State of Wisconsin

CORRESPONDENCE/MEMORANDUM

DATE: 12/17/04

WACD ID: NE-STK-6996
witnessed: Y-Jim Crawford
Report Rec=d: 12/10/04
File Code: 4530

PRELIMINARY* STACK TEST REVIEW

55 071 00025

By: Tim Dallmann

Test Date: 10/21/04

Name of Source: Rockwell Lime Company

FID #: 436034390

Address: 4110 Rockwood Road

Stack #: S11

City: Manitowoc

Process #: P33, P36

Permit #: 436034390-P01

Date Issued: 6/30/03

Description of Source Tested: Testing was performed on S11 which serves two rotary lime kilns, P33 and P36. During testing, the lime kilns were fired with a combination of natural gas and a coal/coke blend.

Description of Control Equipment: baghouse

Test Firm: CleanAir Engineering
Crew Chief & Phone#: Scott Brown (847) 654-4544

Pollutant Tested: PM — Test Method: EPA Methods 5,202
Pollutant Tested: SO_2 — Test Method: EPA Method 6C
Pollutant Tested: — Test Method:
Pollutant Tested: — Test Method:

Test Production Level: 32.2 TPH stone feed
Rated Production Level: 37.5 TPH stone feed

Discussion of Results:

Poll. Test Ave. = (PM) 0.026 lb/ton stone — Limit = 0.30 lb/ton stone — In Compliance? (Y) N

Poll. Test Ave. = (SO_2) 2.71 lb/mmBtu — Limit = 5.5 lb/mmBtu — In Compliance? (Y) N

Poll. Test Ave. = — Limit = — In Compliance? Y N

Poll. Test Ave. = — Limit = — In Compliance? Y N

Is This a Valid Test? (Y) N If answer is no, please indicate the reason.

* Test may be reviewed in depth later, if necessary.

CC Central Office - AM/7
US EPA Region V
Jim Crawford - NER

ANWM 091
3/15/05

PARTICULATE CHECKLIST

Name of Source: Rockwell Lime Test Date: 10/21/04

1. Are the isokinetics per run between 90 and 110%? YES x NO_
   If the %I for a run is outside the range, void the run. See 5.

2. Is the sample volume per run ≥ 30 DSCF? YES x NO_
   If the sample volume for a run is < 30 DSCF, void the run. See 5.

3. Is the sample time per run ≥ 60 min.? YES x NO_
   If the sample time for a run is < 60 min., void the run. See 5.

4. Is the sample time per sample point ≥ two min.? YES x NO_
   If the sample time per point for a run is < two min., void the run. See 5.

5. A stack test shall consist of three valid runs or, at a minimum, two valid runs if one run is voided. Is this a valid test? YES x NO_
   If no, inform the Region or the source that the test is unacceptable and should be redone. Your review is over.

6. Is the total particulate per run added correctly? YES x NO_
   If an incorrect total is found, correct the total and the results or call the consultant and ask for a correction.

7. Was the backhalf included in the total particulate? YES x NO_
   NSPS sources are exempt from including the backhalf. All other sources must include the backhalf. If they don't, the test is invalid. See 5.

Eq. 1 Gr/DSCF = 15.43* g of part./sample volume of run in DSCF

Eq. 2 Gr/DSCF @ 12% CO_2 = (Gr/DSCF)*12/Stack CO_2

Eq. 3 Gr/DSCF @ 7% O_2 = (Gr/DSCF)*(20.9-7)/(20.9-Stack O_2)

Eq. 4 Lb/DSCF = (Gr/DSCF)/7000 Eq. 5 $Lb/MLb_{DRY} = 385.6*10^3*(Lb/DSCF)/MW_{DRY}$

Eq. 6 $Lb/MLb_{WET} = 385.6*10^3*(Lb/DSCF)*(1-(\%\ Moisture/100))/MW_{WET}$

Eq. 7 Lb/Hr = 60*DSCFM*(Lb/DSCF) Eq. 8 $Lb/10^6$ BTU = (Lb/Hr)/(10^6 BTU/Hr)

Eq. 9 $Lb/10^6$ BTU = (Lb/DSCF)*F Factor*20.9/(20.9-Stack O_2)

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8. If the emission limit is in Gr/DSCF, Lb/DSCF, Lb/MLb, Lb/Hr or $Lb/10^6$ BTU, solve the needed Eq. Do your results match the consultant's? YES x NO_
   If no, fix the problem or call the consultant for a correction.

9. Is the three run(or two run) average correct? YES x NO_
   If no, write in the correct average.

10. Is the average result in compliance? YES x NO_
    If no, the Region should take appropriate action.

11. Was the source operating at a level representative of capacity? YES x NO_
    If no, the Region may cap the source at the test level until a stack test at a higher production level(showing compliance)is performed.

GASEOUS TEST CHECKLIST

Name of Source: Rockwell Lime Gas Tested: SO_2 Test Date: 10/21/04

1. A stack test shall consist of three valid runs or, at a minimum, two valid runs if one run is voided. Is this a valid test? YES x NO_
   If no, inform the Region or the source that the test is unacceptable and should be redone. Your review is over.

