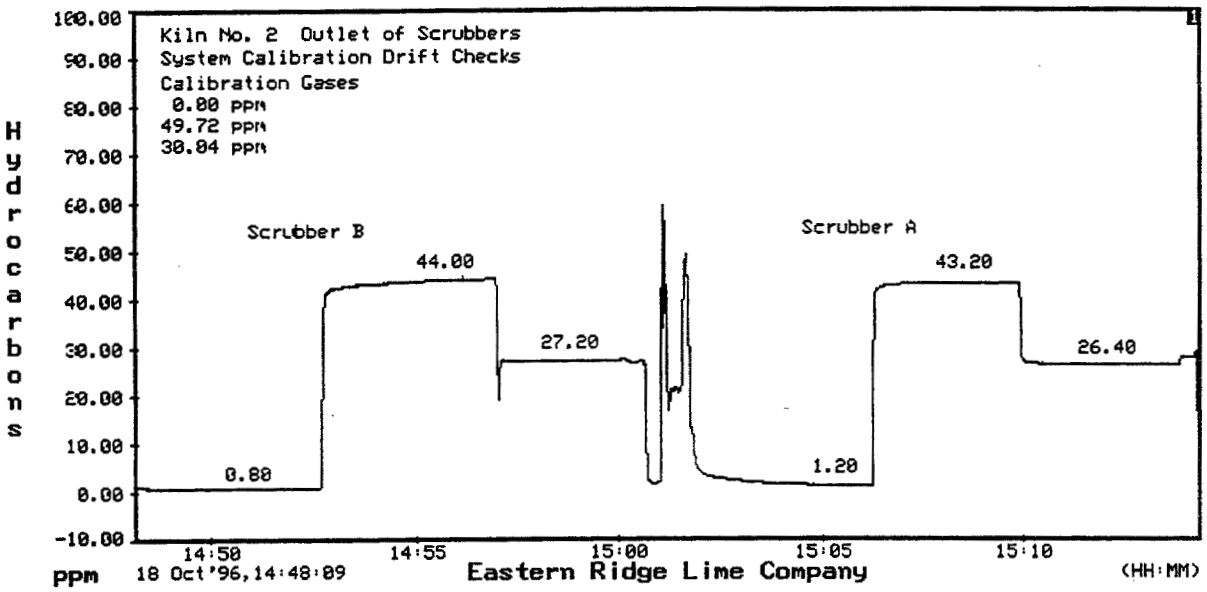

Kiln No. 2 Outlet of Scrubbers
System Calibration Drift Checks
Calibration Gases
0.00 ppm
49.72 ppm
30.04 ppm
Scrubber B
46.00
28.40
1.60
Scrubber A
42.80
27.20
2.40
Hydrocarbons
ppm
17 Oct'96,16:33:46
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Outlet of Scrubbers
Direct
85.60
49.60
29.60
0.40
Cal Gases
87.86 ppm
49.72 ppm
30.04 ppm
0.00 ppm
Scrubber A
82.40
48.00
29.60
1.20
Scrubber B
83.20
48.80
29.60
1.20
Direct vs System Calibrations
Hydrocarbons
ppm
18 Oct'96,09:20:00
Eastern Ridge Lime Company
(HH:MM)


Kiln No. 2 Outlet of Scrubbers
Run 3 10:10 - 12:15
Scrubber A
Scrubber B
A
B
A
B
A
B
Hydrocarbons
ppm
18 Oct'96,10:10:00
Eastern Ridge Lime Company
(HH:MM)

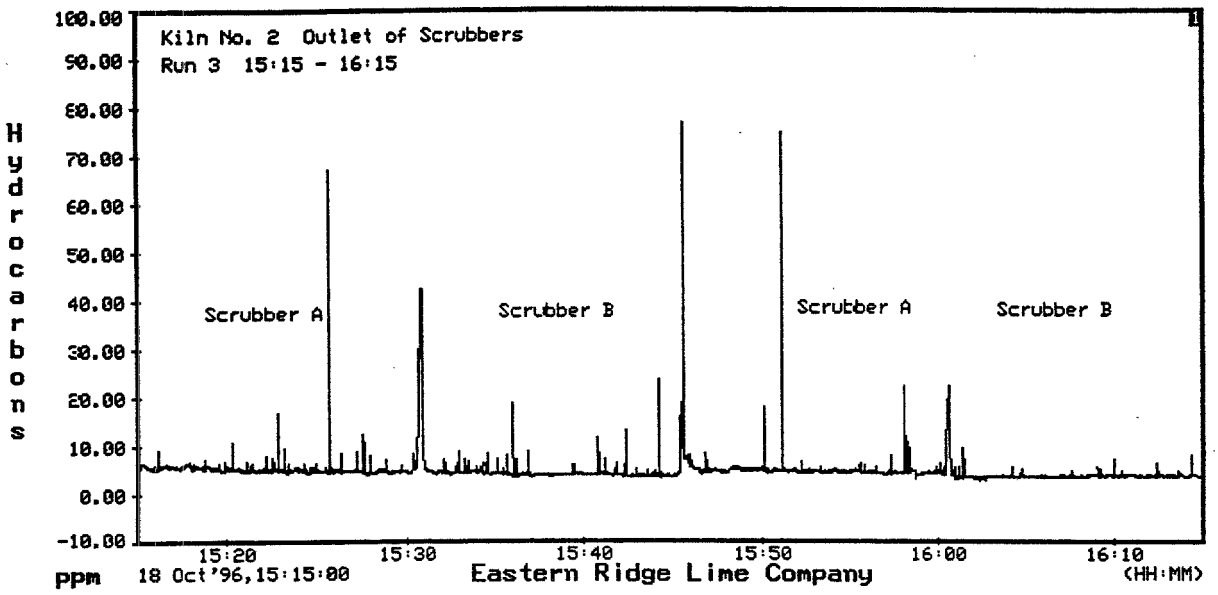

Kiln No. 2 Outlet of Scrubbers
System Calibration Drift Checks
Calibration Gases
0.00 ppm
49.72 ppm
30.04 ppm
87.86 ppm
Scrubber A
42.00
26.80
76.40
1.60
Scrubber B
44.00
27.20
78.40
1.60
Hydrocarbons
ppm
18 Oct'96,12:18:30
Eastern Ridge Lime Company
(HH:MM)

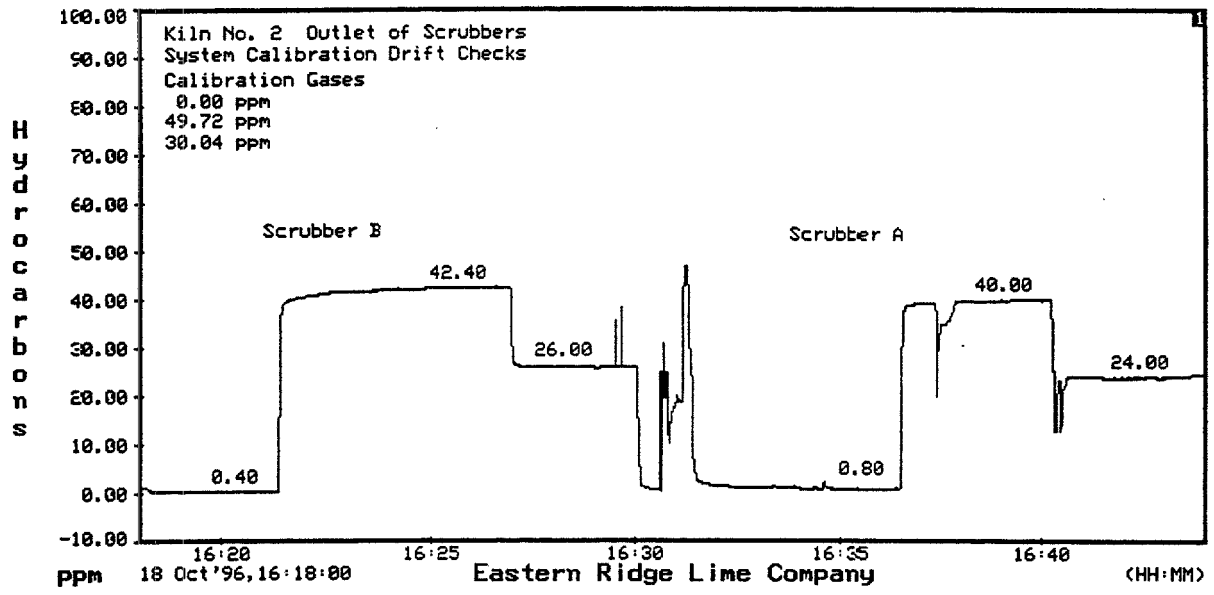




Key:

Graph 1 Trace 1 OUT-18.DTA Adaptive Line 14 Sep 1995





Key:

Graph 1 Trace 1 OUT-18.DTA Adaptive Line 14 Sep 1995

Appendix D.2

Calculations

Hydrator

Circular Stack Method 1 Calculation Results

Date: 11/01/96 Time: 16:29:34

Facility:	EASTERN RIDGE LIME
Source ID:	HYDRATOR
Source Name:	HYDRATOR
Date:	10/18/96
Calculated By:	MARC HAMILTON

Input Values

Traverse Point Type:	Sample - M5	
Inside of far wall to outside of nipple:	26 1/2	(inches)
Nipple Length:	3 even	(inches)
Distance from Upstream Disturbance:	144 even	(inches)
Distance from Downstream Disturbance:	120 even	(inches)
Number of ports:	2 ports at 90 degrees	

Calculated Values

Inside Diameter:	23.5000	(inches)
Upstream Duct Diameters:	6.12	
Downstream Duct Diameters:	5.10	
Mininum Traverse Points:	16	

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3	Nipple Length (inches)	Traverse Point Location Sum of Col 4 & 5
1	0.032	23 1/2	0 3/4	3 even	3 3/4
2	0.105	23 1/2	2 7/16	3 even	5 7/16
3	0.194	23 1/2	4 9/16	3 even	7 9/16
4	0.323	23 1/2	7 9/16	3 even	10 9/16
5	0.677	23 1/2	15 15/16	3 even	18 15/16
6	0.806	23 1/2	18 15/16	3 even	21 15/16
7	0.895	23 1/2	21 1/16	3 even	24 1/16
8	0.968	23 1/2	22 3/4	3 even	25 3/4

PES

Program

VOID

ISOKINETIC CALCULATION M29-4 M29-5 M29-6

SITE _____ TEST NO. _____

			RUN 1	RUN 2	RUN 3
1. Volume of dry gas sampled corrected to standard conditions. Note: V_m must be corrected for leakage if any leakage rates exceed L_a). $V_{m_{std}} = 17.65 \times V_m \times Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] =$	A	V_m, ft^3	68.258	55.512	44.722
	E	Y	1.003	1.003	1.003
	C	P_{bar}, in.Hg	28.25	28.25	28.26
	D	$\overline{\Delta H}$, in.H_2O	1.02	0.70	-0.442
	E	$\overline{T}_m$, °R	540	523	530
	F	$V_{m_{std}}$, dscf	63.383	53.179	42.263
2. Volume of water vapor at standard conditions, ft^3. $V_{w_{std}} = 0.04707 V_{1c} =$	G	V_{1c}, g	1858.8	1601.1 +7.8	~~1872~~ 1555.4
	H	$V_{w_{std}}$, ft^3	87.494	75.364	54.385
3. Moisture content in stack gas. $B_{ws} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} =$	I	B_{ws}	0.5799	0.5863	.5627
	J	$1-B_{ws}$	0.4201	0.4137	.4373
4. Dry molecular weight of stack gas, lb/lb-mole. $M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO) =$		% CO_2	0.0	0	0
		% O_2	21.0	21	21
		% N_2 + % CO	79.0	79	79
	K	M_d, lb/lb-mole	28.84	28.84	28.84
5. Molecular weight of stack gas. $M_s = M_d\ (1-B_{ws}) + 18\ B_{ws} =$	L	M_s, lb/lb-mole	22.553	22.48	22.74
6. Stack velocity at stack conditions, fps. $V_s = 85.49\ Cp\ (avg.\ \sqrt{\Delta P}) \sqrt{\frac{T_s}{P_s M_s}} =$	M	P_{static}, in.H_2O	0.18	0.17	0.18
	N	P_s, in.Hg	28.26	28.26	28.27
	O	$\overline{T}_s$, °R	644	645	645
	P	$\overline{\sqrt{\Delta P}}$	0.2604	0.2839	0.2519
NOTE: $P_s = P_{bar} + \left(\frac{P_{static}}{13.6}\right)$	Q	Cp	0.84	0.84	0.84
	R	V_s, fps 18.797	~~0.437~~	20.541	18.119
7. Isokinetic variation $\%\ I = \frac{V_{m_{std}} \times T_s \times 17.32}{V_s \times D_n^2 \times \theta \times P_s \times (1-B_{ws})}$	S	Dn, in.	0.437	0.439	.437
	T	θ, min.	120.0	120.0	120
	U	% I	138.2	107.0	92.0

