

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

Background Report Reference

AP-42 Section Number: 8.12

Background Chapter: 4

Reference Number: 29

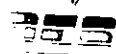
Title: Stack Emissions Survey: FMC-Wyoming Corporation

FMC-Wyoming Corporation

March 1991

rescc:

Original file is damaged



EVALUATOR CAC

EVALUATION DATE 7/14/92

812 (137)

METHOD 5: SECONDARY EMISSIONS TEST REPORT EVALUATION

STATE: WY FACILITY: IMC Wyoming Corp. TEST DATE: 3/5/91

PROCESS(ES) TESTED: gas-fired boilers w/ 4 cyclones & scrubber

SAMPLING DURATION 2
must have at least 3 runs, each ≥ 1 hour
duration, with sampling ≥ 2 minutes at each
traverse point, and total sampling volume ≥ 30 dscf
26 dscf

SAMPLING TEMPERATURE 2
both probe and filter must be maintained at
 $248 \pm 25^\circ\text{F}$ or other temperature specified in NSPS
290 - 300 °F

PRODUCTION RATE 3
is process or production rate during
testing representative of normal rates

BACK-HALF 3
if any, what method was used to
catch and recover condensable matter
W7

CONTROL DEVICE(S) 2
are devices described, and their efficiencies given
no

EQUIPMENT 2
were a borosilicate glass probe
liner and a glass fiber filter used
no doc.

METHOD 1 3
are calculations accurate, and is figure provided

CALIBRATION 2
were both pre- and
post-test calibrations performed for
meter box

METHODS 2.3 2
are data and calculations included for
gas velocity, cyclonic flow, and molecular
weight determination, and is source of
barometric pressure noted
no

pitot tube 2
temperature sensor 2 no doc.
nozzle (3 #) 2

METHOD 4 3
are data and calculations included for
moisture content determination, and is
moisture content realistic ($< \text{saturation}$)

LEAK CHECKS 3
both pre- and post-test

FIELD DATA 3
is field data on standard
forms, and does raw data correspond with printout

BLANKS 3
were filter and reagent blanks
analyzed, and were any problems addressed

BOILER TESTS N/A
calculation of F_0 from Orsat accurate

SAMPLE PREP 3
filter desiccation and tare weights documented

ISOKINETICS 3
within $100 \pm 10\%$ for all runs

lb/hr. total

run 1	26.9
2	28.7
3	31.0

$\Rightarrow 0.119 \frac{\text{lb. PM}}{\text{ton}}$ "B"

FMC Wyoming Corporation

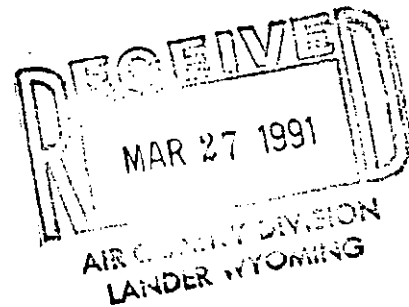
Box 872
Green River Wyoming 82935
307 875 2580

Certified Mail No.: P 532 942 668

FMC

March 25, 1991

Mr. Lee Gribovicz
Air Quality District Engineer
Air Quality Division
State of Wyoming
Department of Environmental Quality
210 Lincoln Street
Lander, Wyoming 82520



Re: Compliance Test Results Source NS-3

Dear Mr. Gribovicz:

Enclosed please find the test report for compliance testing on March 5, 1991 of the Mono II calciner precipitator (Source NS-3) at FMC Wyoming Corporation's Green River, Wyoming plant.

Appendix E of this report, which deals with calciner production rates, has been separated from the report and marked "CONFIDENTIAL" pursuant to Section 35-11-1101 of the Wyoming Environmental Quality Act. The information in this appendix is trade secret, business confidential, and is proprietary to FMC.

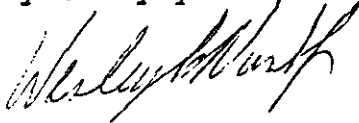
Particulate emissions from Source NS-3 were measured as 28.9 lb/hr on March 5, 1991, which is well below the 41 lb/hr emission rate for this unit under Section 25 of the Wyoming Air Quality Standards. Consequently, on the basis of this testing and the testing on February 14 and February 21, 1991, reported by transmittal letter dated February 28, 1991, FMC does not plan to conduct any further compliance testing of this unit at this time, and deems the unit to be in compliance with the particulate standards.

Mr. Lee Gribovicz
March 25, 1991

Page 2

If there are questions concerning this letter or the enclosed report, please advise me.

Very truly yours,



Wesley K. Nash, Jr., PE
Environmental Manager
(307) 872-2196

Enclosures:

cc: KN Dailey*, ED File - Office
Charles Collins - AQD Administrator, Cheyenne, Wyoming

* Cover letter only

COMPLIANCE TEST REPORT
SOURCE NS-3
MONO-2 CALCINER
MARCH 1991

FMC Wyoming Corporation
Green River, Wyoming

STACK EMISSIONS SURVEY
FMC WYOMING CORPORATION
GREEN RIVER, WYOMING

MARCH 1991

SOURCE NS-3
(Mono 2 Calciner)

Certification of Report

The sampling and analysis represented by this report was performed under my direction and supervision.

Date: 3-18-91

Signature: Dale L. Clark

Dale L. Clark

Sr. Environmental Engineer

I have reviewed all testing details and results in this report and hereby certify that the test report is authentic and accurate.

Date: 3-22-91

Signature: Wesley K. Nash

Wesley K. Nash

Environmental Manager

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
SUMMARY OF RESULTS	2
DISCUSSION OF RESULTS	4
DESCRIPTION OF PROCESS OPERATION	4
DESCRIPTION OF SAMPLING LOCATION	5
SAMPLING AND ANALYTICAL PROCEDURES	6

APPENDICES:

- A. Location of sampling points
- B. Source Emission Calculations
- C. Calibration of Equipment
- D. Field Testing and Analytical Data
- E. Calciner Rate Determinations (CONFIDENTIAL)

Introduction

Compliance tests for particulate emissions were conducted on the Mono 2 Calciner (Source NS-3) on March 5, 1991 at FMC Wyoming Corporation's plant located near Green River Wyoming.

The sampling followed the procedures set forth in Appendix II of the "Wyoming Air Quality Standards and Regulations", Wyoming Department of Environmental Quality, 1989.