Eq. 1 $PPM_{DRY} = PPM_{WET}/(1-\%\ Moisture\ as\ Decimal)$

Eq. 2 $PPM_{DRY}@\ 7\%\ O_2 = PPM_{DRY}*(20.9-7)/(20.9-Stack\ O_2)$

Eq. 3 $PPM_{DRY}@\ 12\%\ CO_2 = PPM_{DRY}*12/Stack\ CO_2$

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2. If the limit is in PPM_{DRY} or in PPM_{DRY} corrected to a certain O_2 or CO_2 value, solve Eq. 1-3. Do your results match the consultant's? YES__ NO_
   If no, fix the problem or call the consultant for a correction.

Eq. 4 $mg/DSCM = PPM_{DRY}*Molecular\ Weight\ of\ Gas/24.06$

Eq. 5 $Lb/DSCF = 2.595*10^{-9}*PPM_{DRY}*Molecular\ Weight\ of\ Gas$

Eq. 6 $Lb/DSCF = 6.243*10^{-8}*(mg/DSCM)$

Eq. 7 $Lb/Hr = 60*DSCFM*(Lb/DSCF)$ Eq. 8 $Lb/10^6\ BTU = (Lb/Hr)/(10^6\ BTU/Hr)$

Eq. 9 $Lb/10^6\ BTU = (Lb/DSCF)*F\ Factor*20.9/(20.9-Stack\ O_2)$

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3. If the limit is in mg/DSCM, Lb/DSCF, Lb/Hr, or $Lb/10^6$ BTU, solve the needed Eq. Eq. 1-3 may also be needed. Do your results match the consultant's? YES x NO_
   If no, fix the problem or call the consultant for a correction.

Eq. 10 $\%\ Capture\ Eff. = \frac{(Lb\ VOC/Hr\ to\ Control\ Equip.)*100}{(Lb\ VOC/Hr\ Input\ to\ Process)}$

Eq. 11 $\%\ Destruction\ Eff. = \frac{(Inlet\ Lb\ VOC/Hr\ -Outlet\ Lb\ VOC/Hr)*100}{(Inlet\ Lb\ VOC/Hr)}$

Eq. 12 $\%\ Overall\ Eff. = (\%\ Cap.\ Eff./100)*(\%\ Dest.\ Eff./100)*100$

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4. If the limit is in terms of % Capture Eff., % Dest. Eff., or % Overall Eff., solve the needed Eq. Eq. 1-9 may also be needed. Do your results match the consultant's? YES__ NO_
   If no, fix the problem or call the consultant for a correction.

5. Is the three run(or two run) average correct? YES x NO_
   If no, write in the correct average.

6. Is the average result in compliance? YES x NO_
   If no, the Region should take appropriate action.

7. Was the source operating at a level representative of capacity? YES x NO_
   If no, the Region may cap the source at the test level until a stack test at a higher production level(showing compliance)is performed.

PROJECT OVERVIEW

Rockwell Lime Company contracted Clean Air Engineering to perform particulate and sulfur dioxide testing at their facility located in Manitowoc, WI for compliance demonstration.

The test parameters included the following pollutants:

- Sulfur dioxide (SO_2);
- total suspended particulate (TSP);
- condensible particulate matter (CPM).

The testing took place at the C01 Baghouse Stack with both kilns in operation on October 21, 2004. Coordinating the field testing were:

D. Brisch - Rockwell Lime
J Crawford - Wisconsin DNR
C. Wiza - Clean Air Engineering

Table 1-1:
Summary of Test Results

Source Constituent	Sampling Method	Average Emission	Permit Limit[1]
Lime Kiln Stack			
Total Particulate (lb/hr)	EPA M5/202	0.83	NA
Total Particulate (lb/MMBtu)	EPA M5/202	0.0075	NA
Total Particulate (lb/ton of stone)	EPA M5/202	0.026	0.30
Sulfur Dioxide (lb/hr)	EPA M3A/6C	299	NA
Sulfur Dioxide (lb/MMBtu)	EPA M3A/6C	2.71	5.5
Sulfur Dioxide (lb/ton of stone)	EPA M3A/6C	9.30	NA

[1] Permit limits obtained from Rockwell Lime Company permit number: 436034390-P01.

RESULTS

Table 2-1:
Lime Kiln Stack - Particulate

Run No.		1	2	3	Average
Date (2004)		Oct 21	Oct 21	Oct 21	
Start Time (approx.)		09:02	11:05	12:48	
Stop Time (approx.)		10:06	12:09	13:52	
Process Conditions					
Rp	Production rate (tons of stone/hour)	31.9	32.5	32.3	**32.2**
H_i	Actual heat input (MMBtu/hr)	112.0	110.1	109.9	**110.7**
Gas Conditions					
O_2	Oxygen (dry volume %)	6.9	6.8	6.9	**6.9**
CO_2	Carbon dioxide (dry volume %)	23.0	23.3	23.0	**23.1**
T_s	Sample temperature (°F)	415	415	409	**413**
B_w	Actual water vapor in gas (% by volume)	8.11	7.81	7.55	**7.82**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	64,628	64,991	65,432	**65,017**
Q_s	Volumetric flow rate, standard (scfm)	38,429	38,646	39,199	**38,758**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	35,314	35,627	36,239	**35,727**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	31.65	39.39	40.15	**37.06**
%I	Isokinetic sampling (%)	101.0	100.1	100.3	**100.5**
Laboratory Data from Method 5					
m_n	Total Method 5 Matter (g)	0.0021	<0.0010	<0.0010	
Laboratory Data from Method 202					
m_{CPM}	Total CPM (g)	0.0041	0.0063	0.0068	
Total Particulate Matter					
m_{Part}	Total Particulate Matter (g)	0.0062	0.0063	0.0068	
Total Particulate Matter Results					
C_{sd}	Particulate Concentration (lb/dscf)	4.3E-07	3.5E-07	3.7E-07	**3.9E-07**
C_{sd}	Particulate Concentration (gr/dscf)	0.0030	0.0025	0.0026	**0.0027**
C_{sd}	Particulate Concentration (mg/dscm)	6.9	5.6	6.0	**6.2**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.92	0.75	0.81	**0.83**
E_{Hi}	Particulate Rate (lb/MMBtu)	0.0082	0.0068	0.0074	**0.0075**
E_{Rp}	Particulate Rate (lb/ton of stone)	0.029	0.023	0.025	**0.026**