VOID

EMISSION CALCULATIONS* m29-4

SITE _____ TEST NO. _____

			RUN 1	RUN 2	RUN 3
8. Stack gas volumetric flow rate at stack conditions, acfm $Q_s = 0.3272 \times V_s \times D_s^2 =$	R	V_s, fps	18.797	20.541	18.119
	V	D_s, in.	22.5	22.5	22.5
	W	Q_s, acfm	3114.	3403	3001
9. Dry stack gas volumetric flow rate at standard conditions, dscfm $Q_{s_{std}} = 17.65\ Q_s \frac{P_s}{T_s}\left(1-B_{ws}\right) =$	N	P_s, in.Hg	28.26	28.26	28.27
	O	T_s, °R	644.	645	645
	J	$(1-B_{ws})$	0.4201	0.4137	.4373
	X	$Q_{s_{std}}$, dscfm	1013.	1089	1015
10. Concentration, gr/dscf $C_s = 0.01543\left(\frac{Mn}{V_{m_{std}}}\right) =$	Y	Mn, mg	---.		
	F	$V_{m_{std}}$, dscf	---.---		
	Z	C_s, gr/dscf	----		
11. Concentration, ppm $ppm = \frac{5.595 \times 10^4}{M_w} \times C_s =$	AA	M_w, lb/lb-mole	---.		
	BB	ppm			
12. Mass emission rate, lb/h a) $E = (8.573 \times 10^{-3}) \times C_s \times Q_{s_{std}} =$ EA b) $E = (1.532 \times 10^{-7}) \times ppm \times M_w \times Q_{s_{std}} =$ EB		E, lb/h	VOID		

*Continuation of isokinetic calculations

Program

ISOKINETIC CALCULATION M29-7

SITE _____ TEST NO. _____

			RUN 1	RUN 2	RUN 3
1. Volume of dry gas sampled corrected to standard conditions. Note: V_m must be corrected for leakage if any leakage rates exceed L_a). $V_{m_{std}} = 17.65 \times V_m \times Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] =$	A	V_m, ft^3	52.934		
	B	Y	1.003		
	C	P_{bar}, in.Hg	28.26		
	D	$\overline{\Delta H}$, in.H_2O	0.57		
	E	$\overline{T}_m$, °R 535	~~648~~		
	F	$V_{m_{std}}$, dscf	49.573		
2. Volume of water vapor at standard conditions, ft^3. $V_{w_{std}} = 0.04707 V_{lc} =$	G	V_{lc}, g	1495.5		
	H	$V_{w_{std}}$, ft^3	70.393		
3. Moisture content in stack gas. $B_{ws} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} =$	I	B_{ws}	0.5868		
	J	$1-B_{ws}$	0.4132		
4. Dry molecular weight of stack gas, lb/lb-mole. $M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO) =$		% CO_2	0		
		% O_2	21.0		
		% N_2 + % CO	79.0		
	K	M_d, lb/lb-mole	28.84		
5. Molecular weight of stack gas. $M_s = M_d\ (1-B_{ws}) + 18\ B_{ws} =$	L	M_s, lb/lb-mole	22.48		
6. Stack velocity at stack conditions, fps. $V_s = 85.49\ Cp\ \left(avg.\ \sqrt{\Delta P}\right) \sqrt{\frac{T_s}{P_s\ M_s}} =$	M	P_{static}, in.H_2O	0.15		
	N	P_s, in.Hg	28.27		
	O	$\overline{T}_s$, °R	646.		
	P	$\overline{\sqrt{\Delta P}}$	0.2859		
NOTE: $P_s = P_{bar} + \left(\frac{P_{static}}{13.6}\right)$	Q	Cp	0.84		
	R	V_s, fps	20.700		
7. Isokinetic variation $\%\ I = \frac{V_{m_{std}} \times T_s \times 17.32}{V_s \times D_n^2 \times \theta \times P_s \times (1-B_{ws})}$	S	Dn, in.	0.439		
	T	θ, min.	120		
	U	% I	99.2		

EMISSION CALCULATIONS* M29-7

SITE _____ TEST NO. _____

			RUN 1	RUN 2	RUN 3
8. Stack gas volumetric flow rate at stack conditions, acfm	R	V_s, fps	20.7		
$Q_s = 0.3272 \times V_s \times D_s^2 =$	V	D_s, in.	22.5		
	W	Q_s, acfm	3429.		
9. Dry stack gas volumetric flow rate at standard conditions, dscfm	N	P_s, in.Hg	28.27		
$Q_{s_{std}} = 17.65\ Q_s \frac{P_s}{T_s}\left(1-B_{ws}\right) =$	O	T_s, °R	646.		
	J	$(1-B_{ws})$	0.4132		
	X	$Q_{s_{std}}$, dscfm	1094.		
10. Concentration, gr/dscf	Y	Mn, mg	____		
$C_s = 0.01543\left(\frac{Mn}{V_{m_{std}}}\right)$	F	$V_{m_{std}}$, dscf	____		
	Z	C_s, gr/dscf	____		
11. Concentration, ppm	AA	M_w, lb/lb-mole	____		
$ppm = \frac{5.595 \times 10^4}{M_w} \times C_s =$	BB	ppm			
12. Mass emission rate, lb/h		E, lb/h			
a) $E = (8.573 \times 10^{-3}) \times C_s \times Q_{s_{std}} =$	EA				
b) $E = (1.532 \times 10^{-7}) \times ppm \times M_w \times Q_{s_{std}} =$	EB				

*Continuation of isokinetic calculations

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 29 - Metals and Particulate Matter
Kiln No. 2 - Hydrator Stack

	RUN NUMBER	M29-5	M29-6	M29-7	
	RUN DATE	10/19/96	10/20/96	10/20/96	Average
	RUN TIME	1339-1541	1008-1213	1233-1436	
	MEASURED DATA				
(Y)	Meter Box Correction Factor, Y	1.003	1.003	1.003	1.00
(dH)	Avg Meter Orifice Pressure, in. H2O	0.696	0.442	0.566	0.568
(Pbar)	Barometric Pressure, in. Hg	28.25	28.26	28.26	28.2
(Vm)	Sample Volume, ft³	55.512	44.722	52.934	51.05
(Tm)	Average Meter Temperature, °F	63	70	75	69
(Pg)	Stack Static Pressure, in. H2O	0.17	0.18	0.15	0.1
(Ts)	Average Stack Temperature, °F	185	185	186	185
(Vlc)	Condensate Collected, ml	1601.1	1155.4	1495.5	1417.3
(%CO2)	Carbon Dioxide content, % by volume	0.0	0.0	0.0	0.
(%O2)	Oxygen content, % by volume	20.9	20.9	20.9	20.9
(%N2)	Nitrogen content, % by volume	79.1	79.1	79.1	79.
(Cp)	Pitot Tube Coefficient	0.84	0.84	0.84	0.8
(dP)	Avg Sqrt Delta P, (in. H2O)½	0.2839	0.2519	0.2859	0.2739
(Theta)	Sample Time, min	120	120	120	12
(Dn)	Nozzle Diameter, in.	0.439	0.437	0.439	0.43
	CALCULATED DATA				
(An)	Nozzle Area, square feet	0.00105	0.00104	0.00105	0.001
(Vmstd, cf)	Standard Meter Volume, ft³	53.142	42.234	49.544	48.307
(Vmstd, cm)	Standard Meter Volume, m³	1.505	1.196	1.403	1.36
(Qm)	Average Sampling Rate, dscfm	0.443	0.352	0.413	0.40
(Ps)	Stack Pressure, inches Hg	28.26	28.27	28.27	28.27
(%H2O)	Moisture, %	58.6	56.3	58.7	57
(%H2Osat)	Moisture (at saturation), %	60.4	60.3	61.1	60.
(Vwstd)	Standard Water Vapor Volume, ft³	75.364	54.385	70.393	66.714
(Mfd)	Dry Mole Fraction	0.414	0.437	0.413	0.42
(Md)	Molecular Weight-dry, lb/lb-mole	28.84	28.84	28.84	28.84
(Ms)	Molecular Weight-wet, lb/lb-mole	22.48	22.74	22.48	22.56
(Vs)	Velocity, ft/s	20.5	18.1	20.7	19
(A)	Stack Area, ft²	2.761	2.761	2.761	2.761
(Qa)	Stack Gas Volumetric flow, acfm	3,403	3,002	3,428	3,27
(Qs, cfm)	Stack Gas Volumetric flow, dscfm	1,088	1,015	1,094	1,0
(Qs, cmm)	Stack Gas Volumetric flow, dscmm	30.8	28.7	31.0	30.2
(I)	Isokinetic Sampling Ratio, %	107.0	92.0	99.2	99

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 29 - Metals and Particulate Matter
Kiln No. 2 - Hydrator Stack

	RUN NUMBER	M29-5	M29-6	M29-7	
	RUN DATE	10/19/96	10/20/96	10/20/96	Average
	RUN TIME	1339-1541	1008-1213	1233-1436	
	EMISSIONS DATA				
	Particulate Matter				
(g)	Catch, grams	0.1242	0.1260	0.1375	0.1292
(gr/dscf)	Concentration, gr/dscf	0.0361	0.0460	0.0428	0.0416
(g/dscm)	Concentration, g/dscm	0.0825	0.105	0.0980	0.0953
(lb/hr)	Emission Rate, lb/hr	0.336	0.400	0.402	0.379
(kg/hr)	Emission Rate, kg/hr	0.153	0.182	0.182	0.172
	Antimony				
(µg)	Catch, micrograms	19.6	5.10	8.27	11.0
(µg/dscm)	Concentration, µg/dscm	13.0	4.26	5.89	7.73
(g/hr)	Emission Rate, g/hr	0.0241	0.00735	0.0110	0.0141
	Arsenic				
(µg)	Catch, micrograms	4.93	2.75	1.33	3.00
(µg/dscm)	Concentration, µg/dscm	3.28	2.30	0.948	2.17
(g/hr)	Emission Rate, g/hr	0.00605	0.00396	0.00176	0.00393
	Beryllium				
(µg)	Catch, micrograms	0.000	0.000	0.000	0.000
(µg/dscm)	Concentration, µg/dscm	0.000	0.000	0.000	0.000
(g/hr)	Emission Rate, g/hr	0.000	0.000	0.000	0.000
	Cadmium				
(µg)	Catch, micrograms	1.46	1.02	1.14	1.21
(µg/dscm)	Concentration, µg/dscm	0.970	0.853	0.813	0.879
(g/hr)	Emission Rate, g/hr	0.00179	0.00147	0.00151	0.00159
	Chromium				
(µg)	Catch, micrograms	38.4	32.6	19.2	30.1
(µg/dscm)	Concentration, µg/dscm	25.5	27.3	13.7	22.2
(g/hr)	Emission Rate, g/hr	0.0472	0.0470	0.0254	0.0399

Summary of Stack Gas Parameters and Test Results
Lime Manufacturing Emission Test - Eastern Ridge Lime Company
US EPA Test Method 29 - Metals and Particulate Matter
Kiln No. 2 - Hydrator Stack

	RUN NUMBER	M29-5	M29-6	M29-7	
	RUN DATE	10/19/96	10/20/96	10/20/96	Average
	RUN TIME	1339-1541	1008-1213	1233-1436	
	EMISSIONS DATA				
	Cobalt				
(µg)	Catch, micrograms	8.95	7.55	4.31	6.94
(µg/dscm)	Concentration, µg/dscm	5.95	6.31	3.07	5.11
(g/hr)	Emission Rate, g/hr	0.0110	0.0109	0.00571	0.00[illegible]9
	Lead				
(µg)	Catch, micrograms	6.54	9.81	8.71	8.[illegible]5
(µg/dscm)	Concentration, µg/dscm	4.35	8.20	6.21	6.25
(g/hr)	Emission Rate, g/hr	0.00803	0.0141	0.0115	0.0[illegible]2
	Manganese				
(µg)	Catch, micrograms	47.1	28.6	18.9	[illegible]5
(µg/dscm)	Concentration, µg/dscm	31.3	23.9	13.5	[illegible]9
(g/hr)	Emission Rate, g/hr	0.0578	0.0412	0.0250	0.0414
	Mercury				
(µg)	Catch, micrograms	0.000	0.000	0.000	0.00[illegible]
(µg/dscm)	Concentration, µg/dscm	0.000	0.000	0.000	0.[illegible]
(g/hr)	Emission Rate, g/hr	0.000	0.000	0.000	0.[illegible]
	Nickel				
(µg)	Catch, micrograms	26.4	11.3	19.7	19.[illegible]
(µg/dscm)	Concentration, µg/dscm	17.5	9.45	14.0	13.[illegible]
(g/hr)	Emission Rate, g/hr	0.0324	0.0163	0.0261	0.0[illegible]4[illegible]
	Selenium				
(µg)	Catch, micrograms	18.8	4.44	8.10	1[illegible]4[illegible]
(µg/dscm)	Concentration, µg/dscm	12.5	3.71	5.77	7.3[illegible]
(g/hr)	Emission Rate, g/hr	0.0231	0.00640	0.0107	0.0[illegible]3[illegible]

APPENDIX E

QA/QC DATA

PACIFIC ENVIRONMENTAL SERVICES,INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR SAMPLE HEAD

DATE: 20-Dec-95

THERMOCOUPLE NUMBER: SH-1

AMBIENT TEMPERATURE: 64 °F

BAROMETRIC PRES.(In.Hg): 29.22

CALIBRATOR: J. Huntelman

REFERENCE:
Mercury-in-glass: ASTM-3F

Other: _____

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
1	Ambient Air	64	64	0
2	Cold Bath	34	34	0

[a]Type of calibration used.