FMC Wyoming Personnel taking part in the testwork were:

Dale Clark	Senior Environmental Engineer
Ted Brown	Environmental Engineer
Scot Aler	Environmental Engineer
Simon Lee	Environmental Engineering Aide
Ron McNalley	Environmental Technician

Mr. Lee Gribovicz observed the testwork for the Wyoming Department of Environmental Quality - Air Quality Division.

Summary of Results

This section summarizes the results of the particulate emission tests performed on the Mono 2 Calciner (Source NS-3). Table I is a summary of the results of the particulate tests performed on this unit. Details of the individual tests, including field data sheets, laboratory data sheets and calculation sheets can be found in the Appendix.

The data listed in Table I shows that the particulate emission from Source NS-3 was 28.9 lb/hr, based on the average of the three tests. The allowable emission rate for this unit (NS-3), established by Section 25 of the Wyoming Air Quality Standards and Regulations is 41.0 lb/hr.

Table 1
FMC Wyoming Corporation
SUMMARY OF STACK SAMPLING CALCULATIONS

Stack NS - 3 (MONO 2 CALCINER)	TEST 1	TEST 2	TEST 3
Test Code Number	91-NS-3-4	91-NS-3-5	91-NS-3-6
Ambient Barometric Pressure, (in Hg)	23.52	23.52	23.52
Absolute stack gas pressure., (in. Hg)	23.52	23.52	23.52
Absolute average stack gas temp., (R)	866	866.1	863.5
Absolute average dry gas meter temp., (R)	541.6	565.4	560.7
Total volume of water collected, (ml)	399.1	416.3	402.2
Volume of gas through dry gas meter, (ft ³)	33.466	36.978	35.245
Average pressure drop across orifice, (in. H ₂ O)	0.612	0.677	0.63
Pitot tube coefficient	0.84	0.84	0.84
Average velocity head of stack gas, (in. H ₂ O)	0.83	0.903	0.873
Cross sectional area of stack, (ft ²)	50.27	50.27	50.27
Front half particulate collected, (gm)	0.0753	0.0791	0.0837
Back half particulate collected, (gm)	0.0121	0.0111	0.0132
Total particulate collected, (gm)	0.0874	0.0902	0.0969
Total sampling time, (min)	72	72	72
Cross sectional area of nozzle, (ft ² *10 ⁻⁴)	2.986	2.986	2.986
Gas volume, (acfm)	216,053	235,378	227,032
Gas volume, (scfm)	103,943	113,227	109,541
Percent isokinetic	101	97.6	97.1
Emission rate, (lb/hr)	26.9	28.7	31

Discussion of Results

The three particulate tests taken on the stack appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data are in close agreement. The moisture percentages were within 0.2% of the mean value. The measured flow rates (Q_s) were within 4.5% of the mean value. Isokinetic sampling rates on all three tests were maintained well within the 90% to 110% allowable range.

Description of Process Operation

Crushed Trona ore (sodium sesquicarbonate) is fed into the gas fired rotary calciner where the trona is converted to impure soda ash (sodium carbonate) by heat.

The exhaust gases from the calciner pass through two sets of four dry cyclones and a four set electrostatic precipitator for particulate removal before emission to the atmosphere.

Description of Sampling Location

The sampling ports are located on the circular stack approximately 100 feet above the ground. The sampling was performed from two ports on the stack located 17 feet (2.1 stack diameters) downstream of the stack inlet, and 5 feet (0.63 stack diameters) upstream of the stack outlet. The area of the stack is 50.27 square feet. Port and wall thickness is 7 inches.

Sampling and Analysis Procedures

Testing for particulate emissions was conducted on March 5 using Reference Method 5 from Appendix II of the "Wyoming Air Quality Standards and Regulations" - 1989. Each test consisted of traversing both sample diameters, with twelve points being sampled on each diameter. Sample points were determined by Reference Method 1. Each point was sampled for three minutes for a total sample time of seventy two minutes.

The testwork was completed without incident and the samples were returned to the FMC Environmental Department work area for recovery and analysis.

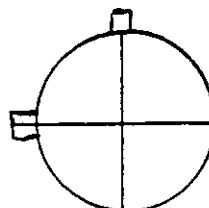
Operational parameters that were logged during the testwork can be found in the logsheets in the Appendix.

APPENDIX A

Location of Sample Points

FMC Wyoming Corporation
Green River Wyoming

NS - 3



B/D = 2.1

No. of points per traverse = 24

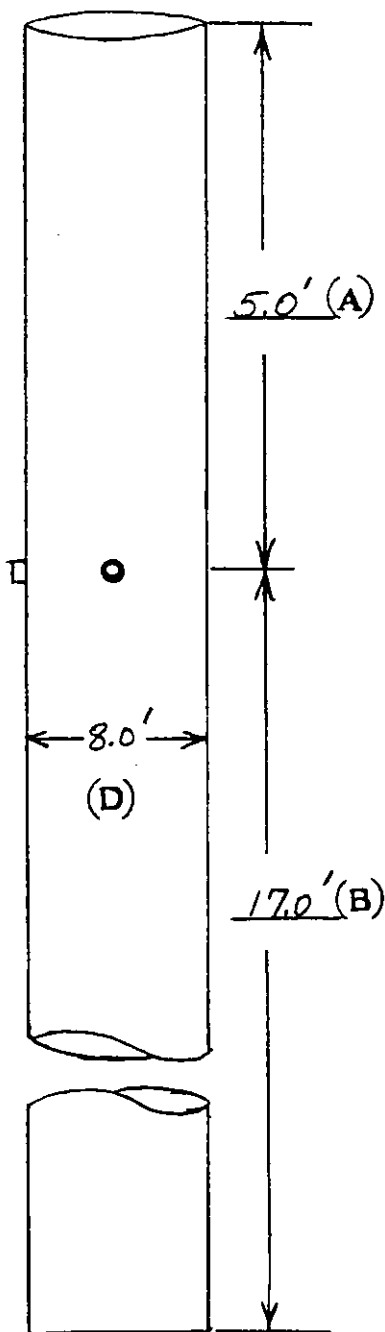
No. of points per diameter = 12

No. diameters per run = 2

Sample time per point = 3 min

Traverse Points on Each Diameter

	% of Diameter	Distance From Inside Wall (in)	Distance From Coupling (in)
1	2.1	2.02	9.02
2	6.7	6.43	13.43
3	11.8	11.33	18.33
4	17.7	16.99	23.99
5	25.0	24.00	31.00
6	35.5	34.08	41.08
7	64.5	61.92	68.92
8	75.0	72.00	69.00
9	82.3	79.01	86.01
10	88.2	84.67	91.67
11	93.3	89.57	96.57
12	97.9	93.98	103.98