ROCKWELL LIME COMPANY
MANITOWOC, WI

Client Reference No: 0317
CleanAir Project No: 9625

RESULTS

Table 2-2:
Lime Kiln Stack - Sulfur Dioxide

Run No.		1	2	3	Average
Date (2004)		Oct 21	Oct 21	Oct 21	
Start Time (approx.)		09:02	11:02	12:45	
Stop Time (approx.)		10:05	12:08	13:52	
Process Conditions					
Rp	Production rate (tons of stone/hour)	31.9	32.5	32.3	**32.2**
H_i	Actual heat input (MMBtu/hr)	112.0	110.1	109.9	**110.7**
Gas Conditions					
O_2	Oxygen (dry volume %)	6.6	6.7	6.7	**6.7**
CO_2	Carbon dioxide (dry volume %)	24.0	23.6	23.4	**23.6**
T_s	Sample temperature (°F)	415	415	409	**413**
B_w	Actual water vapor in gas (% by volume)	8.11	7.81	7.55	**7.82**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	64,628	64,991	65,432	**65,017**
Q_s	Volumetric flow rate, standard (scfm)	38,429	38,646	39,199	**38,758**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	35,314	35,627	36,239	**35,727**
Sulfur Dioxide Results					
C_{sd}	Concentration (ppmdv)	835	840	844	**840**
C_{sd}	Concentration (lb/dscf)	1.39E-04	1.40E-04	1.40E-04	**1.40E-04**
$E_{lb/hr}$	Mass Rate (lb/hr)	294	299	305	**299**
E_{Hi}	Mass Rate (lb/MMBtu)	2.63	2.71	2.78	**2.71**
E_{Rp}	Mass Rate (lb/ton of stone)	9.24	9.20	9.46	**9.30**

RESULTS

Table 2-3:
Lime Kilns No. 1 and 2 - Operating Data

Run No.	1	2	3	Average
Date (2004)	Oct 21	Oct 21	Oct 21	
Start Time (approx.)	09:00	11:00	12:45	
Stop Time (approx.)	10:06	12:08	13:52	
Operating Data - Kiln No. 1				
Production rate (tons of stone/hour)	8.75	8.63	8.61	**8.66**
Natural gas (cf/hr)	6,455	5,965	6,269	**6,229**
Coal/Coke blend (lbs/hr)	2,297	2,277	2,265	**2,280**
Operating Data - Kiln No. 2				
Production rate (tons of stone/hour)	23.1	23.8	23.7	**23.5**
Natural gas (cf/hr)	6,818	7,447	7,433	**7,233**
Coal/Coke blend (lbs/hr)	5,442	5,299	5,273	**5,338**
Fuel Data				
Natural Gas (Btu/cf)	1,001	1,001	1,001	
Coal/Coke Blend (Btu/lb)	12,758	12,758	12,758	
Operating Data - Combined				
Production rate (tons of stone/hour)	31.9	32.5	32.3	**32.2**
Natural gas (cf/hr)	13,273	13,412	13,702	**13,462**
Coal/Coke blend (lbs/hr)	7,739	7,576	7,538	**7,618**
Natural gas (MMBtu/hr)	13.29	13.43	13.72	**13.48**
Coal/Coke blend (MMBtu/hr)	98.74	96.65	96.16	**97.18**
Total (MMBtu/hr)	112.0	110.1	109.9	**110.7**
Baghouse Data				
Cleaning cycle (sec)	80	80	80	
Dwell (min)	10	10	10	
Base inlet pressure (in H_2O)	4.2	4.2	4.2	
Peak inlet pressure (in H_2O)	4.8	4.8	4.8	
Differential pressure (in H_2O)				
Compartment No. 1	0.9	1.3	1.3	**1.2**
Compartment No. 2	1.5	2.0	0.5	**1.3**
Compartment No. 3	0.8	1.2	1.4	**1.1**
Compartment No. 4	1.5	1.4	1.6	**1.5**
Compartment No. 5	1.3	1.0	1.4	**1.2**
Compartment No. 6	1.4	1.0	1.4	**1.3**
Compartment No. 7	1.3	1.6	1.2	**1.4**
Compartment No. 8	1.1	1.5	1.0	**1.2**
Opacity				
Opacity (%)	3	2	1	**2**