[b]Allowable tolerance ±2°F

Comments:

PACIFIC ENVIRONMENTAL SERVICES,INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR SAMPLE HEAD

DATE: 20-Dec-95

THERMOCOUPLE NUMBER: SH-2

AMBIENT TEMPERATURE: 64 °F

BAROMETRIC PRES.(In.Hg): 29.22

CALIBRATOR: J. Huntelman

REFERENCE:
Mercury-in-glass: ASTM-3F

Other: _____

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] °F
1	Ambient Air	63	63	0
2	Cold Bath	33	33	0

[a]Type of calibration used.

[b]Allowable tolerance ±2°F

Comments:

SAMPLE HEAD

PACIFIC ENVIRONMENTAL SERVICES,INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR SAMPLE HEAD

DATE: 20-Dec-95

THERMOCOUPLE NUMBER: SH-3

AMBIENT TEMPERATURE: 64 °F

BAROMETRIC PRES.(In.Hg): 29.22

CALIBRATOR: J. Huntelman

REFERENCE:
Mercury-in-glass: ASTM-3F

Other: _____

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
1	Ambient Air	64	66	0.19
2	Cold Bath	34	34	0

[a]Type of calibration used.

[b]Allowable tolerance ±2°F

Comments:

PACIFIC ENVIRONMENTAL SERVICES,INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR STACK THERMOCOUPLES

DATE: 18-Dec-95

THERMOCOUPLE NUMBER: 4B

AMBIENT TEMPERATURE: 66°F

BAROMETRIC PRES.(In.Hg): 29.19

CALIBRATOR: J. Huntelman

REFERENCE:
Mercury-in-glass: ASTM-3F

Other: _____

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] %
1	Ambient Air	73	68	0.94
2	Cold Bath	32	33	0.2
3	Hot Bath	202	202	0
4	Hot Oil	350	350	0.0

[a]Type of calibration used.

[b]$\frac{(\text{ref. temp.}^{\circ}\text{F}+460)-(\text{test thermometer temp.}^{\circ}\text{F}+460)}{\text{ref temp.}^{\circ}\text{F}+460}$ X100 $100 \leq 1.5\%$

Comments:

PACIFIC ENVIRONMENTAL SERVICES,INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR STACK THERMOCOUPLES

DATE: 18-Dec-95

THERMOCOUPLE NUMBER: 4C

AMBIENT TEMPERATURE: 66 °F

BAROMETRIC PRES.(In.H 29.19

CALIBRATOR: J. Huntelman

REFERENCE:
Mercury-in-glass: ASTM-3F

Other:

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] %
1	Ambient Air	71	70	0.19
2	Cold Bath	33	34	-0.20
3	Hot Bath	209	208	0.15
4	Hot Oil	383	386	-0.36

[a]Type of calibration used.

[b]$\frac{(\text{ref. temp.}^{\circ}\text{F}+460)-(\text{test thermometer temp.}^{\circ}\text{F}+460)}{\text{ref temp.}^{\circ}\text{F}+460} \times 100$ $100 \leq 1.5\%$

Comments:

Date 5/31/96 Thermocouple No. Probe 5C

Ambient temperature 82 °F Barometric pressure 29.95 in Hg

Calibration person mw Reference: mercury-in-glass 82 °F

other _____ °F

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature[b] difference, %
Stack	Ice Bath	36	38	-0.36
	Ambient	82	83	-0.18
	Hot H_2O	199	198	0.15
	Hot 0.1	284	280	0.54
Probe	Ambient	82	83	-0.18
	Probe Heat	265	260	0.69

[a]Type of calibration system used.

[b]

$$\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460} \times 100 = \qquad (<1.5\%)$$

Date 7/24/86 Thermocouple No. 5-A
Ambient temperature 85 °F Barometric pressure 29.5 in Hg
Calibration person DG Reference: mercury-in-glass ✓ °F
other _____ °F

Reference point number	Source* (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature[b] difference, %
Probe Ambient	Air	85	84	0.18
250°	Probe Heat	244	252	-1.14
Stack Ambient	Air	85	84	0.18
32	Ice Bath	32	37	-1.02
212	Boiling H_2O	190	188	0.31

*Type of calibration system used.

[b]

$$\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460} \times 100 = \qquad (<1.5\%)$$

Date 10-9-96 Thermocouple No. Se - cherokee rental probe
Ambient temperature 73 °F Barometric pressure 28.95 in Hg
Calibration person AB Reference: mercury-in-glass X °F
other _____ °F

	Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature[b] difference, %
Probe TC	Ambient	Air	73	74	-0.19
	250	Probe Heat	248	246	0.28
Stack Tc	Ambient	Air	73	74	-0.19
	Ice Water	Ice Water	33	33	0.0
	250	Hot Oven	242	244	-0.29

[a]Type of calibration system used.

[b]

$$\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460} \times 100 = \qquad (<1.5\%)$$

Posttest Probe and Pitot Tube (Type S) Inspection Sheet

Probe or Pitot # 5-A
Date 9/29/96
Job # _____
Calibration Person DG

1. Probe or Pitot Tube Assembly Level? ✓ yes _____ no

2. Pitot Tube Openings Damaged? _____ yes (explain below) X no

3. α_1 1 ° (<10°), α_2 0 ° (<10°), β_1 1 ° (<5°),
   β_2 0 ° (<5°)

4. γ = 1 °, θ = 1 °, A = 1.012 cm (in.)

5. z = A sin γ = 0.018 cm (in.); <0.32 cm (<1/8 in.),
   w = A sin θ = 0.018 cm (in.); <0.08 cm (<1/32 in.)

6. P_A 0.506 cm (in.), P_B 0.506 cm (in.),
   D_t 0.375 cm (in.)

7. Comments _____

8. Calibration Required? _____ yes _____ no

9. Stack Thermocouple Check Needed? _____ yes (Goto Step 10) _____ no

10. Type of Reference Thermometer _____
    Barometric Pressure _____ in. Hg
    Ambient Temperature _____ °F
    Source[1] _____

    Reference Thermometer Temperature _____ °F
    Thermocouple Temperature _____ °F
    Absolute[2] Temperature Difference _____ % (<1.5%)

[1] Type of Calibration System Used

[2] $$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Thermo. Temp, °F} + 460)}{(\text{Ref. Temp., °F} + 460)} * 100\% = _____$$

Posttest Probe and Pitot Tube (Type S) Inspection Sheet

Probe or Pitot # 5-C
Date 10/9/96
Job # EPA-PES
Calibration Person MH

1. Probe or Pitot Tube Assembly Level? ✓ yes _____ no

2. Pitot Tube Openings Damaged? _____ yes (explain below) X no

3. α_1 1 ° (<10°), α_2 1 ° (<10°), β_1 0 ° (<5°),
β_2 0 ° (<5°)

4. γ = 1 °, θ = 0 °, A = 1.004 cm (in.)

5. z = A sin γ = 0.018 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = 0 cm (in.); <0.08 cm (<1/32 in.)

6. P_A 1.002 cm (in.), P_B 1.002 cm (in.),
D_t 0.375 cm (in.)

7. Comments Could not find pitot cal from May 1996
Calibration of TC found

8. Calibration Required? _____ yes _____ no

9. Stack Thermocouple Check Needed? _____ yes (Goto Step 10) _____ no

10. Type of Reference Thermometer _____
Barometric Pressure _____ in. Hg
Ambient Temperature _____ °F
Source[1] _____

Reference Thermometer Temperature _____ °F
Thermocouple Temperature _____ °F
Absolute[2] Temperature Difference _____ % (<1.5%)

[1] Type of Calibration System Used

[2] $$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Thermo. Temp, °F} + 460)}{(\text{Ref. Temp., °F} + 460)} * 100\% = _____$$

Posttest Probe and Pitot Tube (Type S) Inspection Sheet

Probe or Pitot # 5-e (Cherokee rental probe)
Date 10/9/96
Job # EPA/PES
Calibration Person AB

1. Probe or Pitot Tube Assembly Level? X yes _____ no

2. Pitot Tube Openings Damaged? _____ yes (explain below) X no

3. α_1 2 ° (<10°), α_2 1 ° (<10°), β_1 0 ° (<5°),
   β_2 0 ° (<5°)

4. γ = 0 °, θ = 0 °, A = 1.000 cm (in.)

5. z = A sin γ = 0 cm (in.); <0.32 cm (<1/8 in.),
   w = A sin θ = 0 cm (in.); <0.08 cm (<1/32 in.)

6. P_A 0.500 cm (in.), P_B 0.500 cm (in.),
   D_t 0.374 cm (in.)

7. Comments _____

8. Calibration Required? _____ yes _____ no

9. Stack Thermocouple Check Needed? _____ yes (Goto Step 10) _____ no

10. Type of Reference Thermometer _____
    Barometric Pressure _____ in. Hg
    Ambient Temperature _____ °F
    Source[1] _____

    Reference Thermometer Temperature _____ °F
    Thermocouple Temperature _____ °F
    Absolute[2] Temperature Difference _____ % (<1.5%)

[1] Type of Calibration System Used

[2] $$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Thermo. Temp, °F} + 460)}{(\text{Ref. Temp., °F} + 460)} * 100\% = _____$$

Pitot Tube Calibration Sheet

Calibrated By: BEN ELSASS / JEFF HUENTELMAN

Date: 20DEC95

Pitot Tube Number: 4B

Effective Length: 4'

Pitot Tube Assembly Level? YES NO

Pitot Tube Openings Damaged ? YES NO

α_1 = 0.0 ° (<10°) α_2 = 0.0 ° (<10°)

β_1 = 0.0 ° (< 5°) β_2 = 1.0 ° (< 5°)

γ = 0.0 ° θ = 0.0 ° A = 0.945 "

z = A sin γ = 0.00 cm (in.) 0.32 cm (< 1/8 in.)

w = A sin θ = 0.00 cm (in.) 0.08 cm (< 1/32 in.)

P_A = 0.472 cm (in.)

P_B = 0.473 cm (in.)

D_t = 0.375 cm (in.)

PACIFIC ENVIRONMENTAL SERVICES, INC.

Pitot Tube Calibration Sheet

Calibrated By: BEN ELSASS

Date: 20DEC95

Pitot Tube Number: 4C

Effective Length: 4'

Pitot Tube Assembly Level? YES NO

Pitot Tube Openings Damaged ? YES NO

α_1 = 0.0 ° (<10°) α_2 = 0.0 ° (<10°)

β_1 = 0.0 ° (< 5°) β_2 = 0.0 ° (< 5°)

γ = 0.0° θ = 1.0° A = 0.473

z = A sin γ = 0.00 cm (in.) 0.32 cm (< 1/8 in.)

w = A sin θ = 0.0170 cm (in.) 0.08 cm (< 1/32 in.)

P_A = 0.487 cm (in.)

P_B = 0.486 cm (in.)

D_t = 0.375 cm (in.)

PACIFIC ENVIRONMENTAL SERVICES, INC.