APPENDIX B

Source Emission Calculations

VELOCITY AND VOLUME DETERMINATION

DRY GAS VOLUME

$$Vmstd = (17.71 \text{ deg R/in. Hg}) * Vm * (Pbar + \Delta H / 13.6) / Tm$$

Where $Vmstd$ = Volume (ft³) of gas sample at 70F and 29.92 in. Hg Vm = Volume (ft³) of gas at meter conditions Tm = Average dry gas meter temperature (R) $Pbar$ = Barometric pressure (in. Hg) ΔH = Pressure drop across orifice (in. WG)

$$Vmstd = 17.71 * 33.47 * (23.52 + 0.612 / 13.6) / 541.6 = 25.788 \text{ ft}^3$$

VOLUME OF WATER VAPORWhere $Vwstd$ = Volume (ft³) of water vapor Vlc = Total volume of water collected (ml)

$$Vwstd = .00474 * 399.1 = 18.917 \text{ ft}^3$$

MOISTURE CONTENT

$$Bwo = Vwstd * 100 / (Vwstd + Vmstd)$$

Where Bwo = Percent moisture

$$Bwo = 18.92 * 100 / (18.92 + 25.79) = 42.316 \text{ percent}$$

CONCENTRATION

O

$$Cs' = (15.43 \text{ grains/gm}) * Mn / (Vmstd + Vwstd)$$

Where Cs' = Concentration (grains/scf) Mn = Total particulate collected (gm)

$$Cs' = 15.43 * 0.0874 / (25.79 + 18.92) = 0.0302 \text{ grains/scf}$$

STACK VELOCITY

$$V = Kp * 85.48 * \text{SQR}(\Delta P * Mw * Ps)$$

Where V = Stack velocity (ft/sec) Ts = Stack absolute temperature (R) ΔP = Average pitot reading (in. WG) Mw = Molecular wt. of stack gas (lb/lb mole) Kp = Pitot tube coefficient

$$Mw = 0.18 * 42.32 + 0.44 * 9.92 + 0.32 * 3.29 + 0.28 * 44.47 = 25.487 \text{ lb/mole}$$

$$V = 0.84 * 85.48 * 0.830 * \text{SQR}(866.0 / (25.49 * 23.52)) = 71.631 \text{ ft/sec}$$

STACK VOLUME

$$ACFM = V * A * 60 \quad \text{AND} \quad SCFM = ACFM * 530 * Ps / (Ts * 29.92)$$

Where $ACFM$ = Actual cubic Ft per minute at stack conditions A = Stack area (ft²) $SCFM$ = Standard cubic ft. per min. (29.92 in. Hg & 530 R)

$$ACFM = 71.63 * 50.270 * 60 = 216053 \text{ acfm}$$

$$SCFM = 216053 * 530 * 23.52 / (866.0 * 29.92) = 103943 \text{ scfm}$$

CALCULATED DUST LOAD

$$\text{lb/hr} = Cs' * SCFM * 60 / 7000 \text{ grains/lb}$$

$$\text{DUST LOAD} = 0.0302 * 103943 * 60 / 7000 = 26.88 \text{ Lb/Hr}$$

ISOKINETIC RATE

$$I = 101.0058 \%$$

VELOCITY AND VOLUME DETERMINATION

DRY GAS VOLUME

$$Vmstd = (17.71 \text{ deg R/in. Hg}) * Vm * (Pbar + \Delta H / 13.6) / Tm$$

Where Vmstd = Volume (ft³) of gas sample at 70F and 29.92 in. HgVm = Volume (ft³) of gas at meter conditions

Tm = Average dry gas meter temperature (R)

Pbar = Barometric pressure (in. Hg)

 ΔH = Pressure drop across orifice (in. WG)

$$Vmstd = 17.71 * 36.98 * (23.52 + 0.677 / 13.6) / 565.4 = 27.300 \text{ ft}^3$$

VOLUME OF WATER VAPORWhere Vwstd = Volume (ft³) of water vapor

Vlc = Total volume of water collected (ml)

$$Vwstd = .00474 * 416.3 = 19.733 \text{ ft}^3$$

MOISTURE CONTENT

$$Bwo = Vwstd * 100 / (Vwstd + Vmstd)$$

Where Bwo = Percent moisture

$$Bwo = 19.73 * 100 / (19.73 + 27.30) = 41.955 \text{ percent}$$

CONCENTRATION

O

$$Cs' = (15.43 \text{ grains/gm}) * Mn / (Vmstd + Vwstd)$$

Where Cs' = Concentration (grains/scf)

Mn = Total particulate collected (gm)

$$Cs' = 15.43 * 0.0902 / (27.30 + 19.73) = 0.0296 \text{ grains/scf}$$

STACK VELOCITY

$$V = Kp * 85.48 * \text{SQR}(\Delta P) * \text{SQR}(Mw * Ps)$$

Where V = Stack velocity (ft/sec)

Ts = Stack absolute temperature (R)

 ΔP = Average pitot reading (in. WG)

Mw = Molecular wt. of stack gas (lb/lb mole)

Kp = Pitot tube coefficient

$$Mw = 0.18 * 41.96 + 0.44 * 9.05 + 0.32 * 4.18 + 0.28 * 44.81 = 25.420 \text{ lb/mole}$$

$$V = 0.84 * 85.48 * 0.903 * \text{SQR}(866.1 / (25.42 * 23.52)) = 78.038 \text{ ft/sec}$$

STACK VOLUME

$$ACFM = V * A * 60 \quad \text{AND} \quad SCFM = ACFM * 530 * Ps / (Ts * 29.92)$$

Where ACFM = Actual cubic Ft per minute at stack conditions

A = Stack area (ft²)