Rockwell Lime Company
Clean Air Project No: 9625
Lime Kiln Stack

USEPA Method 5/202 (Particulate/CPM)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2004)		Oct 21	Oct 21	Oct 21	
Start Time (approx.)		09:02	11:05	12:48	
Stop Time (approx.)		10:06	12:09	13:52	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9941	0.9941	0.9941	
C_p	Pitot tube coefficient	0.84	0.84	0.84	
P_g	Static pressure (in. H_2O)	-0.1000	-0.1000	-0.1000	
A_s	Sample location area (ft^2)	28.2743	28.2743	28.2743	
P_{bar}	Barometric pressure (in. Hg)	29.50	29.50	29.50	**29.5000**
D_n	Nozzle diameter (in.)	0.2770	0.3090	0.3090	
O_2	Oxygen (dry volume %)	6.9480	6.8420	6.8990	**6.8963**
CO_2	Carbon dioxide (dry volume %)	23.0010	23.3040	22.9880	**23.0977**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	70.0510	69.8540	70.1130	**70.0060**
V_{lc}	Total Liquid collected (ml)	59.30	70.90	69.70	
V_m	Volume metered, meter conditions (ft^3)	32.2600	40.0500	40.7000	
T_m	Dry gas meter temperature (°F)	68.6667	68.0625	66.4583	
T_s	Sample temperature (°F)	415.2917	415.2500	408.7500	**413.0972**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0129	1.5579	1.6100	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	2.7913	3.3373	3.2808	**3.1364**
V_{mstd}	Volume metered, standard (dscf)	31.6467	39.3868	40.1532	**37.0622**
P_s	Sample gas pressure, absolute (in. Hg)	29.4926	29.4926	29.4926	**29.4926**
P_v	Vapor pressure, actual (in. Hg)	29.4926	29.4926	29.4926	**29.4926**
B_{wo}	Moisture measured in sample (% by volume)	8.1052	7.8112	7.5535	**7.8233**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	8.1052	7.8112	7.5535	**7.8233**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.5407	0.5444	0.5501	**0.5451**
M_d	MW of sample gas, dry (lb/lb-mole)	31.9581	32.0023	31.9540	**31.9715**
M_s	MW of sample gas, wet (lb/lb-mole)	30.8268	30.9086	30.9000	**30.8785**
V_s	Velocity of sample (ft/sec)	38.0959	38.3095	38.5696	**38.3250**
%I	Isokinetic sampling (%)	100.9699	100.0970	100.3232	**100.4634**
Q_a	Volumetric flow rate, actual (acfm)	64,628	64,991	65,432	**65,017**
Q_s	Volumetric flow rate, standard (scfm)	38,429	38,646	39,199	**38,758**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	35,314	35,627	36,239	**35,727**
Q_a	Volumetric flow rate, actual (acf/hr)	3,877,685	3,899,431	3,925,911	**3,901,009**
Q_s	Volumetric flow rate, standard (scf/hr)	2,305,716	2,318,757	2,351,970	**2,325,481**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	2,118,834	2,137,634	2,174,314	**2,143,594**
Q_a	Volumetric flow rate, actual (m^3/hr)	109,818	110,434	111,184	**110,479**
Q_s	Volumetric flow rate, standard (m^3/hr)	65,299	65,669	66,609	**65,859**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	60,007	60,539	61,578	**60,708**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	60,847	61,191	62,068	**61,369**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	55,915	56,411	57,379	**56,569**

Comments:

Average includes 3 runs.

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QA/QC
Date 11/17

Rockwell Lime Company
Clean Air Project No: 9625
Lime Kiln Stack

USEPA Method 5/202
Total Particulate Matter Parameters

		1	2	3	Average
Run No.		Oct 21	Oct 21	Oct 21	
Date (2004)		09:02	11:05	12:48	
Start Time (approx.)		10:06	12:09	13:52	
Stop Time (approx.)					
Process Conditions					
R_P	Production rate (tons of stone/hour)	31.85	32.45	32.27	**32.19**
H_i	Actual heat input (MMBtu/hr)	112.0	110.1	109.9	**110.7**
Gas Conditions					
O_2	Oxygen (dry volume %)	6.9480	6.8420	6.8990	**6.8963**
CO_2	Carbon dioxide (dry volume %)	23.0010	23.3040	22.9880	**23.0977**
T_s	Sample temperature (°F)	415.2917	415.2500	408.7500	**413.0972**
B_w	Actual water vapor in gas (% by volume)	8.1052	7.8112	7.5535	**7.8233**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	64,628	64,991	65,432	**65,017**
Q_s	Volumetric flow rate, standard (scfm)	38,429	38,646	39,199	**38,758**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	35,314	35,627	36,239	**35,727**
Q_a	Volumetric flow rate, actual (acf/hr)	3,877,685	3,899,431	3,925,911	**3,901,009**
Q_s	Volumetric flow rate, standard (scf/hr)	2,305,716	2,318,757	2,351,970	**2,325,481**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	2,118,834	2,137,634	2,174,314	**2,143,594**
Q_a	Volumetric flow rate, actual (m^3/hr)	109,818	110,434	111,184	**110,479**
Q_s	Volumetric flow rate, standard (m^3/hr)	65,299	65,669	66,609	**65,859**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	60,007	60,539	61,578	**60,708**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	31.6467	39.3868	40.1532	**37.0622**
%I	Isokinetic sampling (%)	100.9699	100.0970	100.3232	**100.4634**
Laboratory Data from Method 5					
m_n	Total Method 5 Matter (g)	0.00210	<0.00100	<0.00100	**<0.00137**
Laboratory Data from Method 202					
m_{CPM}	Total CPM (g)	0.00410	0.00630	0.00680	**0.00573**
Total Particulate Matter					
m_{Part}	Total Particulate Matter (g)	0.00620	0.00630	0.00680	**0.00643**
Total Particulate Matter Results					
C_{sd}	Particulate Concentration (lb/dscf)	4.3199E-07	3.5269E-07	3.7342E-07	**3.8603E-07**
C_a	Particulate Concentration (lb/acf)	2.3605E-07	1.9334E-07	2.0681E-07	**2.1207E-07**
C_{sd}	Particulate Concentration (gr/dscf)	0.0030	0.0025	0.0026	**0.0027**
C_a	Particulate Concentration (gr/acf)	0.0017	0.0014	0.0014	**0.0015**
C_{sd}	Particulate Concentration (mg/dscm)	6.9177	5.6479	5.9798	**6.1818**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	3.7799	3.0961	3.3118	**3.3960**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	7.4239	6.0612	6.4173	**6.6341**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.9153	0.7539	0.8119	**0.8271**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.4151	0.3419	0.3682	**0.3751**
E_{Hi}	Particulate Rate - Heat Input-based (lb/MMBtu)	0.0082	0.0068	0.0074	**0.0075**
E_{Rp}	Particulate Rate (lb/ton of stone)	0.0287	0.0232	0.0252	**0.0257**