Pitot Tube Calibration Sheet

Calibrated By: BEN. ELSASS / JEFF HUENTELMAN

Date: 20DEC95

Pitot Tube Number: 4D

Effective Length: 4'

Pitot Tube Assembly Level? YES NO

Pitot Tube Openings Damaged ? YES NO

α_1 = 0.0 ° (<10°) α_2 = 1.0 ° (<10°)

β_1 = 0.0 ° (< 5°) β_2 = 0.0 ° (< 5°)

γ = 0.0 ° θ = 0.0 ° A = 0.938 "

z = A sin γ = 0.00 cm (in.) 0.32 cm (< 1/8 in.)

w = A sin θ = 0.00 cm (in.) 0.08 cm (< 1/32 in.)

P_A = 0.468 cm (in.)

P_B = 0.470 cm (in.)

D_t = 0.375 cm (in.)

PACIFIC ENVIRONMENTAL SERVICES, INC.

DRY GAS METER AND ORIFICE CALIBRATION

CONTROL BOX N MB-13 BAROMETRIC PRESS 29.21 IN. HG.

DATE: 8apr96 PERFORMED BY : B.FISHER

	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
Hd ("H2O)	0.50	0.75	1.00	1.50	2.00	4.00
INITIAL WTM	100.411	110.759	121.486	133.682	149.250	162.823
FINAL WTM	110.469	121.161	133.330	148.899	162.238	179.934
INITIAL DGM	576.862	587.508	598.573	611.203	627.346	641.423
FINAL DGM	587.206	598.248	610.833	626.983	640.821	659.172
TEMP. WTM (F)	75.0	76.0	76.0	77.0	77.0	78.0
TEMP. DGM (F)	82.0	85.0	88.0	90.0	93.0	95.0
TEST TIME (MIN.)	23.5	20.0	20.0	21.5	16.0	15.0

****

NET VOLUME WT	10.058	10.402	11.844	15.217	12.988	17.111
NET VOLUME DG	10.344	10.740	12.260	15.780	13.475	17.749
Y	0.984	0.983	0.985	0.984	0.988	0.985
H@	1.564	1.586	1.622	1.704	1.718	1.740

****

AVERAGE Y = 0.985

ACCEPTABLE Y RANGE = 0.965 TO 1.005

AVERAGE H@ = 1.656

ACCEPTABLE dH@ RANGE = 1.456 TO 1.856

Y = (Vw x Pb x (Td + 460)) / (Vd (Pb + (dHd / 13.6)) x x(Tw + 460)

THERMOCOUPLE DIGITAL INDICATOR CALIBRATION DATA SHEET

DATE: 21 DEC 95 INDICATOR #: MB-13

OPERATOR: J. HUENTELMAN SERIAL #: 207

CALIBRATION DEVICE #: Thermocouple simulator MANUFACTURER: Omega

TEST POINT #	MILLIVOLT SIGNAL	EQUIVALENT TEMP. deg. F	DIGITAL INDICATOR TEMP. READING deg. F	DIFFERENCE %
1	-0.692	0	2	0.43
2	1.520	100	101	0.18
3	3.819	200	203	0.45
4	6.092	300	303	0.39
5	8.314	400	400	0
6	10.560	500	501	0.10
7	22.251	1000	1002	0.14
8	29.315	1300	1300	0
9	36.166	1600	1600	0
10	42.732	1900	1900	0

Percent difference must be less than or equal to 0.5%

Percent difference: $\frac{\text{(Equivalent temp., deg. R - Digital indicator temp., deg R)(100\%)}}{\text{(Equivalent temp., deg. R)}}$

Where, deg. R = deg. F + 460

POSTTEST DRY GAS METER CALIBRATION

MB #:	13	BAROMETRIC PRES	29.10	(in. hg.)
DATE:	10-29-96	PERFORMED BY:	TA	
PLANT:	EPA Lime	PRETEST Y :	0.985	
		PRETEST H@:	1.656	

	RUN 1	RUN 2	RUN 3
VACUUM ("Hg)	10.00	10.00	10.00
H ("H2O)	1.60	1.60	1.60
INITIAL RTM	609.000	616.471	623.990
FINAL RTM	616.471	623.990	631.487
INITIAL DGM	77.816	85.470	93.173
FINAL DGM	85.470	93.173	100.866
TEMP. RTM (F)	76.0	77.0	78.0
TEMP. DGM (F)	76.0	80.0	83.0
TEST TIME (MIN.)	10.0	10.0	10.0

********** ********** **********

NET VOLUME RT	7.471	7.519	7.497
NET VOLUME DG	7.654	7.703	7.693
Y	0.972	0.978	0.980
H@	1.674	1.646	1.653

********** **********

PRIOR Y = 0.985
RECHECK Y = 0.976
% DIFFERENCE = -0.867

AVERAGE H@ = 1.658

Y = (Vw x Pb x (Td + 460)) / (Vd (Pb + (dHd / 13.6)) x(Tw + 460)

H@ = 0.0317 x H / (Pb (Td + 460)) x ((Tw + 460) x time) / Vw)^2

PACIFIC ENVIRONMENTAL SERVICES,INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 21-Dec-95

THERMOCOUPLE NUMBER: MB-13

AMBIENT TEMPERATURE: 75 °F

BAROMETRIC PRES.(In.Hg): 29.20

CALIBRATOR: B. ELSASS

REFERENCE:
Mercury-in-glass: ASTM-3F

Other: _____

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
INLET				
1	Ambient Air	73	71	0.37
2	Cold Bath	37	38	0.2
3	Hot Bath	187	190	0.46
OUTLET				
1	Ambient Air	75	73	0.37
2	Cold Bath	37	37	0
3	Hot Bath	188	191	0.46

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

DRY GAS METER AND ORIFICE CALIBRATION

CONTROL BOX N MB-14 BAROMETRIC PRESS 29.01

DATE: MAR 31, 96 PERFORMED BY : R. KOLDE

	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
Hd ("H2O)	0.50	0.75	1.00	1.50	2.00	4.00
INITIAL WTM	667.953	674.137	680.714	691.486	701.536	711.482
FINAL WTM	673.782	680.216	691.152	701.080	711.081	721.600
INITIAL DGM	355.200	361.402	368.000	378.800	388.905	398.901
FINAL DGM	361.048	367.500	378.482	388.453	398.506	409.097
TEMP. WTM (F)	75.5	75.5	75.5	76.0	76.0	76.5
TEMP. DGM (F)	77.0	78.5	81.0	84.0	85.5	87.0
TEST TIME (MIN.)	14.0	12.0	18.0	14.0	12.0	9.0

****

NET VOLUME WT	5.829	6.079	10.438	9.594	9.545	10.118
NET VOLUME DG	5.848	6.098	10.482	9.653	9.601	10.196
Y	0.998	1.001	1.003	1.005	1.007	1.002
H@	1.683	1.701	1.722	1.843	1.819	1.820

****

AVERAGE Y = 1.003

ACCEPTABLE Y RANGE = 0.983 TO 1.023

AVERAGE H@ = 1.765

ACCEPTABLE dH@ RANGE = 1.565 TO 1.965

Y = (Vw x Pb x (Td + 460)) / (Vd (Pb + (dHd / 13.6)) x x(Tw + 460)

THERMOCOUPLE DIGITAL INDICATOR CALIBRATION DATA SHEET

DATE: 21 DEC 95 INDICATOR #: IMB-14

OPERATOR: D. ELSASS SERIAL #: 207

CALIBRATION DEVICE #: THERMOCOUPLE SIMULATOR MANUFACTURER: OMEGA

TEST POINT #	MILLIVOLT SIGNAL	EQUIVALENT TEMP. deg. F	DIGITAL INDICATOR TEMP. READING deg. F	DIFFERENCE %
1	-0.692	0	2	0.43
2	1.520	100	101	0.18
3	3.819	200	203	0.45
4	6.092	300	303	0.39
5	8.314	400	399	0.12
6	10.560	500	500	—
7	22.251	1000	999	0.07
8	29.315	1300	1297	0.17
9	36.166	1600	1596	0.19
10	42.732	1900	1895	0.20

Percent difference must be less than or equal to 0.5%

$$\text{Percent difference:} \quad \frac{(\text{Equivalent temp., deg. R} - \text{Digital indicator temp., deg R})(100\%)}{(\text{Equivalent temp., deg. R})}$$

Where, deg. R = deg. F + 460

PACIFIC ENVIRONMENTAL SERVICES,INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 21-Dec-95

THERMOCOUPLE NUMBER: MB-14

AMBIENT TEMPERATURE: 75 °F

BAROMETRIC PRES.(In.Hg): 29.20

CALIBRATOR: B. ELSASS

REFERENCE:
Mercury-in-glass: ASTM-3F

Other: _____

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] °F
INLET				
1	Ambient Air	75	73	0.38
2	Cold Bath	32	34	0.41
3	Hot Bath	197	200	0.46
OUTLET				
1	Ambient Air	75	75	0
2	Cold Bath	33	35	0.41
3	Hot Bath	195	195	0

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

POSTTEST DRY GAS METER CALIBRATION

MB #:	14	BAROMETRIC PRESS.	29.41 (in. hg.)
DATE:	NOV 6, 96	PERFORMED BY:	MILLER
PLANT:	EPA LIME	PRETEST Y :	1.003
		PRETEST H@:	1.765

	RUN 1	RUN 2	RUN 3
VACUUM ("Hg)	3.00	3.00	3.00
H ("H2O)	1.90	1.90	1.90
INITIAL RTM	696.735	704.522	712.329
FINAL RTM	704.522	712.329	720.121
INITIAL DGM	297.229	304.955	312.698
FINAL DGM	304.955	312.698	320.466
TEMP. RTM (F)	77.0	77.0	78.0
TEMP. DGM (F)	79.5	80.5	81.5
TEST TIME (MIN.)	10.0	10.0	10.0

********** ********** **********

NET VOLUME RT	7.787	7.807	7.792
NET VOLUME DG	7.726	7.743	7.768
Y	1.008	1.010	1.005
H@	1.805	1.793	1.803

********** **********

PRIOR Y = 1.003
RECHECK Y = 1.008
% DIFFERENCE = 0.455

AVERAGE H@ = 1.800

Y = (Vw x Pb x (Td + 460)) / (Vd (Pb + (dHd / 13.6)) x(Tw + 460)

H@ = 0.0317 x H / (Pb (Td + 460)) x ((Tw + 460) x time) / Vw)^2

DRY GAS METER AND ORIFICE CALIBRATION

CONTROL BOX N MB-15 BAROMETRIC PRESS 29.27 IN. HG.

DATE: 1.APR.96 PERFORMED BY : FISHER

	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
Hd ("H2O)	0.50	0.75	1.00	1.50	2.00	4.00
INITIAL WTM	858.445	865.912	887.274	897.512	907.410	918.463
FINAL WTM	865.472	874.536	897.165	907.001	918.005	928.281
INITIAL DGM	399.528	407.014	428.474	438.822	448.836	460.025
FINAL DGM	406.560	415.675	438.473	448.411	459.561	469.936
TEMP. WTM (F)	74.0	75.0	75.0	75.0	75.0	75.0
TEMP. DGM (F)	78.0	83.0	84.0	85.0	85.0	85.0
TEST TIME (MIN.)	17.0	17.0	17.0	13.4	13.0	8.4

****

NET VOLUME WT	7.027	8.624	9.891	9.489	10.595	9.818
NET VOLUME DG	7.032	8.661	9.999	9.589	10.725	9.911
Y	1.006	1.009	1.003	1.004	1.001	0.999
H@	1.680	1.664	1.683	1.701	1.713	1.665

****

AVERAGE Y = 1.004

ACCEPTABLE Y RANGE = 0.984 TO 1.024

AVERAGE H@ = 1.684

ACCEPTABLE dH@ RANGE = 1.484 TO 1.884

Y = (Vw x Pb x (Td + 460)) / (Vd (Pb + (dHd / 13.6)) x x(Tw + 460)

THERMOCOUPLE DIGITAL INDICATOR CALIBRATION DATA SHEET

DATE: 12/18/95 INDICATOR #: MB-15

OPERATOR: BE SERIAL #: 207

CALIBRATION DEVICE #: Thermocouple Simulator MANUFACTURER: OMEGA

TEST POINT #	MILLIVOLT SIGNAL	EQUIVALENT TEMP. deg. F	DIGITAL INDICATOR TEMP. READING deg. F	DIFFERENCE %
1	-0.692	0	1	0.22
2	1.520	100	100	-0-
3	3.819	200	202	0.30
4	6.092	300	302	0.26
5	8.314	400	399	0.12
6	10.560	500	500	-0-
7	22.251	1000	1001	0.07
8	29.315	1300	1300	-0-
9	36.166	1600	1601	.05
10	42.732	1900	1902	.08

Percent difference must be less than or equal to 0.5%

Percent difference: $\frac{\text{(Equivalent temp., deg. R - Digital indicator temp., deg R)(100\%)}}{\text{(Equivalent temp., deg. R)}}$