SCFM = Standard cubic ft. per min. (29.92 in. Hg & 530 R)

$$ACFM = 78.04 * 50.270 * 60 = 235378 \text{ acfm}$$

$$SCFM = 235378 * 530 * 23.52 / (866.1 * 29.92) = 113227 \text{ scfm}$$

CALCULATED DUST LOAD

$$\text{lb/hr} = Cs' * SCFM * 60 / 7000 \text{ grains/lb}$$

$$\text{DUST LOAD} = 0.0296 * 113227 * 60 / 7000 = 28.72 \text{ Lb/Hr}$$

ISOKINETIC RATE

$$I = 97.55139 \%$$

VELOCITY AND VOLUME DETERMINATION

DRY GAS VOLUME

$$Vmstd = (17.71 \text{ deg R/in. Hg}) * Vm * (Pbar + \Delta H / 13.6) / Tm$$

Where $Vmstd$ = Volume (ft³) of gas sample at 70F and 29.92 in. Hg Vm = Volume (ft³) of gas at meter conditions Tm = Average dry gas meter temperature (R) $Pbar$ = Barometric pressure (in. Hg) ΔH = Pressure drop across orifice (in. WG)

$$Vmstd = 17.71 * 35.25 * (23.52 + 0.630 / 13.6) / 560.7 = 26.235 \text{ ft}^3$$

VOLUME OF WATER VAPORWhere $Vwstd$ = Volume (ft³) of water vapor Vlc = Total volume of water collected (ml)

$$Vwstd = .00474 * 402.2 = 19.064 \text{ ft}^3$$

MOISTURE CONTENT

$$Bwc = Vwstd * 100 / (Vwstd + Vmstd)$$

Where Bwc = Percent moisture

$$Bwc = 19.06 * 100 / (19.06 + 26.23) = 42.085 \text{ percent}$$

CONCENTRATION

0

$$Cs' = (15.43 \text{ grains/gm}) * Mn / (Vmstd + Vwstd)$$

Where Cs' = Concentration (grains/scf) Mn = Total particulate collected (gm)

$$Cs' = 15.43 * 0.0969 / (26.23 + 19.06) = 0.0330 \text{ grains/scf}$$

STACK VELOCITY

$$V = Kp * 85.48 * \text{SQR}(\Delta P) * \text{SQR}(Mw * Ps)$$

Where V = Stack velocity (ft/sec) Ts = Stack absolute temperature (R) ΔP = Average pitot reading (in. WG) Mw = Molecular wt. of stack gas (lb/lb mole) Kp = Pitot tube coefficient

$$Mw = 0.18 * 42.09 + 0.44 * 9.50 + 0.32 * 3.76 + 0.28 * 44.65 = 25.462 \text{ lb/mole}$$

$$V = 0.84 * 85.48 * 0.873 * \text{SQR}(863.5 / (25.46 * 23.52)) = 75.271 \text{ ft/sec}$$

STACK VOLUME

$$ACFM = V * A * 60 \quad \text{AND} \quad SCFM = ACFM * 530 * Ps / (Ts * 29.92)$$

Where $ACFM$ = Actual cubic Ft per minute at stack conditions A = Stack area (ft²) $SCFM$ = Standard cubic ft. per min. (29.92 in. Hg & 530 R)

$$ACFM = 75.27 * 50.270 * 60 = 227032 \text{ acfm}$$

$$SCFM = 227032 * 530 * 23.52 / (863.5 * 29.92) = 109541 \text{ scfm}$$

CALCULATED DUST LOAD

$$\text{lb/hr} = Cs' * SCFM * 60 / 7000 \text{ grains/lb}$$

$$\text{DUST LOAD} = 0.0330 * 109541 * 60 / 7000 = 30.99 \text{ Lb/Hr}$$

ISOKINETIC RATE

$$I = 97.11738 \%$$

APPENDIX C

Calibration of Equipment

FMC, WYOMING CORPORATION
GREEN RIVER, WYOMING

METER BOX CALIBRATION DATA AND CALCULATION FORM

DATE: 2/5/91
Pb: 24.1

METER BOX NUMBER: NAPP, D514
CALIBRATED BY: SIMON

DH (IWC)	Vw (FT3)	Vd (FT3)	Tw (F)	Td (F)	DP (IWC)	TIME (MIN)	Yd	DHe	Q
0.5	6.719	6.907	72.5	97	-0.4	15.00	1.0149	1.669	0.358
0.5	6.776	6.955	73	99	-0.4	15.00	1.0191	1.638	0.360
1.5	7.031	7.653	73	103	-0.7	10.00	0.9641	2.014	0.561
1.5	7.007	7.644	73	104	-0.7	10.00	0.9636	2.024	0.559
3.0	10.034	10.752	73	107	-1.1	10.00	0.9806	1.964	0.800
3.0	10.119	10.714	73	107	-1.1	10.00	0.9924	1.931	0.807

AVERAGES: 0.9891 1.873

ORIFICE & METER CALIBRATION

CONTROL UNIT #D-514 (Napp)

S. Lee

RUN #	1	2	3	4	5	6
VOLUME WET TEST METER (ft ³)	6.719	6.736	7.031	7.007	10.034	10.119
VOLUME DRY GAS METER (ft ³)	935.454	943.016	950.224	958.104	966.092	977.190
	942.361	947.971	957.877	965.748	975.844	987.904
	6.907	6.955	7.653	7.644	10.752	10.714
TEMP. WET TEST METER (F.)	72.5°F	73°F	73°F	73°F	73°F	73°F
TEMP. DRY GAS METER (F.) IN	189	95	104	101	110	110
	105	102	110	112	116	115
		104	112	113	115	117
TEMP. DRY GAS METER (F.) OUT	92	95	96	98	99	100
	93	96	97	99	100	101
	94	97	98	99	101	101
AVERAGE DRY GAS TEMP. (F.)	- 97°F	99°F	103°F	104°F	107°F	107°F
TIME (MIN.)	15	15	10	10	10	10
ORIFICE DH	0.5	0.5	1.5	1.5	3.0	3.0

COMMENTS:

-.35"wg -.35"VG -.65"wg -.65"wr -1.05 -1.05"wg

1
25
35

25
26
27

6.250
217

6.5.1

500
236

$$\begin{array}{r} 145 \\ \times 6 \\ \hline 105 \end{array}$$

7000
007

10.200
119

700
7031

$\begin{array}{r} .45 \\ .60 \\ \hline \end{array}$

10.11.19

7.03

10.053

APPENDIX D

Field Testing
and
Analytical Data

STACK SAMPLING FIELD DATA

Company **FMC**

Assumed Moisture % 40

Plant Location Green River, Wyo.