Average includes 3 runs.

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PGK@_O_K
QA/QC PGK
Date 11/22

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Rockwell Lime Company
Clean Air Project No: 9625
Lime Kiln Stack

USEPA Method 5/202
Filterable Particulate Parameters

Run No.		1	2	3	Average
Date (2004)		Oct 21	Oct 21	Oct 21	
Start Time (approx.)		09:02	11:05	12:48	
Stop Time (approx.)		10:06	12:09	13:52	
Process Conditions					
R_P	Production rate - (tons of stone/hour)	31.85	32.45	32.27	**32.19**
Hi	Actual heat input (MMBtu/hr)	112.0	110.1	109.9	**110.7**
Gas Conditions					
O_2	Oxygen (dry volume %)	6.9480	6.8420	6.8990	**6.8963**
CO_2	Carbon dioxide (dry volume %)	23.0010	23.3040	22.9880	**23.0977**
T_s	Sample temperature (°F)	415.2917	415.2500	408.7500	**413.0972**
B_w	Actual water vapor in gas (% by volume)	8.1052	7.8112	7.5535	**7.8233**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	64,628	64,991	65,432	**65,017**
Q_s	Volumetric flow rate, standard (scfm)	38,429	38,646	39,199	**38,758**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	35,314	35,627	36,239	**35,727**
Q_a	Volumetric flow rate, actual (acf/hr)	3,877,685	3,899,431	3,925,911	**3,901,009**
Q_s	Volumetric flow rate, standard (scf/hr)	2,305,716	2,318,757	2,351,970	**2,325,481**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	2,118,834	2,137,634	2,174,314	**2,143,594**
Q_a	Volumetric flow rate, actual (m^3/hr)	109,818	110,434	111,184	**110,479**
Q_s	Volumetric flow rate, standard (m^3/hr)	65,299	65,669	66,609	**65,859**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	60,007	60,539	61,578	**60,708**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	31.6467	39.3868	40.1532	**37.0622**
%I	Isokinetic sampling (%)	100.9699	100.0970	100.3232	**100.4634**
Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00010	0.00000	0.00000	**0.00003**
m_s	Matter collected in solvent rinse(s) (g)	0.00200	0.00070	0.00060	**0.00110**
m_n	Total particulate matter collected (g)	0.00210	<0.00100	<0.00100	**<0.00137**
Particulate Results					
C_{sd}	Particulate Concentration (lb/dscf)	1.4632E-07	<5.5983E-08	<5.4915E-08	**<8.5739E-08**
C_a	Particulate Concentration (lb/acf)	7.9951E-08	<3.0689E-08	<3.0414E-08	**<4.7018E-08**
C_{sd}	Particulate Concentration (gr/dscf)	0.0010	<0.0004	<0.0004	**<0.0006**
C_a	Particulate Concentration (gr/acf)	0.0006	<0.0002	<0.0002	**<0.0003**
C_{sd}	Particulate Concentration (mg/dscm)	2.3431	<0.8965	<0.8794	**<1.3730**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	1.2803	<0.4914	<0.4870	**<0.7529**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	2.5145	<0.9621	<0.9437	**<1.4735**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.3100	<0.1197	<0.1194	**<0.1830**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.1406	<0.0543	<0.0542	**<0.0830**
E_{Hi}	Particulate Rate - Heat Input-based (lb/MMBtu)	0.0028	<0.0011	<0.0011	**<0.0016**
E_{Rp}	Particulate Rate (lb/ton of stone)	0.0097	<0.0037	<0.0037	**<0.0057**

Average includes 3 runs.