Where, deg. R = deg. F + 460

PACIFIC ENVIRONMENTAL SERVICES,INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 21-Dec-95

THERMOCOUPLE NUMBER: MB-15

AMBIENT TEMPERATURE: 75 °F

BAROMETRIC PRES.(In.Hg): 29.20

CALIBRATOR: B. ELSASS

REFERENCE:
Mercury-in-glass: ASTM-3F

Other: _____

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] °F
INLET				
1	Ambient Air	75	76	0.37
2	Cold Bath	34	37	0.61
3	Hot Bath	189	193	0.62
OUTLET				
1	Ambient Air	75	75	0
2	Cold Bath	35	38	0.61
3	Hot Bath	188	191	0.46

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

POSTTEST DRY GAS METER CALIBRATION

MB #:	15	BAROMETRIC PRESS.	29.21 (in. hg.)
DATE:	October 30, 1996	PERFORMED BY:	P. Miller
PLANT:	EPA LIME	PRETEST Y :	1.004
		PRETEST H@:	1.685

	RUN 1	RUN 2	RUN 3
VACUUM ("Hg)	8.00	8.00	8.00
H ("H2O)	1.70	1.70	1.70
INITIAL RTM	655.459	662.934	670.405
FINAL RTM	662.934	670.405	677.878
INITIAL DGM	689.647	697.004	704.361
FINAL DGM	697.004	704.361	711.736
TEMP. RTM (F)	75.0	76.0	77.0
TEMP. DGM (F)	75.0	76.0	76.0
TEST TIME (MIN.)	10.0	10.0	10.0

********** ********** **********

NET VOLUME RT	7.475	7.471	7.473
NET VOLUME DG	7.357	7.357	7.375
Y	1.012	1.011	1.007
H@	1.766	1.772	1.777

********** **********

PRIOR Y = 1.004
RECHECK Y = 1.010
% DIFFERENCE = 0.597

AVERAGE H@ = 1.772

Y = (Vw x Pb x (Td + 460)) / (Vd (Pb + (dHd / 13.6)) x(Tw + 460)

H@ = 0.0317 x H / (Pb (Td + 460)) x ((Tw + 460) x time) / Vw)^2

Date	9/28/96	Meter Box Number	M5-6
Calibrated By	Keith Lar ick	Initials KDL	

---------- REFERENCE TEST METER ----------

Meter Y 0.997

	RUN 1	RUN 2	RUN 3
Vw, init	162.359	167.368	172.373
Vw, fin	167.368	172.373	177.418
Vw, total	5.009	5.005	5.045
Pb	29.95	29.95	29.95
tw	82	82.5	83
Tw+460	542	542.5	543

---------- DRY GAS METER ----------

Previous Y 1.008

Vm, init	271.078	276.131	281.157
Vm, fin	276.131	281.157	286.212
Vm, total	5.053	5.026	5.055
Tdii	82	85	88
Tdif	85	88	89
Tdoi	82	83	83
Tdof	83	83	83
Td,avg	83	84.75	85.75
Td+460	543	544.75	545.75
Time, min	5	5	5
Time, sec	42	48	30
Time Total	5.70	5.80	5.50
dH	2.50	2.50	2.50

---------- CALIBRATION CHECK RESULTS ----------

Y	0.984	0.991	0.994
dH@	1.867	1.938	1.718
Y tolerance from avg *	0.01	-0.00	-0.00
dH@ tol. from avg **	-0.03	-0.10	0.12
AVERAGE Y	0.990		
AVERAGE dH@	1.841		
Y error (vs prior Y) ***	-1.8%		

* must be no greater than +/- 0.02
** must be no greater than +/- 0.20
*** must be no greater than +/- 5%

Date 11-5-96 Meter Box Number M5-6
Calibrated by B. Palm

	Run 1	Run 2	Run 3
Reference Meter			
Meter gam	1.016		
Vwi	674.31	683.864	693.438
Vwf	683.864	693.438	703.002
Vw	9.70686	9.72718	9.71702
Pb	30.05	30.05	30.05
Twi	64	64	65
Twf	64	65	65
Tw	64	64.5	65
Tw+460	524	524.5	525
Dry Gas Meter			
Vmi	347.589	357.299	367.042
Vmf	357.299	367.042	376.795
Vm	9.71	9.743	9.753
dH	3.1	3.1	3.1
Tdii	67	68	72
Tdif	69	76	75
tdoi	65	66	68
Tdof	66	68	69
Td, avg	66.75	69.5	71
Td+460	526.75	529.5	531
Time, min	10	10	10
Time, sec	0	0	0
Time Total	10.00	10.00	10.00
Y	0.997	1.000	1.000
dH@	1.813	1.760	1.774
Y error	0.2%	-0.1%	-0.1%
dH@ error	-1.7%	1.3%	0.5%
Average Y	0.999		
Average d	1.783		

Date	11/26/96	Meter Box Number	M5-9
Calibrated By	David Goshaw	Initials	

---------- REFERENCE TEST METER ----------

Meter Y 1.016

	RUN 1	RUN 2	RUN 3
Vw, init	890.811	896.668	902.094
Vw, fin	896.668	902.094	907.255
Vw, total	5.857	5.426	5.161
Pb	29.70	29.70	29.70
tw	63	63	63
Tw+460	523	523	523

---------- DRY GAS METER ----------

Previous Y 1.009

Vm, init	236.3	242.154	247.583
Vm, fin	242.154	247.583	252.747
Vm, total	5.854	5.429	5.164
Tdii	67	69	70
Tdif	70	71	71
Tdoi	65	65	66
Tdof	65	68	67
Td,avg	66.75	67.75	68.5
Td+460	526.75	527.75	528.5
Time, min	12	11	10
Time, sec	0	0	25
Time Total	12.00	11.00	10.42
dH	0.80	0.79	0.81

---------- CALIBRATION CHECK RESULTS ----------

Y	1.022	1.023	1.024
dH@	1.809	1.747	1.773
Y tolerence from avg *	0.00	0.00	-0.00
dH@ tol. from avg **	-0.03	0.03	0.00

AVERAGE Y 1.023
AVERAGE dH@ 1.776

Y error (vs prior Y) *** 1.4%

* must be no greater than +/- 0.02
** must be no greater than +/- 0.20
*** must be no greater than +/- 5%

M5-9 FULL CAL 7-24-96

METHOD 5 CALIBRATION FORM

Date 7/24/96 Meter box number M5-9

Calibrated by KDL Orifice: Front Leak Check ✓ Back Leak Check ✓

Reference Meter, Y_r = ~~1.003~~ 0.997

Meter Box Pretest Y_i = 1.013

Barometric Pressure, P_b ~~30.0~~ 29.90

Orifice Manometer setting $\Delta H@_i$, in H_2O	Volume: Reference Test Meter (V_w), ft^3		Volume: Dry gas meter (V_d), ft^3		Temperatures: Wet test meter (t_m), °F	Temperatures: Dry Gas Meter Inlet ($t_{d,i}$), °F	Temperatures: Dry Gas Meter Outlet ($t_{d,o}$), °F	Temperatures: Dry Gas Meter Avg (t_d), °F	Time (θ), mins tenths	Y_i	$\Delta H@_i$, in H_2O
0.5	233.307	238.418	468.649	473.797	82/81	82/85	82/82	82/84	13.5	0.990	2.017
1.0	238.418	248.621	473.797	483.804	81/81	85/94	82/84	84/89	18.3	1.024	1.849
1.5	248.621	258.706	483.804	493.828	81/81	94/94	84/86	89/90	14.8	1.015	1.850
2.0	258.706	268.937	493.828	504.096	81/81	94/95	86/87	90/91	12.9	1.006	1.816
									Avg.	1.009	1.883

Meter Y 1.009

% Error _____

*If there is only one thermometer on the dry gas meter, record the temperature under t_d.

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

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

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (810) 589-2950 FAX:(810) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
PACIFIC ENVIRONMENTAL SER
STE 150
4700 DUKE DRIVE, STE 150
MASON, OH 45040

Assay Laboratory
Scott Specialty Gases, Inc
1290 Combermere
Troy, MI 48083

Purchase Order : 103-96-0206
Scott Project # : 96412

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards; Procedure G1; September, 1993.

Cylinder Number : ALM057024 **Certificate Date :** 5/20/96 **Expiration Date :** 5/20/99
Cylinder Pressure + : 1950 psig **Previous Certificate Date :** None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon Dioxide	9.85 %	±1% NIST Directly Traceable
Oxygen	13.1 %	±1% NIST Directly Traceable

Balance Gas: Nitrogen

+Do not use when cylinder presssure is below 150 psig.
*Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM 18000	12/21/96	ALM058589	17.95 % Carbon Dioxide in Nitrogen
NTRM 2659	11/23/96	ALM031731	20.72 % Oxygen in Nitrogen

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO2: Horiba/PIR2000/609105	5/20/96	Non-dispersive Infrared
O2: Rosemount/755R/57076204	5/14/96	Paramagnetic

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Carbon Dioxide	Date: 5/20/96 Response Units: mv Z1=0.00 R1=130.70 T1=89.20 R2=130.70 Z2=0.00 T2=89.20 Z3=0.00 T3=89.20 R3=130.70 Avg. Conc. of Cust. Cyl. 9.85 %		Concentration=A+Bx+Cx²+Dx³+Ex⁴ r=1.00000 NTRM 18000 Constants: A=-2.546553000 B=0.185816300 C=-0.000607556 D=0.000005678 E=0.000000000
Oxygen	Date: 5/20/96 Response Units: mv Z1=0.00 R1=20.72 T1=13.07 R2=20.72 Z2=0.00 T2=13.07 Z3=0.00 T3=13.07 R3=20.72 Avg. Conc. of Cust. Cyl. 13.1 %		Concentration=A+Bx+Cx²+Dx³+Ex⁴ r=1.00000 NTRM 2659 Constants: A=0.011929630 B=1.001842000 C=0.000000000 D=0.000000000 E=0.000000000

Special Notes

Mail

Robin R. Warburton
Analyst

MSPAP-1

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (810) 589-2950 FAX:(810) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
PACIFIC ENVIRONMENTAL SER
ATTN: GARY GUY
4700 DUKE DRIVE, STE 150
MASON, OH 45040

Assay Laboratory
Scott Specialty Gases, Inc
1290 Combermere
Troy, MI 48083

Purchase Order : GARY GAY
Scott Project # : 583831

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards; Procedure G1; September, 1993.

Cylinder Number : ALM036992 **Certificate Date :** 7/26/95 **Expiration Date :** 7/26/98
Cylinder Pressure + : 1900 psig **Previous Certificate Date :** None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon Dioxide	16.1 %	±1% NIST Directly Traceable
Oxygen	21.2 %	±1% NIST Directly Traceable

Balance Gas: Nitrogen

+Do not use when cylinder presssure is below 150 psig.
*Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM 18000	12/21/96	ALM058589	17.95 % Carbon Dioxide in Nitrogen
NTRM 2659	11/23/96	ALM031731	20.72 % Oxygen in Nitrogen

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO2: Horiba/PIR2000/609105	7/12/95	NonDispersive Infra-Red
O2:ROSEMOUNT/755R/1000430	7/12/95	Paramagnetic

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Carbon Dioxide	Date: 7/26/95 Response Units: mv Z1=0.00 R1=130.70 T1=122.70 R2=130.70 Z2=0.00 T2=122.50 Z3=0.00 T3=122.60 R3=130.70 Avg. Conc. of Cust. Cyl. 16.1 %		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=1.00000 NTRM 18000 Constants: A=-2.546553000 B=0.165816300 C=-0.000807556 D=0.000005678 E=0.000000000
Oxygen	Date: 7/26/95 Response Units: mv Z1=0.00 R1=20.72 T1=21.12 R2=20.72 Z2=0.00 T2=21.13 Z3=0.00 T3=21.12 R3=20.72 Avg. Conc. of Cust. Cyl. 21.2 %		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=1.00000 NTRM 2659 Constants: A=0.011929630 B=1.001842000 C=0.000000000 D=0.000000000 E=0.000000000

Special Notes

Mail

Analyst

MISP/P-1

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (810) 589-2950 FAX:(810) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
PACIFIC ENVIROMENTAL SER
ATTN: GARY GUY
4700 DUKE DRIVE,STE 150
MASON, OH 45040

Assay Laboratory
Scott Specialty Gases, Inc
1290 Combermere
Troy, MI 48083

Purchase Order : 103-95-0237
Scott Project # : 578641

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards; Procedure G1; September, 1993.