Probe Tip Diameter, in. 0.234

Run No. 91-N8-3-4

Probe Length, ft. 10

Sampling Location N8-3

Ambient Temperature, °F _____

Date 3-5-91

Bar. Pressure, in. Hg 23.52

Start Time 8:03 - 8:43

Initial Leak Check, CFM 0.000 at 15 in. Hg.

Finish Time 8:39 - 9:19

Final Leak Check, CFM 0.000 at 15 in. Hg.

Meter Correction 0.9891

Orsat, %CO₂ 17.2

% O₂ 5.1

Stack Area 50.27

% CO 0.0

Point No.	Time (min)	Dry Gas Meter FT ³	Pitot In. H ₂ O		Orifice ΔH In H ₂ O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Sample Box Temp. °F	Impinger Temp. °F	Stack Press. in Hg	Stack Temp. °F
			P	√P	Desired	Actual	Inlet	Outlet					
W. Port													
1	0	202.000	0.37	0.608	0.30	0.30	57	57	1.0	275	20		389
2	3	203.3	0.52	0.721	0.43	0.43	65	56	1.5	300	20		403
3	6	204.4	0.52	0.721	0.43	0.43	68	57	1.8	300	19		409
4	9	205.6	0.54	0.735	0.48	0.48	72	59	2.0	300	19		410
5	12	206.9	0.59	0.768	0.49	0.49	73	61	2.0	284	18		413
6	16	208.3	0.71	0.841	0.63	0.63	77	63	2.0	293	19		415
7	18	209.7	0.91	0.954	0.75	0.75	79	65	2.2	296	19		420
8	21	211.3	0.88	0.938	0.71	0.71	82	67	2.2	288	18		418
9	24	212.8	0.77	0.877	0.63	0.63	85	70	2.0	284	18		418
10	27	214.3	0.77	0.877	0.63	0.63	86	71	2.0	272	18		418
11	30	215.7	0.80	0.894	0.65	0.65	88	73	2.0	264	18		415
12	33	217.3	0.66	0.812	0.54	0.54	91	75	1.8	257	18		413
	36	218.642											
N. Port													
1	0	218.642	0.40	0.632	0.33	0.33	79	81	2.0	292	18		382
2	3	219.7	0.53	0.728	0.44	0.44	89	81	2.0	272	19		393
3	6	221.9	0.56	0.748	0.45	0.45	93	82	2.0	271	20		401
4	9	222.7	0.68	0.825	0.55	0.55	95	84	2.1	274	20		405
5	12	223.6	0.76	0.872	0.61	0.61	99	86	2.3	277	20		407
6	15	225.0	0.90	0.949	0.74	0.74	100	87	2.8	274	20		408
7	18	226.6	0.85	0.922	0.69	0.69	103	88	2.7	285	20		406
8	21	228.2	0.85	0.922	0.69	0.69	103	90	2.8	274	21		404
9	24	229.2	0.83	0.911	0.66	0.66	105	91	2.8	271	21		402
10	27	231.3	0.78	0.883	0.64	0.64	105	91	2.8	270	21		400
11	30	232.8	0.80	0.894	0.65	0.65	106	93	2.8	283	21		397
12	33	234.4	0.73	0.854	0.60	0.60	107	94	2.6	286	21		397
	36	235.835											
												3919	
(0.9891)(33835) =													9743
TOTAL	Vm	33.466	19.922		14.69		81.6°F						406°F
AVG.			0.830		0.612		541.6°F						846°F

JB

FMC Wyoming Corporation
Emission Testing
Laboratory Data

Date: 3-5-91

Run No.: 91-N5-3-4

Location: N5-3

MOISTURE COLLECTED

			GM/ML
Impinger 1	Final Weight	<u>745.0</u>	
	Initial Weight	<u>545.7</u>	
		<u>199.3</u>	Increase <u>199.3</u>
Impinger 2	Final Weight	<u>701.4</u>	
	Initial Weight	<u>546.2</u>	
		<u>155.2</u>	Increase <u>155.2</u>
Impinger 3	Final Weight	<u>476.5</u>	
	Initial Weight	<u>439.3</u>	
		<u>37.2</u>	Increase <u>37.32</u>
Impinger 4	Final Weight	<u>625.6</u>	
	Initial Weight	<u>618.2</u>	
		<u>7.4</u>	Increase <u>7.4</u>
Total Moisture Catch			<u>399.1</u>

PARTICULATE COLLECTED

FRONT HALF WASH
Beaker (Gross Weight) 74.5998
Beaker (Tare Weight) 74.5693

TOTAL WASH CATCH 0.0305

ACETONE BLANK
Beaker (Gross Weight) 75.8816
Beaker (Tare Weight) 75.8816

TOTAL BLANK - 0 -

FRONT HALF ANALYSIS
(Nozzle, Probe, Cyclone, Filter)

Filter (Gross Weight) 0.5909
Filter (Tare Weight) 0.5461
Filter Catch 0.0448

Washings 0.0305
Total Catch 0.0753
cetone Blank - 0 -

TOTAL FRONT CATCH 0.0753

BACK HALF ANALYSIS
(Impingers, Filter Back-Half)

Beaker (Gross Weight) 75.0068
Beaker (Tare Weight) 74.9947

TOTAL BACK HALF CATCH 0.0121

TOTAL TRAIN CATCH 0.0874

FMC

Assumed Moisture % 40

Probe Tip Diameter, in. 0.234

Probe Length, ft. 10

Ambient Temperature, °F

Bar. Pressure, in. Hg. 25.52

Initial Leak Check, CFM 0.005 at 15 In. Hg.

Final Leak Check, CFM 2.002 at 15 in. Hg.