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QA/QC MK PGK@_O
Date 11/22

Rockwell Lime Company
Clean Air Project No: 9625
Lime Kiln Stack

USEPA Method 5/202
Condensible Particulate Matter Parameters

		1	2	3	Average
Run No.					
Date (2004)		Oct 21	Oct 21	Oct 21	
Start Time (approx.)		09:02	11:05	12:48	
Stop Time (approx.)		10:06	12:09	13:52	
Process Conditions					
R_P	Production rate - (tons of stone/hour)	31.85	32.45	32.27	**32.19**
H_i	Actual heat input (MMBtu/hr)	112.0	110.1	109.9	**110.7**
Gas Conditions					
O_2	Oxygen (dry volume %)	6.9480	6.8420	6.8990	**6.8963**
CO_2	Carbon dioxide (dry volume %)	23.0010	23.3040	22.9880	**23.0977**
T_s	Sample temperature (°F)	415.2917	415.2500	408.7500	**413.0972**
B_w	Actual water vapor in gas (% by volume)	8.1052	7.8112	7.5535	**7.8233**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	64,628	64,991	65,432	**65,017**
Q_s	Volumetric flow rate, standard (scfm)	38,429	38,646	39,199	**38,758**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	35,314	35,627	36,239	**35,727**
Q_a	Volumetric flow rate, actual (acf/hr)	3,877,685	3,899,431	3,925,911	**3,901,009**
Q_s	Volumetric flow rate, standard (scf/hr)	2,305,716	2,318,757	2,351,970	**2,325,481**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	2,118,834	2,137,634	2,174,314	**2,143,594**
Q_a	Volumetric flow rate, actual (m^3/hr)	109,818	110,434	111,184	**110,479**
Q_s	Volumetric flow rate, standard (m^3/hr)	65,299	65,669	66,609	**65,859**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	60,007	60,539	61,578	**60,708**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	31.6467	39.3868	40.1532	**37.0622**
%I	Isokinetic sampling (%)	100.9699	100.0970	100.3232	**100.4634**
Laboratory Data					
m_{IT}	Total Inorganic CPM Result (g)	0.00390	0.00630	0.00680	**0.00567**
m_{no}	Total Organic CPM Result (g)	0.00020	0.00000	0.00000	**0.00007**
m_T	Total Gravimetric Result (g)	0.00410	0.00630	0.00680	**0.00573**
m_{CPM}	Total CPM (g)	0.00410	0.00630	0.00680	**0.00573**
Particulate Results					
C_{sd}	Particulate Concentration (lb/dscf)	2.8567E-07	3.5269E-07	3.7342E-07	**3.3726E-07**
C_a	Particulate Concentration (lb/acf)	1.5609E-07	1.9334E-07	2.0681E-07	**1.8542E-07**
C_{sd}	Particulate Concentration (gr/dscf)	0.0020	0.0025	0.0026	**0.0024**
C_a	Particulate Concentration (gr/acf)	0.0011	0.0014	0.0014	**0.0013**
C_{sd}	Particulate Concentration (mg/dscm)	4.5746	5.6479	5.9798	**5.4008**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	2.4996	3.0961	3.3118	**2.9692**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	4.9093	6.0612	6.4173	**5.7959**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.6053	0.7539	0.8119	**0.7237**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.2745	0.3419	0.3682	**0.3282**
E_{Hi}	Particulate Rate - Heat Input-based (lb/MMBtu)	0.0054	0.0068	0.0074	**0.0065**
E_{Rp}	Particulate Rate (lb/ton of stone)	0.0190	0.0232	0.0252	**0.0225**

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SS Average includes 3 runs.

QA/QC PGK
Date 11/22

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Rockwell Lime Company
Clean Air Project No: 9625
Lime Kiln Stack

USEPA Method 5/202
Condensible Particulate Matter Parameters (continued)
Separate Inorganic and Organic Results

Run No.		1	2	3	Average
Date (2004)		Oct 21	Oct 21	Oct 21	
Start Time (approx.)		09:02	11:05	12:48	
Stop Time (approx.)		10:06	12:09	13:52	
Results - Inorganic Fraction					
C_{sd}	Particulate Concentration (lb/dscf)	2.7173E-07	3.5269E-07	3.7342E-07	**3.3262E-07**
C_a	Particulate Concentration (lb/acf)	1.4848E-07	1.9334E-07	2.0681E-07	**1.8288E-07**
C_{sd}	Particulate Concentration (gr/dscf)	0.0019	0.0025	0.0026	**0.0023**
C_a	Particulate Concentration (gr/acf)	0.0010	0.0014	0.0014	**0.0013**
C_{sd}	Particulate Concentration (mg/dscm)	4.3515	5.6479	5.9798	**5.3264**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	2.3777	3.0961	3.3118	**2.9286**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	4.6699	6.0612	6.4173	**5.7161**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.5758	0.7539	0.8119	**0.7139**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.2611	0.3419	0.3682	**0.3238**
E_{Hi}	Particulate Rate - Heat Input-based (lb/MMBtu)	0.0051	0.0068	0.0074	**0.0065**
E_{Rp}	Particulate Rate (lb/ton of stone)	0.0181	0.0232	0.0252	**0.0222**
Results - Organic Fraction					
C_{sd}	Particulate Concentration (lb/dscf)	1.3935E-08	0.0000E+00	0.0000E+00	**4.6450E-09**
C_a	Particulate Concentration (lb/acf)	7.6144E-09	0.0000E+00	0.0000E+00	**2.5381E-09**
C_{sd}	Particulate Concentration (gr/dscf)	0.0001	0.0000	0.0000	**0.0000**
C_a	Particulate Concentration (gr/acf)	0.0001	0.0000	0.0000	**0.0000**
C_{sd}	Particulate Concentration (mg/dscm)	0.2232	0.0000	0.0000	**0.0744**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	0.1219	0.0000	0.0000	**0.0406**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	0.2395	0.0000	0.0000	**0.0798**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.0295	0.0000	0.0000	**0.0098**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.0134	0.0000	0.0000	**0.0045**
E_{Hi}	Particulate Rate - Heat Input-based (lb/MMBtu)	0.0003	0.0000	0.0000	**0.0001**
E_{Rp}	Particulate Rate (lb/ton of stone)	0.0009	0.0000	0.0000	**0.0003**