Cylinder Number : ALM012950
Cylinder Pressure + : 1900 psig
Certificate Date : 3/17/95
Previous Certificate Date : None
Expiration Date : 3/17/98

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	30.04 ppm	±1% NIST Directly Traceable

Balance Gas: Air

+Do not use when cylinder pressure is below 150 psig
*Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM 1668	6/7/96	ALM-032015	95.5 ppm Propane in Air

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Propane : Beckman/400/1002059	3/1/95	Flame Ionization Detector

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components
Propane

First Triad Analysis

Date: 3/17/96 Response Units: mv

Z1=0.00	R1=95.60	T1=30.10
R2=95.50	Z2=0.00	T2=30.10
Z3=0.00	T3=30.10	R3=95.50

Avg. Conc. of Cust. Cyl. 30.04 ppm

Second Triad Analysis

Calibration Curve

Concentration=A+Bz+Cz^2+Dz^3+Ez^4
r=1.00000 NTRM 1668
Constants: A=0.095524000
B=1.000000000 C=0.000000000
D=0.000000000 E=0.000000000

Special Notes

Rohit Patel
Analyst

Scott Specialty Gases

1750 EAST CLUB BOULEVARD, DURHAM, NC 27704 (919) 220-0803 FAX: (919) 220-0808

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
Pacific Environmental Services
Attn: Mr. Frank Meadows
P.O. Box 12077
Research Triangle Park, NC 27709

Assay Laboratory
Scott Specialty Gases, Inc.
1750 East Club Boulevard
Durham, NC 27704

Purchase Order 104-95-0121
Scott Project # 12-11271

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol Procedure #G1, issued September, 1993.

Cylinder Number ALM-029561 **Certification Date** 04-18-95 **Expiration Date** 04-18-98
Cylinder Pressure 2000 PSIG **Previous Certification** None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	49.72 PPM	+/- 1% NIST Directly Traceable
Air		Balance

Do not use when cylinder pressure is less than 150 PSIG.

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM # 1668	06-96	ALM-032005	95.5 PPM Balance in Air

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Varian /3400/16804	03-23-95	Gas Chromatography

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Propane	Date: 04-18-95 Response Units: Area STD=1397517 SPL=729255 SPL=727424 SPL=725065 STD=1396975 STD=1395705	Date: Response Units: STD= SPL= SPL= SPL= STD= STD=	Date: 03-23-95
	Date: Response Units: STD= SPL= SPL= SPL= STD= STD=	Date: Response Units: STD= SPL= SPL= SPL= STD= STD=	Date:
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Analyst S. Vaughan

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (810) 589-2950 FAX:(810) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
PACIFIC ENVIRONMENTAL SER
4700 DUKE DRIVE, STE 150
MASON, OH 45040

Assay Laboratory
Scott Specialty Gases, Inc
1290 Combermere
Troy, MI 48083

Purchase Order : 103-96-205
Scott Project # : 96411

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards; Procedure G1; September, 1993.

Cylinder Number : ALM060903 **Certificate Date :** 5/15/96 **Expiration Date :** 5/15/99
Cylinder Pressure + : 2000 psig **Previous Certificate Date :** None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	87.86 ppm	±1% NIST Directly Traceable

Balance Gas: Air

+Do not use when cylinder pressure is below 150 psig.
*Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM	6/7/96	ALM032007	95.5 ppm Propane in Air

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
C3H8: Varian/1400/08982426	5/15/96	Gas Chromatography

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components
Propane

First Triad Analysis

Date: 5/15/96 Response Units: mv

Z1=0.00	R1=525.00	T1=480.50
R2=525.00	Z2=0.00	T2=481.10
Z3=0.00	T3=480.40	R3=525.00

Avg. Conc. of Cust. Cyl. 87.86 ppm

Second Triad Analysis

Calibration Curve

Concentration=A+Bx+Cx^2+Dx^3+Ex^4

r=1.00000	NTRM
Constants:	A=0.068810850
B=0.182643400	C=0.000000000
D=0.000000000	E=0.000000000

Special Notes

Cylinder

Robin Walker
Analyst

M8PP-1

GAS ANALYSIS DATA FORM

PLANT EASTERN RIDGE LIME CO.
DATE 10-18-96 TEST NO
SAMPLING TIME (24-hr CLOCK) 1130
SAMPLING LOCATION ORSAT CALIBRATION
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) INTEGRATED BAG
ANALYTICAL METHOD ORSAT
AMBIENT TEMPERATURE 70°F
OPERATOR [signature]

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d.
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2 CO_2 cal →	16.1	16.1	16.1	16.1	16.0	16.0	16.1	44/100	
	9.9	9.9	9.9	9.9	9.8	9.8	9.9		
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	mixture 23.0	13.1 ~~23~~	23.0	13.1	22.8	13.0	13.1	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

Cal gas values	CO_2	O_2
Cylinder # ALM0 58589	16.1%	—
Cylinder # ALM057024	9.85%	13.1%

INITIAL CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME CO.
Location: KILN NO 2 INLET
Date: 10-16-96
Operator: P. SIEGEL
Project #: S401.003

Parameter: SO_2, CO_2, O_2, NO_X, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.:

Cylinder #	Cal. Gas Conc., ppm or %	Chart Divisions		Concentration Predicted by Equation,* Direct System		Calibration Error,** % of Span	Sampling System Bias,*** % of Span
		Direct Injection to Monitor	Injection Through System				
0	0	0.1	1.0	-0.34	0.56		0.90
ALM012950	30.04	30.6	29.8	30.08	29.29	0.13	0.79
ALM029561	49.72	51.0	49.0	50.43	48.44	1.43	1.99
ALM060903	87.86	88.1	84.4	87.44	83.75		3.69

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = ppm \quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.440)}{(1.0025)}$$

Correlation Coefficient = 0.99990

Calculation concentration predicted by equatio using actual chart response obtained from each calibration gas response.

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc., ppm} - \text{conc. predicted, ppm}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Sampling system bias} = \frac{(\text{Direct inject. gas conc.} - \text{System inject. gas conc.}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 5% of span

Minimum detectable limit = 2% of span or 2 ppm or % (circle one)

Rise time to 95% of response for high cal. gas injected through the system (return to zero after each injection): 40 s, 40 s, 40 s Average = 40 s

Precision, % scale = difference in chart division response for two repeated injections of the gas concentrations = 84.4 - 84.7 = ~~0.30~~ 0.30 PTS %

(Clock time = 9:00)

DAILY CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME Co.
Location: KILN No. 2 INLET
Date: 10-16-96
Operator: P. SIEGEL
Project #: S401.003
Time, Pretest: _____ Post-test: _____
Run #: _____

Parameter: SO_2, CO_2, O_2, NO_X, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.: _____
Ambient Temp., F: _____

Cyl. #	Cal. Gas Conc., ppm or %	Calibrations (Chart Divisions) 13:20	14:45	17:30	Concentration Predicted By Equation* 13:20	14:45	17:30	Analyzer Calibration Error,** % of Span	Drift,*** % of Span
	0	1.0	1.0	2.0	-0.22	-0.22	0.8		1.0
	30.04	31.0		29.0	29.98		27.97	0.20	-2.0
	49.72	51.2	51.2	47.0	50.31	50.31	46.08	-1.19	-4.2
	87.86	88.2		80.0	87.55		79.29		-8.2

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = \text{ppm}$ $\quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 1.214)}{(0.9936)}$$

Correlation Coefficient = 0.99994

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc.} - \text{conc. predicted}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Drift, \% Span} = \frac{(\text{Post-test cal. response} - \text{initial cal. response}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 3% of span
Minimum detectable limit = 2% of span or 2 ppm or % (circle one)
Maximum zero drift = 3 % of span or 3 ppm or % (circle one)
Maximum calibration drift = 3 % of span or 3 ppm or % (circle one)

COMMENTS: Pretest or post-test (circle one) calibration used to quantitate sample data. Post-test is used if drift exceeds limits and if post-test yields higher concentrations.

DAILY CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME CO
Location: KILN No. 2 INLET
Date: 10-16-96
Operator: P. SIEGEL
Project #: S401.003
Time, Pretest: _____ Post-test: _____
Run #: _____

Parameter: SO_2, CO_2, O_2, NO_X, (THC)
Monitor: (ppm) or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.: _____
Ambient Temp., F: _____

Cyl. #	Cal. Gas Conc., ppm or %	Calibrations (Chart Divisions) 17:30	20:15	Concentration Predicted By Equation* 17:30	20:15	Analyzer Calibration Error,** % of Span	Drift,*** % of Span
	0	2.0	1.0	-0.30	-1.43		-1.13
	30.04	29.0		30.09		-0.17	
	49.72	47.0	45.5	50.35	48.66	-1.27	-1.69
	87.86	80.0		87.49			

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = ppm \quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 2.269)}{(0.8885)}$$

Correlation Coefficient = 0.99992

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc.} - \text{conc. predicted}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Drift, \% Span} = \frac{(\text{Post-test cal. response} - \text{initial cal. response}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 3% of span
Minimum detectable limit = 2% of span or 2 (ppm) or % (circle one)
Maximum zero drift = 3 % of span or 3 (ppm) or % (circle one)
Maximum calibration drift = 3 % of span or 3 (ppm) or % (circle one)

COMMENTS: Pretest or post-test (circle one) calibration used to quantitate sample data. Post-test is used if drift exceeds limits and if post-test yields higher concentrations.

INITIAL CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME Co.
Location: KILN No. 2 SCRUBBER A PTS
Date: 10-16-96
Operator: P. SIEGEL
Project #: S401.003

Parameter: SO_2, CO_2, O_2, NO_X, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.:

Cylinder #	Cal. Gas Conc., ppm or %	Chart Divisions		Concentration Predicted by Equation,* Direct System		Calibration Error,** % of Span	Sampling System Bias,*** % of Span
		Direct Injection to Monitor	Injection Through System				
	0	0.1	1.7	-0.25	1.33		1.58
ALM012950	30.04	30.8	30.3	30.11	29.62	1.63	0.49
ALM029561	49.72	51.1	49.6	50.19	48.70	3.00	1.49
ALM060903	87.86	88.9	84.4	87.57	83.12		4.45

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ x = ppm y = chart divisions

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.353)}{(1.0111)}$$

Correlation Coefficient = 0.99995

Calculation concentration predicted by equatio using actual chart response obtained from each calibration gas response.

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc., ppm} - \text{conc. predicted, ppm}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Sampling system bias} = \frac{(\text{Direct inject. gas conc.} - \text{System inject. gas conc.}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 5% of span

Minimum detectable limit = 2% of span or 2 ppm or % (circle one)

Rise time to 95% of response for high cal. gas injected through the system (return to zero after each injection): 55 s, 55 s, 55 s Average = 55 s

Precision, % scale = difference in chart division response for two repeated injections of the gas concentrations = 84.4 - 84.6 = 0.2 %
(Clock time = 10:40)

DAILY CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME CO.
Location: KILN NO 2 SCRUBBER A
Date: 10-16-96
Operator: P. SIEGEL
Project #: S401.003
Time, Pretest: _____ Post-test: _____
Run #: _____

Parameter: SO_2, CO_2, O_2, NO_X, (THC)
Monitor: (ppm) or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.: _____
Ambient Temp., F: _____

Cyl. #	Cal. Gas Conc., ppm or %	Calibrations (Chart Divisions) 10:30	18:00	15:00	20:45	Concentration Predicted By Equation* 15:00	18:00	20:45	Analyzer Calibration Error,** % of Span	Drift,*** % of Span
	0	1.7	2.6	2.4	2.0	-0.48	-0.24	-0.94		0.70
	30.04	30.3	29.0				30.49		-1.50	
	49.72	49.6	45.4	50.1	44.6	55.06	49.59	48.66	0.26	-5.47/0.93
	87.86	84.4	78.2				87.78			

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = ppm \quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 2.808)}{(0.8589)}$$

Correlation Coefficient = 0.99996

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc.} - \text{conc. predicted}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Drift, \% Span} = \frac{(\text{Post-test cal. response} - \text{initial cal. response}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 3% of span
Minimum detectable limit = 2% of span or 2 ppm or % (circle one)
Maximum zero drift = 3 % of span or 3 ppm or % (circle one)
Maximum calibration drift = 3 % of span or 3 ppm or % (circle one)

COMMENTS: Pretest or post-test (circle one) calibration used to quantitate sample data. Post-test is used if drift exceeds limits and if post-test yields higher concentrations.