Orsat, %CO₂ 15.6

% O₂ 7.2

% CO 0.0

Point No.	Time (min)	Dry Gas Meter FT ³	Pitot in. H ₂ O		Orifice ΔH in H ₂ O		Dry Gas Temp. °F		Pump Vacuum in. Hg Gauge	Sample Box Temp. °F	Impinger Temp. °F	Stack Press. in Hg	Stack Temp. °F
			P	√P	Desired	Actual	Inlet	Outlet					
10	236.214	.400	.632	.33	.33	101	97	2	227	26		385	
23	237.4	.550	.742	.45	.45	106	98	8	256	24		396	
36	238.6	.680	.826	.57	.57	107	98	8	268	23		399	
49	240.0	.720	.848	.58	.58	107	99	9	280	23		403	
512	241.5	.760	.872	.62	.62	107	99	9	292	22		406	
615	243.0	.930	.964	.76	.76	108	99	10	220	28		400	
718	244.6	.980	.990	.81	.81	107	99	10	257	28		408	
821	246.3	1.1	1.049	.90	.90	109	99	6	283	28		411	
924	248.1	.950	.976	.78	.78	110	99	4	268	29		409	
1027	249.8	.930	.964	.77	.77	111	99	4	245	28		404	
1130	251.4	.900	.949	.74	.74	111	100	4	265	29		407	
1233	253.1	.800	.894	.65	.65	112	100	4	274	27		409	
3436	254.679												
10	254.649	.530	.728	.44	.44	107	101	4	260	22		393	
23	256.1	.620	.787	.50	.50	109	101	4	264	23		405	
36	257.4	.660	.812	.53	.53	110	102	4	266	23		410	
49	258.8	.740	.860	.61	.61	112	102	4	259	24		414	
512	260.3	1.0	1.000	.82	.82	114	103	4	254	25		418	
615	261.9	.990	.995	.81	.81	114	103	4	257	25		417	
718	263.7	1.0	1.000	.82	.82	114	103	4	276	26		414	
821	265.4	1.0	1.000	.82	.82	114	103	4	274	27		413	
924	267.1	.720	.848	.76	.76	115	104	4.5	224	22		410	
1027	268.7	.970	.985	.71	.71	115	104	4.5	250	28		409	
1130	270.4	.850	.922	.67	.67	114	104	4.0	273	27		405	
1233	272.7	.850	.922	.67	.67	115	105	4.0	273	28		401	
36	273.600												
(0.9891) 37.386	36.978												
TOTAL	Vm	36.978	21.679	16.24	105.4°F								
AVG.			0.903	0.677	565.4°F								

FMC Wyoming Corporation

Emission Testing

Laboratory Data

Date: 3-5-91

Run No.: 91-NS-3-A⁵

Location: NS-3

MOISTURE COLLECTED

GM/ML

Impinger 1	Final Weight	<u>724.5</u>		
	Initial Weight	<u>515.4</u>		
		<u>209.1</u>	Increase	<u>209.1</u>
Impinger 2	Final Weight	<u>697.0</u>		
	Initial Weight	<u>555.7</u>		
		<u>141.3</u>	Increase	<u>141.3</u>
Impinger 3	Final Weight	<u>494.6</u>		
	Initial Weight	<u>441.0</u>		
		<u>53.6</u>	Increase	<u>53.6</u>
Impinger 4	Final Weight	<u>626.0</u>		
	Initial Weight	<u>613.7</u>		
		<u>12.3</u>	Increase	<u>12.3</u>
		Total Moisture Catch		<u>416.3</u>

PARTICULATE COLLECTED

FRONT HALF WASH

Beaker (Gross Weight) 75.2303

Beaker (Tare Weight) 75.1923

TOTAL WASH CATCH 0.0380

ACETONE BLANK

Beaker (Gross Weight) 75.8816

Beaker (Tare Weight) 75.8816

TOTAL BLANK -0-

FRONT HALF ANALYSIS

(Nozzle, Probe, Cyclone, Filter)

Filter (Gross Weight) 0.5836

Filter (Tare Weight) 0.5435

Filter Catch 0.0411

Washings 0.0380

Total Catch 0.0791

Acetone Blank -0-

TOTAL FRONT HALF CATCH 0.0791

BACK HALF ANALYSIS

(Impingers, Filter Back-Half)

Beaker (Gross Weight) 74.4382

Beaker (Tare Weight) 74.4271

TOTAL BACK HALF CATCH 0.0111

TOTAL TRAIN CATCH 0.0902

STACK SAMPLING FIELD DATA

Company **FMC**
 Plant Location Green River, Wyo.
 Run No. 91-NB-3-6
 Sampling Location NB-3
 Date 3-5-91
 Start Time 11:36 - 12:15
 Finish Time 12:12 - 12:51
 Meter Correction 0.9891
 Stack Area 50.27

Assumed Moisture % 40
 Probe Tip Diameter, in. 0.234
 Probe Length, ft. 10
 Ambient Temperature, °F _____
 Bar. Pressure, in. Hg. 23.52
 Initial Leak Check, CFM 0.002 at 9.0 in. Hg.
 Final Leak Check, CFM 0.003 at 9.0 in. Hg.
 Orsat, %CO₂ 16.4
 % O₂ 6.5
 % CO 0.0

Point No.	Time (min)	Dry Gas Meter FT ³	Pitot in. H ₂ O		Orifice ΔH in H ₂ O		Dry Gas Temp. °F		Pump Vacuum in. Hg Gauge	Sample Box Temp. °F	Impinger Temp. °F	Stack Press. in Hg	Stack Temp. °F
			P	√P	Desired	Actual	Inlet	Outlet					
10		275.171	0.520	0.721	0.43	0.43	101	102	2.0	210	31		385
23		276.5	0.540	0.735	0.45	0.45	103	102	2.4	222	33		394
36		277.7	0.580	0.762	0.48	0.48	104	102	3.4	222	33		404
49		279.0	0.670	0.818	0.55	0.55	105	101	3.8	226	34		407
512		280.4	0.630	0.794	0.52	0.52	106	101	3.8	236	34		408
615		281.8	0.700	0.837	0.57	0.57	105	100	3.8	230	33		409
718		283.2	0.950	0.975	0.78	0.78	104	99	4.7	236	32		412
821		284.8	0.930	0.964	0.75	0.75	105	98	3.8	245	32		412
924		286.4	0.800	0.949	0.74	0.74	105	97	3.0	241	32		411
1027		288.1	0.840	0.916	0.68	0.68	104	97	2.8	235	34		412
1130		289.6	0.780	0.883	0.63	0.63	103	96	2.2	230	34		410
1233		291.1	0.750	0.866	0.61	0.61	102	95	2.4	259	32		410
36		292.5%											
10		292.5%	0.470	0.685	0.39	0.39	91	94	2.0	261	30		384
23		293.8	0.550	0.742	0.45	0.45	98	93	2.0	220	28		392
36		295.1	0.680	0.825	0.55	0.55	100	94	2.2	228	29		397
49		296.4	0.750	0.866	0.61	0.61	102	94	2.3	233	29		403
512		298.0	0.850	0.922	0.69	0.69	103	94	2.8	236	29		409
615		299.5	0.950	0.975	0.78	0.78	105	95	3.0	243	28		410
718		301.1	0.970	0.985	0.80	0.80	107	95	3.0	240	28		407
821		302.8	1.020	1.010	0.82	0.82	108	96	3.2	230	29		407
924		304.5	0.920	0.959	0.75	0.75	109	97	3.0	238	29		404
1027		306.1	0.800	0.894	0.65	0.65	109	97	3.0	240	26		404
1130		307.6	0.870	0.933	0.72	0.72	109	98	3.1	236	26		398
1233		309.2	0.870	0.933	0.72	0.72	110	99	3.0	243	27		396
36		310.804											
(0.9891)(35.633) = 35.245							4834						9685
TOTAL	V _m	35.245	20.949		15.12		100.7°F						403.5
AVG.			0.873		0.63		560.7°R						863.5