Average includes 3 runs.

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Date 11/22

Rockwell Lime Company
Clean Air Project No. 9625
Manitowoc, WI
Lime Kiln Stack, #1 Kiln, #2 Kiln

Continuous Emissions Monitoring Parameters

Run Number	1
Date (2004)	Oct 21
Start Time	9:02
End Time	10:05
Elapsed Time (hh:mm)	01:03

Channel	1	2	3
Parameter	SO2	O2	CO2
Location	Lime Kiln Stack		
Measurement Units	ppmdv	%dv	%dv
Measured Average (drift-corrected)	835.12	6.56	23.95
Concentration (ppmdv)	835.12		
Concentration (ppmwv)	767.43		
Concentration (lb/dscf)	1.389E-04		
Concentration (lb/scf)	1.276E-04		
Concentration (lb/acf)	7.587E-05		
Concentration (%dv)	0.084	6.559	23.951
Concentration (%wv)	0.077	6.027	22.010
Concentration (mg/dscm)	2223.55		
Concentration (mg/scm)	2043.33		
Concentration (mg/acm)	1214.98		
Concentration (mg/Nm3)	2386.25		
Mass Rate (lb/hr)	294.21		
Mass Rate (kg/hr)	133.43		
Mass Rate (gm/sec)	37.06		
Mass Rate (Ton/yr)	N/A		
Mass Rate (lb/MMBtu) - Fd	N/A		
Mass Rate (lb/MMBtu) - Fc	N/A		
Mass Rate (lb/MMBtu) - Heat Input	2.626E+00		
Mass Rate (ng/J) - Fd	N/A		
Mass Rate (ng/J) - Fc	N/A		
Mass Rate (ng/J) - Heat Input	1.130E+03		
Mass Rate (lb/tn)	9.24		
Mass Rate (kg/UNITS)	4.189E+00		

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Date

Rockwell Lime Company
Clean Air Project No. 9625
Manitowoc, WI
Lime Kiln Stack, #1 Kiln, #2 Kiln

G

Continuous Emissions Monitoring Parameters

Run Number	2
Date (2004)	Oct 21
Start Time	11:02
End Time	12:08
Elapsed Time (hh:mm)	01:06

Channel	1	2	3
Parameter	SO2	O2	CO2
Location	Lime Kiln Stack		
Measurement Units	ppmdv	%dv	%dv
Measured Average (drift-corrected)	839.95	6.68	23.56
Concentration (ppmdv)	839.95		
Concentration (ppmwv)	774.34		
Concentration (lb/dscf)	1.397E-04		
Concentration (lb/scf)	1.287E-04		
Concentration (lb/acf)	7.656E-05		
Concentration (%dv)	0.084	6.682	23.564
Concentration (%wv)	0.077	6.160	21.724
Concentration (mg/dscm)	2236.40		
Concentration (mg/scm)	2061.71		
Concentration (mg/acm)	1225.98		
Concentration (mg/Nm3)	2400.04		
Mass Rate (lb/hr)	298.53		
Mass Rate (kg/hr)	135.39		
Mass Rate (gm/sec)	37.61		
Mass Rate (Ton/yr)	N/A		
Mass Rate (lb/MMBtu) - Fd	N/A		
Mass Rate (lb/MMBtu) - Fc	N/A		
Mass Rate (lb/MMBtu) - Heat Input	2.712E+00		
Mass Rate (ng/J) - Fd	N/A		
Mass Rate (ng/J) - Fc	N/A		
Mass Rate (ng/J) - Heat Input	1.167E+03		
Mass Rate (lb/tn)	9.20		
Mass Rate (kg/UNITS)	4.172E+00		

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Rockwell Lime Company
Clean Air Project No. 9625
Manitowoc, WI
Lime Kiln Stack, #1 Kiln, #2 Kiln

Continuous Emissions Monitoring Parameters

Run Number	3
Date (2004)	Oct 21
Start Time	12:45
End Time	13:52
Elapsed Time (hh:mm)	01:07