INITIAL CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME Co.
Location: KILN No 2 SCRUBBER ~~A~~ B PTS
Date: 10-16-96
Operator: P. SIEGEL
Project #: S401.003

Parameter: SO_2, CO_2, O_2, NO_X, (THC)
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.:

Cylinder #	Cal. Gas Conc., ppm or %	Chart Divisions		Concentration Predicted by Equation,* Direct System		Calibration Error,** % of Span	Sampling System Bias,*** % of Span
		Direct Injection to Monitor	Injection Through System				
	0	0.1	1.0	-0.25	0.64		0.89
ALM012950	30.04	30.8	30.0	30.11	29.32	0.23	0.79
ALM029561	49.72	51.1	49.7	50.19	48.80	0.95	1.39
ALM060903	87.86	88.9	85.0	87.57	83.71		3.86

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ x = ppm y = chart divisions

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.353)}{(1.0111)}$$

Correlation Coefficient = 0.99995

Calculation concentration predicted by equatio using actual chart response obtained from each calibration gas response.

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc., ppm - conc. predicted, ppm}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Sampling system bias} = \frac{(\text{Direct inject. gas conc. - System inject. gas conc.}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 5% of span

Minimum detectable limit = 2% of span or 2 (ppm) or % (circle one)

Rise time to 95% of response for high cal. gas injected through the system (return to zero after each injection): 65 s, 65 s, 65 s Average = 65 s

Precision, % scale = difference in chart division response for two repeated injections of the gas concentrations = 86.0 - 86.0 = 0.0 %
(Clock time = 9:50)

DAILY CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME CO
Location: KILN No 2 SCRUBBER B
Date: 10-16-96
Operator: P. SIEGEL
Project #: S401.003
Time, Pretest: _____ Post-test: _____
Run #: _____

Parameter: SO_2, CO_2, O_2, NO_X, (THC)
Monitor: (ppm) or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.: _____
Ambient Temp., F: _____

Cyl. #	Cal. Gas Conc., ppm or %	Calibrations (Chart Divisions) 9:40	17:30	15:05	~~[illegible]~~ 20:20	Concentration Predicted By Equation* 9:40	15:05	17:30	20:20	Analyzer Calibration Error,** % of Span	Drift,*** % of Span
	0	1.0	2.0	2.0	1.4	-0.31	0.73	0.73	0.10		1.04
	30.04	30.0			28.0	29.97			27.88	0.23	2.09
	49.72	49.7	48.8	50.3	44.7	50.55	51.17	49.61	45.33	-1.67	5.22
	87.86	85.0				87.41					

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = \text{ppm}$ $\quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 1.302)}{(0.9575)}$$

Correlation Coefficient = 0.99988

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc.} - \text{conc. predicted}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Drift, \% Span} = \frac{(\text{Post-test cal. response} - \text{initial cal. response}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 3% of span
Minimum detectable limit = 2% of span or 2 ppm or % (circle one)
Maximum zero drift = 3 % of span or 3 ppm or % (circle one)
Maximum calibration drift = 3 % of span or 3 ppm or % (circle one)

COMMENTS: Pretest or post-test (circle one) calibration used to quantitate sample data. Post-test is used if drift exceeds limits and if post-test yields higher concentrations.

INITIAL CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME CO.
Location: KILN No. 2 SCRUBBER A
Date: 10-17-96
Operator: P. SIEGEL
Project #: S401.003

Parameter: SO_2, CO_2, O_2, NO_X, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.:

Cylinder #	Cal. Gas Conc., ppm or %	Chart Divisions		Concentration Predicted by Equation,* Direct System		Calibration Error,** % of Span	Sampling System Bias,*** % of Span
		Direct Injection to Monitor	Injection Through System				
	0	0.4	1.1	-.24	0.46		-0.70
ALM012950	30.04	30.7	29.9	30.02	29.22	0.07	0.80
ALM029561	49.72	51.0	49.0	50.29	48.30	-1.15	1.99
ALM060903	87.86	88.3	84.3	87.54	83.55		3.99

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = ppm \quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.637)}{(1.0014)}$$

Correlation Coefficient = 0.99994

Calculation concentration predicted by equatio using actual chart response obtained from each calibration gas response.

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc., ppm - conc. predicted, ppm}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Sampling system bias} = \frac{(\text{Direct inject. gas conc. - System inject. gas conc.}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 5% of span

Minimum detectable limit = 2% of span or 2 ppm or % (circle one)

Rise time to 95% of response for high cal. gas injected through the system (return to zero after each injection): 55 s, _____ s, _____ s Average = 55 s

Precision, % scale = difference in chart division response for two repeated injections of the gas concentrations = _____ - _____ = _____ %
(Clock time =)

DAILY CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME Co.
Location: KILN No. 2 SCRUBBER A
Date: 10-17-96
Operator: PAUL SIEGEL
Project #: S401.003
Time, Pretest: _____ Post-test: _____
Run #: _____

Parameter: SO_2, CO_2, O_2, NO_X, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm as Propane
Pbar, in. Hg.: _____
Ambient Temp., F: _____

Cyl. #	Cal. Gas Conc., ppm or %	Calibrations (Chart Divisions) 11:20	13:50	16:50	Concentration Predicted By Equation* 11:20	13:50	16:50	Analyzer Calibration Error,** % of Span	Drift,*** % of Span
	0	1.6	3.0	2.8	-0.16	1.42	1.19		1.4
	30.04	28.5		27.2	30.10		28.63	-0.20	
	49.72	46.2	44.0	44.2	50.00	47.53	47.75	-0.56	-2.2
	87.86	79.7			87.68				

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $x = ppm$ $y =$ chart divisions

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 1.742)}{(0.8891)}$$

Correlation Coefficient = 0.99998

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc.} - \text{conc. predicted}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Drift, \% Span} = \frac{(\text{Post-test cal. response} - \text{initial cal. response}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 3% of span
Minimum detectable limit = 2% of span or 2 ppm or % (circle one)
Maximum zero drift = 3 % of span or 3 ppm or % (circle one)
Maximum calibration drift = 3 % of span or 3 ppm or % (circle one)

COMMENTS: Pretest or post-test (circle one) calibration used to quantitate sample data. Post-test is used if drift exceeds limits and if post-test yields higher concentrations.

INITIAL CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME CO.
Location: KILN NO. 2 SCRUBBER B
Date: 10-17-96
Operator: P. SIEGEL
Project #: S401.003

Parameter: SO_2, CO_2, O_2, NO_X, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.:

Cylinder #	Cal. Gas Conc., ppm or %	Chart Divisions: Direct Injection to Monitor	Chart Divisions: Injection Through System	Concentration Predicted by Equation,* Direct System		Calibration Error,** % of Span	Sampling System Bias,*** % of Span
	0	0.4	1.0	-0.24	0.36		-0.60
ALM012950	30.04	30.7	30.2	30.02	29.52	0.07	0.50
ALM029561	49.72	51.0	50.0	50.29	49.29	-1.15	1.00
ALM060903	87.86	88.3	85.3	87.54	84.55		2.99

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = \text{ppm}$ $\quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.637)}{(1.0014)}$$

Correlation Coefficient = 0.99994

Calculation concentration predicted by equatio using actual chart response obtained from each calibration gas response.

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc., ppm} - \text{conc. predicted, ppm}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Sampling system bias} = \frac{(\text{Direct inject. gas conc.} - \text{System inject. gas conc.}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 5% of span

Minimum detectable limit = 2% of span or 2 ppm or % (circle one)

Rise time to 95% of response for high cal. gas injected through the system (return to zero after each injection): 65 s, ____ s, ____ s Average = 65 s

Precision, % scale = difference in chart division response for two repeated injections of the gas concentrations = ____ - ____ = ____ %
(Clock time =)

DAILY CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME Co
Location: KILN No. 2 SCRUBBER B
Date: 10 - 17 - 96
Operator: P. SIEGEL
Project #: S401.003
Time, Pretest: _____ Post-test: _____
Run #: _____

Parameter: SO_2, CO_2, O_2, NO_X, (THC)
Monitor: (ppm) or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.: _____
Ambient Temp., F: _____

Cyl. #	Cal. Gas Conc., (ppm) or %	Calibrations (Chart Divisions) 9:50	11:15	13:40	16:40	Concentration Predicted By Equation* 9:50	11:15	13:40	16:40	Analyzer Calibration Error,** % of Span	Drift,*** % of Span
	0	1.0	1.1	1.9	2.0	-0.37	-0.27	0.56	0.67		1.04
	30.04	30.2		29.5	29.0	30.01		29.29	28.77	0.10	-1.24
	49.72	50.0	49.0	47.8	46.5	50.62	49.58	48.33	46.98	-1.81	-3.64
	87.86	85.3				87.36					

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = \text{ppm}$ $\quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 1.360)}{(0.9609)}$$

Correlation Coefficient = 0.99985

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc.} - \text{conc. predicted}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Drift, \% Span} = \frac{(\text{Post-test cal. response} - \text{initial cal. response}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 3% of span
Minimum detectable limit = 2% of span or 2 (ppm) or % (circle one)
Maximum zero drift = 3 % of span or 3 (ppm) or % (circle one)
Maximum calibration drift = 3 % of span or 3 (ppm) or % (circle one)

COMMENTS: Pretest or post-test (circle one) calibration used to quantitate sample data. Post-test is used if drift exceeds limits and if post-test yields higher concentrations.

INITIAL CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME Co.
Location: KILN No. 2 INLET
Date: 10-17-96
Operator: P. SIEGEL
Project #: S401.003

Parameter: SO_2, CO_2, O_2, NO_x, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm ~~THC~~ Propane
Pbar, in. Hg.:

Cylinder #	Cal. Gas Conc., ppm or %	Chart Divisions		Concentration Predicted by Equation,* Direct System		Calibration Error,** % of Span	Sampling System Bias,*** % of Span
		Direct Injection to Monitor	Injection Through System				
	0	0.1	0.2	-0.23	-0.13		0.1
ALM012950	30.04	30.3	28.6	29.87	28.18	0.57	1.69
ALM029561	49.72	51.0	47.5	50.50	47.01	-1.57	3.49
ALM060903	87.86	88.1	82.0	87.48	81.40		6.08

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = ppm \quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.328)}{(1.0034)}$$

Correlation Coefficient = 0.99990

Calculation concentration predicted by equatio using actual chart response obtained from each calibration gas response.

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc., ppm - conc. predicted, ppm}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Sampling system bias} = \frac{(\text{Direct inject. gas conc. - System inject. gas conc.}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 5% of span

Minimum detectable limit = 2% of span or 2 ppm or % (circle one)

Rise time to 95% of response for high cal. gas injected through the system (return to zero after each injection): 40 s, ____ s, ____ s Average = 40 s

Precision, % scale = difference in chart division response for two repeated injections of the gas concentrations = ____ - ____ = ____ %
(Clock time =)

DAILY CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME CO.
Location: KILN NO 2 INLET
Date: 10-17-96
Operator: P. SIEGEL
Project #: S401.003
Time, Pretest: _____ Post-test: _____
Run #: _____

Parameter: SO_2, CO_2, O_2, NO_X, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.: _____
Ambient Temp., F: _____

Cyl. #	Cal. Gas Conc., ppm or %	Calibrations (Chart Divisions) 9:15	11:35	13:40	15:40	17:05	Concentration Predicted By Equation* 9:15	11:35	13:40	15:40	17:05	Analyzer Calibration Error,** % of Span	Drift,*** % of Span
	0	0.2	0.4	1.5	1.6	1.3	-0.36	-.14	1.04	1.15	0.82		1.4
	30.04	28.6					30.13					0.30	
	49.72	47.5	47.0	49.0	46.7	46.8	50.41	49.87	52.02	49.55	49.66	1.39	1.5
	87.86	82.0					87.44						

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = ppm \quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.532)}{(0.9317)}$$

Correlation Coefficient = 0.99990

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc.} - \text{conc. predicted}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Drift, \% Span} = \frac{(\text{Post-test cal. response} - \text{initial cal. response}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 3% of span
Minimum detectable limit = 2% of span or 2 ppm or % (circle one)
Maximum zero drift = 3 % of span or 3 ppm or % (circle one)
Maximum calibration drift = 3 % of span or 3 ppm or % (circle one)

COMMENTS: Pretest or post-test (circle one) calibration used to quantitate sample data. Post-test is used if drift exceeds limits and if post-test yields higher concentrations.

INITIAL CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME CO.
Location: KILN No. 2 INLET
Date: 10-18-96
Operator: P. SIEGEL
Project #: S401.003

Parameter: SO_2, CO_2, O_2, NO_x, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.:

Cylinder #	Cal. Gas Conc., ppm or %	Chart Divisions		Concentration Predicted by Equation,* Direct System		Calibration Error,** % of Span	Sampling System Bias,*** % of Span
		Direct Injection to Monitor	Injection Through System				
	0	0.2	0.6	-0.34	0.06		-0.40
ALM012950	30.04	30.3	28.5	29.97	28.16	0.23	1.81
ALM029561	49.72	50.8	47.1	50.62	46.89	-1.81	3.73
ALM060903	87.86	87.3	81.0	87.38	81.03		6.35

- Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ x = ppm y = chart divisions

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.541)}{(0.9929)}$$

Correlation Coefficient = 0.99986

Calculation concentration predicted by equatio using actual chart response obtained from each calibration gas response.