FMC Wyoming Corporation
Emission Testing
Laboratory Data

Date: 3-5-91

Run No.: 91-NS-3-⁶5

Location: NS-3

MOISTURE COLLECTED

GM/ML

Impinger 1	Final Weight	<u>694.2</u>	
	Initial Weight	<u>534.1</u>	
		<u>160.1</u>	Increase <u>160.1</u>
Impinger 2	Final Weight	<u>770.4</u>	
	Initial Weight	<u>537.9</u>	
		<u>232.5</u>	Increase <u>232.5</u>
Impinger 3	Final Weight	<u>432.2</u>	
	Initial Weight	<u>430.8</u>	
		<u>1.4</u>	Increase <u>1.4</u>
Impinger 4	Final Weight	<u>650.3</u>	
	Initial Weight	<u>642.1</u>	
		<u>8.2</u>	Increase <u>8.2</u>
Total Moisture Catch			<u>402.2</u>

PARTICULATE COLLECTED

FRONT HALF WASH

Beaker (Gross Weight) 75.5783
Beaker (Tare Weight) 75.5456

TOTAL WASH CATCH 0.0327

ACETONE BLANK

Beaker (Gross Weight) 75.8816
Beaker (Tare Weight) 75.8816

TOTAL BLANK -0-

FRONT HALF ANALYSIS

(Nozzle, Probe, Cyclone, Filter)

Filter (Gross Weight) 0.5956
Filter (Tare Weight) 0.5446
Filter Catch 0.0510

Washings 0.0327
Total Catch 0.0837
Acetone Blank -0-

TOTAL FRONT CATCH 0.0837

BACK HALF ANALYSIS

(Impingers, Filter Back-Half)

Beaker (Gross Weight) 73.9209
Beaker (Tare Weight) 73.9077

TOTAL BACK HALF CATCH 0.0132

TOTAL PARTICULATE CATCH 0.0969

Don 3
File

MEMORANDUM

TO: FMC Wyoming Corporation Compliance File

THROUGH: Charles Collins, Administrator, AQD
Bernie Dailey, Engineering Supervisor, AQD

FROM: Dan Olson, Compliance Officer, AQD *DO*

DATE: March 14, 1991

Subject: Stack Test Analysis on Mono 2 Calciner (Source NS-3)

This source was initially tested on October 11, 1990 for compliance with particulate emission levels as a result of Division concerns with elevated opacities. The results of this test were reviewed by my memo of December 10, 1990, which indicated a tested emission rate of 52.3 pph against an allowable of 41.0 pph. The source was again tested on January 31, 1991 after some modifications were made to the system (these mods are detailed in Lee Gribovicz's memo of February 7, 1991). Because of the negative nature of the results of this second attempt, FMC did not transmit them to the Division, choosing instead to make additional modifications to the system and then conduct a series of "internal" tests in February 1991 to verify that the modifications had the desired effect (Lee Gribovicz's memo of March 6, 1991 details these additional modifications). In the meantime, the Administrator in a February 21, 1991 letter, required FMC to immediately transmit the results of the January test to the Division. On February 28, 1991, FMC transmitted the results of the January official compliance test along with the results of the "internal" tests conducted in February. This transmittal was received by the Division on March 4, 1991, and is the subject of this analysis.

All tests were conducted in accordance with the requirements of Reference Method 5 for particulate. The raw test data included with the test reports were reviewed for consistency and accuracy and independent calculations made in accordance with the requirements of Method 5 to determine emission rates for particulate based on these data. The results of these calculations are summarized below and included as attachments to this memo.

FMC verbally arranged an official retesting schedule with Lee Gribovicz because of their satisfaction with the results of the "internal" tests and this test was conducted on March 5, 1991. The Division has not yet received the results of this test.

TESTED EMISSION RATES
MONO 2 CALCINER
(NS-3)

TEST DATE	AQD RESULTS(pph)	FMC RESULTS(pph)	ALLOWABLE(pph)
01/31/91	50.9	50.6	41.0
02/14/91	33.5	33.4	41.0
02/14/91	36.9	36.7	41.0
02/21/91	28.9	28.7	41.0
02/21/91	33.2	33.1	41.0

The results of the January test are a three test average and indicates a continued non-compliant operation. The average of the three lowest test results for the "internal" tests conducted in February give an emission rate of 31.9 pph which indicates a compliance operation. All emission rates listed above are for the total catch, both front and back halves of the sampling train.

cc: Lee Gribovicz

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

Run Number: ONE
Test Site: NS-3
Test Date: 1/31/91

FMC

DATA

All data are in: 1=metric, 2=English: 2
Area of stack (ft2 or m2): 50.27
Pitot tube calibration coefficient (Cp): 0.84
Barometric pressure (in. Hg or mm Hg): 24.15
Nozzle diameter (ft or m): 0.0195
Dry stack gas molecular weight: 30.78
Initial Dry Gas Meter reading (ft3 or m3): 752.78
Final Dry Gas Meter reading (ft3 or m3): 788.28
Dry Gas Meter calibration factor (Y): 0.9816
Total run time (min): 72

DATA

Particulate weight in probe rinse (mg): 52.7
Particulate weight in filter catch (mg): 54.5
Particulate weight in impinger catch (mg): 20
Volume of Water Vapor Condensed (ml): 415.7
Water Vapor Collected in Silica Gel (mg): 8.5
Percent Oxygen in Stack by Volume (dry): 5.6
Percent Carbon Dioxide in Stack by Volume (dry): 16
Leak Rate Correction Factor Used? 1=yes, 2=no: 2