Channel	1	2	3
Parameter	SO2	O2	CO2
Location	Lime Kiln Stack		
Measurement Units	ppmdv	%dv	%dv
Measured Average (drift-corrected)	844.11	6.75	23.39
Concentration (ppmdv)	844.11		
Concentration (ppmwv)	780.35		
Concentration (lb/dscf)	1.403E-04		
Concentration (lb/scf)	1.297E-04		
Concentration (lb/acf)	7.773E-05		
Concentration (%dv)	0.084	6.745	23.392
Concentration (%wv)	0.078	6.236	21.625
Concentration (mg/dscm)	2247.48		
Concentration (mg/scm)	2077.72		
Concentration (mg/acm)	1244.74		
Concentration (mg/Nm3)	2411.93		
Mass Rate (lb/hr)	305.16		
Mass Rate (kg/hr)	138.40		
Mass Rate (gm/sec)	38.44		
Mass Rate (Ton/yr)	N/A		
Mass Rate (lb/MMBtu) - Fd	N/A		
Mass Rate (lb/MMBtu) - Fc	N/A		
Mass Rate (lb/MMBtu) - Heat Input	2.777E+00		
Mass Rate (ng/J) - Fd	N/A		
Mass Rate (ng/J) - Fc	N/A		
Mass Rate (ng/J) - Heat Input	1.195E+03		
Mass Rate (lb/tn)	9.46		
Mass Rate (kg/UNITS)	4.289E+00		

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PARTICULATE / SO_2 STACK TEST

Date: 10/21/04

	Test Run #1				Test Run #2				Test Run #3			
	Start	Stop	Total	Amt./Hr	Start	Stop	Total	Amt./Hr	Start	Stop	Total	Amt./Hr
TIME	09:00 AM	10:06 AM	1:06		11:00 AM	12:08 PM	1:08		12:45 PM	01:52 PM	1:07	
#1 Kiln												
Nat. Gas (CF)	58020500	58035100	7,100	6,454.55	58045400	58060600	6,760	5,964.71	58069000	58084300	7,000	6,268.66
C/C Blend (Lbs)	1276176	1278703	2,527	2,297.27	1280691	1283272	2,581	2,277.35	1284599	1287128	2,629	2,264.78
Coal (Lbs)			0	0.00			0	0.00			0	0.00
Stone (Tons)	5243.47	5253.09	9.62	8.75	5260.62	5270.4	9.78	8.63	5275.48	5285.09	9.61	8.61
Mill Returns (Lbs)												
#2 KILN												
Nat. Gas (CF)	8076100	8083600	7,500	6,818.18	8089650	8098090	8,440	7,447.06	8102540	8110840	8,300	7,432.84
C/C Blend (Lbs)	3960970	3966956	5,986	5,441.82	3971475	3977480	6,005	5,298.53	3980651	3986539	5,888	5,272.84
Coal (Lbs)			0	0.00			0	0.00			0	0.00
Stone (Tons)	18257.30	18282.71	25.41	23.10	18302.95	18329.95	27.00	23.82	18344.21	18370.63	26.42	23.66
Mill Returns (Lbs)	0				0				0			
Opacity (10 Min)	3				2				1			
O_2 (Avg %)	Not Working				Not Working				2			
CO (Avg PPM)	Not Working				Not Working				0			
BAGHOUSE												
Clean Cycle (Sec)	80				80				80			
Dwell (Min)	10				10				10			
	Base	Peak			Base	Peak			Base	Peak		
Inlet Pressure	4.2	4.8			4.2	4.8			4.2	4.8		
Differential Pressure												
Compartment #1	0.9				1.3				1.3			
Compartment #2	1.5				2.0				0.5			
Compartment #3	0.8				1.2				1.4			
Compartment #4	1.5				1.4				1.6			
Compartment #5	1.3				1.0				1.4			
Compartment #6	1.4				1.0				1.4			
Compartment #7	1.3				1.6				1.2			
Compartment #8	1.1				1.5				1.0			

Fuel Data

	Avg. BTU Value / Unit
Coal/Coke Blend	12,758/ Lbs
Natural Gas	1001/CF

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SGS

November 1, 2004

ROCKWELL LIME COMPANY
4110 Rockwood Road
Manitowoc, WI 54220
Attn: Carie Boldt

Sample identification by
Rockwell Lime Company

Kind of sample reported to us: Coal/Petroleum Coke Blend

Sample ID: RLC-10/21/04 Stack Test

Sample taken at: Burner Pipe

Sample taken by: Auto Sampler

Date sampled: October 21, 2004

Date received: October 27, 2004

P.O. No. VERBAL

Analysis Report No. 71-246318

Page 1 of 1

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	7.20 *	xxxxx
% Ash	7.82	8.43
% Volatile	25.39	27.36
% Fixed Carbon	59.59	64.21
	100.00	100.00
Btu/lb	12758	13748
% Sulfur	2.59	2.79
MAF Btu		15014

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture *	7.20	xxxxx
% Carbon	71.69	77.25
% Hydrogen	4.10	4.42
% Nitrogen	1.37	1.48
% Sulfur	2.59	2.79
% Ash	7.82	8.43
% Oxygen(diff)	5.23	5.63
	100.00	100.00

* Total Moisture supplied by Rockwell Lime Company.

METHODS
Moisture: ASTM D 4931; Ash: ASTM D 4422; Volatile: ASTM D 4421; Fixed Carbon: Calculated Value; ASTM D 3172
Btu/lb: ASTM D 5865; Sulfur: ASTM D 4239 (Method C); Carbon, Hydrogen & Nitrogen: ASTM D 5373

MEMBER ACIL

Respectfully submitted,
SGS NORTH AMERICA INC.

South Holland Laboratory

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TERMS AND CONDITIONS ON REVERSE