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc., ppm - conc. predicted, ppm}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Sampling system bias} = \frac{(\text{Direct inject. gas conc. - System inject. gas conc.}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 5% of span

Minimum detectable limit = 2% of span or 2 ppm or % (circle one)

Rise time to 95% of response for high cal. gas injected through the system (return to zero after each injection): 40 s, ____ s, ____ s Average = 40 s

Precision, % scale = difference in chart division response for two repeated injections of the gas concentrations = ____ - ____ = ____ %
(Clock time =)

DAILY CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME Co
Location: KILN No. 2 INLET
Date: 10-18-96
Operator: P. SIEGEL
Project #: S401.003
Time, Pretest: _____ Post-test: _____
Run #: _____

Parameter: SO_2, CO_2, O_2, NO_X, (THC)
Monitor: (ppm) or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.: _____
Ambient Temp., F: _____

Cyl. #	Cal. Gas Conc., ppm or %	Calibrations (Chart Divisions) 9:20	12:05	14:10	16:10	Concentration Predicted By Equation* 9:20	12:05	14:10	16:10	Analyzer Calibration Error,** % of Span	Drift,*** % of Span
	0	0.6	1.0	1.1	0.0	-0.35	0.08	0.19	-1.01		-0.54
	30.04	28.5			23.9	30.11			25.09	-0.23	5.02
	49.72	47.1	46.0	44.7	39.1	50.42	49.22	47.80	41.69	-1.41	
	87.86	81.0				87.44					

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ x = ppm y = chart divisions

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.923)}{(0.9158)}$$

Correlation Coefficient = 0.99990

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc.} - \text{conc. predicted}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Drift, \% Span} = \frac{(\text{Post-test cal. response} - \text{initial cal. response}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 3% of span
Minimum detectable limit = 2% of span or 2 (ppm) or % (circle one)
Maximum zero drift = 3 % of span or 3 (ppm) or % (circle one)
Maximum calibration drift = 3 % of span or 3 (ppm) or % (circle one)

COMMENTS: Pretest or post-test (circle one) calibration used to quantitate sample data. Post-test is used if drift exceeds limits and if post-test yields higher concentrations.

INITIAL CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME CO.
Location: KILN NO. 2 SCRUBBER A
Date: 10-18-96
Operator: P. SIEGEL
Project #: S401.003

Parameter: SO_2, CO_2, O_2, NO_X, (THC)
Monitor: (ppm) or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.: _____

Cylinder #	Cal. Gas Conc., ppm or %	Chart Divisions		Concentration Predicted by Equation,* Direct System		Calibration Error,** % of Span	Sampling System Bias,*** % of Span
		Direct Injection to Monitor	Injection Through System				
	0	0.6	1.6	-0.19	0.83		-1.02
ALM012950	30.04	30.0	29.7	29.90	29.60	0.47	0.30
ALM029561	49.72	50.0	48.6	50.38	48.94	-1.33	1.44
ALM060903	87.86	86.3	83.1	87.54	84.26		3.28

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = \text{ppm}$ $\quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.790)}{(0.9769)}$$

Correlation Coefficient = 0.99993

Calculation concentration predicted by equatio using actual chart response obtained from each calibration gas response.

$$** \text{ Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc., ppm} - \text{conc. predicted, ppm}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$*** \text{ Sampling system bias} = \frac{(\text{Direct inject. gas conc.} - \text{System inject. gas conc.}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 5% of span

Minimum detectable limit = 2% of span or 2 (ppm) or % (circle one)

Rise time to 95% of response for high cal. gas injected through the system (return to zero after each injection): 55 s, _____ s, _____ s Average = 55 s

Precision, % scale = difference in chart division response for two repeated injections of the gas concentrations = _____ - _____ = _____ %
(Clock time =)

DAILY CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: Eastern Ridge Lime Co.
Location: Kiln No. 2 Scrubber A
Date: 10-18-96
Operator: P. Siegel
Project #: S401.003
Time, Pretest: _____ Post-test: _____
Run #: _____

Parameter: SO_2, CO_2, O_2, NO_x, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.: _____
Ambient Temp., F: _____

Cyl. #	Cal. Gas Conc., ppm or %	Calibrations (Chart Divisions) 9:35	12:20	15:05	16:35	Concentration Predicted By Equation* 9:35	12:20	15:05	16:35	Analyzer Calibration Error,** % of Span	Drift,*** % of Span
	0	1.6	2.0	1.4	1.1	0.30	0.77	0.06	-0.29		1.06
	30.04	29.7	27.0	26.7	24.0	33.32	30.15	29.80	26.63	-0.37	3.52
	49.72	48.6	42.0	43.7	40.1	55.54	47.78	49.78	45.55	3.90	
	87.86	83.1	77				88.92				

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = \text{ppm}$ $\quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 1.347)}{(0.8508)}$$

Correlation Coefficient = 0.99933

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc.} - \text{conc. predicted}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Drift, \% Span} = \frac{(\text{Post-test cal. response} - \text{initial cal. response}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 3% of span
Minimum detectable limit = 2% of span or 2 ppm or % (circle one)
Maximum zero drift = 3 % of span or 3 ppm or % (circle one)
Maximum calibration drift = 3 % of span or 3 ppm or % (circle one)

COMMENTS: Pretest or post-test (circle one) calibration used to quantitate sample data. Post-test is used if drift exceeds limits and if post-test yields higher concentrations.

INITIAL CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME Co.
Location: KILN No 2 SCRUBBER B
Date: 10-18-96
Operator: P. SIEGEL
Project #: S401.003

Parameter: SO_2, CO_2, O_2, NO_x, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.:

Cylinder #	Cal. Gas Conc., ppm or %	Chart Divisions		Concentration Predicted by Equation,* Direct System		Calibration Error,** % of Span	Sampling System Bias,*** % of Span
		Direct Injection to Monitor	Injection Through System				
	0	0.6	1.4	-0.19	0.62		-0.81
ALM012950	30.04	30.0	30.0	29.90	29.90	0.47	0
ALM029561	49.72	50.0	49.1	50.38	49.45	-1.33	0.93
ALM060903	87.86	86.3	84.0	87.54	85.18		2.36

• Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ x = ppm y = chart divisions

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 0.790)}{(0.9769)}$$

Correlation Coefficient = 0.99993

Calculation concentration predicted by equatio using actual chart response obtained from each calibration gas response.

$$** \text{ Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc., ppm} - \text{conc. predicted, ppm}) \times 1}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$*** \text{ Sampling system bias} = \frac{(\text{Direct inject. gas conc.} - \text{System inject. gas conc.}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 5% of span

Minimum detectable limit = 2% of span or 2 ppm or % (circle one)

Rise time to 95% of response for high cal. gas injected through the system (return to zero after each injection): 65 s, ____ s, ____ s Average = 65 s

Precision, % scale = difference in chart division response for two repeated injections of the gas concentrations = ____ - ____ = ____ %
(Clock time =)

DAILY CEM CALIBRATION AND PERFORMANCE EVALUATION

Plant: EASTERN RIDGE LIME CO.
Location: KILN NO. 2 SCRUBBER B
Date: 10-18-96
Operator: P. SIEGEL
Project #: S401.003
Time, Pretest: _____ Post-test: _____
Run #: _____

Parameter: SO_2, CO_2, O_2, NO_x, THC
Monitor: ppm or %
Span Value: 100
Chart Scale: 0-100 ppm Propane
Pbar, in. Hg.: _____
Ambient Temp., F: _____

Cyl. #	Cal. Gas Conc., ppm or %	Calibrations (Chart Divisions) 9:45	12:40	14:50	16:20	Concentration Predicted By Equation* 9:45	12:40	14:50	16:20	Analyzer Calibration Error,** % of Span	Drift,*** % of Span
	0	1.4	~~2.0~~ 1.8	1.1	0.8	0.05	0.50	-0.30	-0.64		1.14
	30.04	30.0	27.6	27.4	26.0	32.62	29.89	29.66	28.07	0.50	-2.73
	49.72	49.1	44.2	44.5	42.9	54.38	48.80	49.14	47.32	1.85	
	87.86	84.0	79.0			94.13	88.43				

* Perform linear regression of pretest cal. gas concentration vs. chart divisions to determine the following equation:

$y = mx + b$ $\quad x = ppm \quad y = \text{chart divisions}$

For Data Reduction:

$$\text{Pollutant, ppm/\%} = \frac{(\text{Chart Division} - b)}{m} = \frac{(CD - 1.360)}{(0.8779)}$$

Correlation Coefficient = 0.99982

$$\text{** Analyzer cal. error, \% cal. gas value} = \frac{(\text{Cal. gas conc.} - \text{conc. predicted}) \times 100}{\text{Cal. gas value, ppm}}$$

Acceptable limit = ≤ 2% of calibration gas value (≤ 5% for THC)

$$\text{*** Drift, \% Span} = \frac{(\text{Post-test cal. response} - \text{initial cal. response}) \times 100}{\text{Span value}}$$

Acceptable limit ≤ 3% of span
Minimum detectable limit = 2% of span or 2 ppm or % (circle one)
Maximum zero drift = 3 % of span or 3 ppm or % (circle one)
Maximum calibration drift = 3 % of span or 3 ppm or % (circle one)

COMMENTS: Pretest or post-test (circle one) calibration used to quantitate sample data. Post-test is used if drift exceeds limits and if post-test yields higher concentrations.

APPENDIX F

PARTICIPANTS

PROJECT PARTICIPANTS

Name	Affiliation	Responsibility
Dennis P. Holzschuh	USEPA, Emission Measurement Center	Work Assignment Manager
John T. Chehaske	Pacific Environmental Services, Inc.	Program Manager
Franklin Meadows	Pacific Environmental Services, Inc.	Project Manager/ Field Team Leader
Troy Abernathy	Pacific Environmental Services, Inc.	Site Leader/Console Operator
Ben Fisher	Pacific Environmental Services, Inc.	Probe Technician
Mike Maret	Pacific Environmental Services, Inc.	Site Leader/Metals Preparation & Recovery
Paul Siegel	Pacific Environmental Services, Inc.	THC CEM Operator
Allan Baker	DEECO[a]	Probe Technician
Marc Hamilton	DEECO[a]	Site Leader/Console Operator
Dwayne Ritchie	DEECO[a]	Console Operator
C.E. Riley	Triangle Laboratories, Inc.[a]	CDD/CDF Sample Train Preparations /Recovery
Selena Armistead	Triangle Laboratories, Inc.[a]	CDD/CDF and Metals Analyses

[a] Subcontractor to Pacific Environmental Services, Inc.

TECHNICAL REPORT DATA

Please read instructions on the reverse before completing

1. REPORT NO. EMC Report 96-LIM-1	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Lime Manufacturing Emissions Test Report Eastern Ridge Lime Company Ripplemead, Virginia		5. REPORT DATE October 1996 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Franklin Meadows		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Pacific Environmental Services, Inc. Post Office Box 12077 Research Triangle Park, NC 27709-2077		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. 68D20162
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Emission, Monitoring and Analysis Division Research Triangle Park, NC 27711		13. TYPE OF REPORT AND PERIOD COVERED Final 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This report presents the results of a testing program conducted at the Eastern Ridge Lime Company, Ripplemead, Virginia to obtain air emissions data to support the EPA's development of the lime manufacturing NESHAP. Testing was conducted on a coal-fired rotary kiln to (1) determine total hydrocarbons at the common inlet and individual outlets of two parallel wet scrubbers and (2) determine concentrations and mass emission rates of particulate matter, metals and dioxin/furan at the individual outlets of the two scrubbers. In addition, testing was conducted on the hydrator exhaust to determine emissions of particulate matter and metals.

Volume 1 of 3 - Report, 70 Pages
Volume 2 of 3 - Appendices A and B, 132 Pages
Volume 3 of 3 - Appendices C-F, 806 Pages

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTIONS	b.IDENTIFIERS/OPEN ENDED TERMS	c. COASTI Field/Group
Lime Manufacturing Scrubbers Particulate Matter Metals Dioxin/Furan HAPs		

18. DISTRIBUTION STATEMENT Unlimited	19. SECURITY CLASS *(This Report)* Unclassified	21. NO. OF PAGES 1006
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