MEASURED DATA FROM TEST RUN no:ONE

Run Time (min)	Pitot Delta p (in H2O, mm H2O)	Orifice Delta H (in H2O, mm H2O)	Average Pressure DGM Temp (in H2O, (F,C) mm H2O)	Stack Temp (F,C)
0	0.7	0.59	68	0
3	0.7	0.59	71.5	0
6	0.78	0.66	74.5	0
9	0.9	0.76	76.5	0
12	0.9	0.76	78	0
15	0.9	0.76	79.5	0
18	0.84	0.71	81	0
21	0.75	0.64	83.5	0
24	0.7	0.59	83.5	0
27	0.62	0.53	83.5	0
30	0.65	0.55	85	0
33	0.6	0.51	86.5	0
36				
0	0.6	0.51	88	0
3	0.64	0.54	89	0
6	0.6	0.51	91.5	0
9	0.7	0.59	92	0
12	0.78	0.66	93.5	0
15	0.9	0.76	94	0
18	0.83	0.7	93	0

30	0.75	0.64	94.5	0	432
33	0.7	0.59	95	0	429
36					

RESULTS

Percent moisture in stack gas (%):	42.29
Wet Stack Gas Molecular Weight (Ms):	25.4
Average Stack Pressure (Ps)(in Hg,mm Hg):	24.15
Average Stack Gas Temperature (Ts)(R,K):	894
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	75.48
Actual Volumetric Flow Rate (Q)(acfm,acmm):	227647.7
Standard Volumetric Flow Rate (Qstd)(scfm,scmm dry):	42501.8

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

=====

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr):	3.26E+01
Total Catch Pollutant Mass Rate (lbs/hr):	3.87E+01
Dry Catch Pollutant Mass Rate (g/hr):	14777.41
Total Catch Pollutant Mass Rate (g/hr):	17534.39
Dry Catch Concentration (grains/dscf,g/dscm):	6.07E-02
Total Catch Concentration (grains/dscf,g/dscm):	7.21E-02
Isokinetic Check (% I):	101.8
Oxygen-Based Emission Rate (ng/J,lb/million Btu):	1.38E-01
Carbon Dioxide-Based Emission Rate (ng/J,lb/million Btu):	1.16E-01

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

Run Number: two
Test Site: NS-3 *FMC*
Test Date: 1/31/91

	DATA
All data are in: 1=metric, 2=English:	2
Area of stack (ft2 or m2):	50.27
Pitot tube calibration coefficient (Cp):	0.84
Barometric pressure (in. Hg or mm Hg):	24.15
Nozzle diameter (ft or m):	0.0195
Dry stack gas molecular weight:	30.81
Initial Dry Gas Meter reading (ft3 or m3):	788.6
Final Dry Gas Meter reading (ft3 or m3):	825.88
Dry Gas Meter calibration factor (Y):	0.9816
Total run time (min):	72

	DATA
Particulate weight in probe rinse (mg):	90.7
Particulate weight in filter catch (mg):	67.1
Particulate weight in impinger catch (mg):	21.1
Volume of Water Vapor Condensed (ml):	412.9
Water Vapor Collected in Silica Gel (mg):	8.4
Percent Oxygen in Stack by Volume (dry):	5.5
Percent Carbon Dioxide in Stack by Volume (dry):	16.2
Leak Rate Correction Factor Used? 1=yes, 2=no:	2

MEASURED DATA FROM TEST RUN no: TWO

Run Time (min)	Pitot Delta p (in H2O, mm H2O)	Orifice Delta H (in H2O, mm H2O)	Average Pressure DGM Temp (in H2O, (F,C) mm H2O)	Stack Temp (F,C)
0	0.7	0.59	95.5	426
3	0.7	0.59	97	428
6	0.9	0.76	98	429
9	0.95	0.81	97.5	432
12	1	0.85	97.5	436
15	1.1	0.93	97.5	437
18	0.9	0.76	98	436
21	0.75	0.64	98.5	435
24	0.75	0.64	99	434
27	0.7	0.59	98.5	434
30	0.68	0.57	98.5	434
33	0.6	0.51	98.5	432
0	0.6	0.51	97.5	425
3	0.6	0.51	99	430
6	0.66	0.56	99.5	434
9	0.7	0.59	101	437
12	0.8	0.68	102	440
15	0.95	0.81	102.5	443
18	0.85	0.72	103	440
21	0.8	0.68	103	438

33

0.75

0.64

104.5

0

429

RESULTS

Percent moisture in stack gas (%):	41.55
Wet Stack Gas Molecular Weight (Ms):	25.5
Average Stack Pressure (Ps)(in Hg,mm Hg):	24.15
Average Stack Gas Temperature (Ts)(R,K):	894
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	77.06
Actual Volumetric Flow Rate (Q)(acfm,acmm):	232441.6
Standard Volumetric Flow Rate (Qs)(scfm,acmm):	13770.0

CONCENTRATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

=====

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr):	4.85E+01
Total Catch Pollutant Mass Rate (lbs/hr):	5.50E+01 ✓
Dry Catch Pollutant Mass Rate (g/hr):	21983.46
Total Catch Pollutant Mass Rate (g/hr):	24922.95
Dry Catch Concentration (grains/dscf,g/dscm):	8.73E-02
Total Catch Concentration (grains/dscf,g/dscm):	9.90E-02
Isokinetic Check (% I):	100.7
Oxygen-Based Emission Rate (ng/J,lb/million Btu):	1.88E-01
Carbon Dioxide-Based Emission Rate (ng/J,lb/million Btu):	1.57E-01

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

Run Number: THREE

Test Site: NS-3 *FMC*

Test Date: 1/31/91

DATA

All data are in: 1=metric, 2=English: 2
 Area of stack (ft² or m²): 50.27
 Pitot tube calibration coefficient (Cp): 0.84
 Barometric pressure (in. Hg or mm Hg): 24.15
 Nozzle diameter (ft or m): 0.0195
 Dry stack gas molecular weight: 30.83
 Initial Dry Gas Meter reading (ft³ or m³): 826.23
 Final Dry Gas Meter reading (ft³ or m³): 861.94
 Dry Gas Meter calibration factor (Y): 0.9816
 Total run time (min): 72

DATA

Particulate weight in probe rinse (mg): 105.2
 Particulate weight in filter catch (mg): 66.7
 Particulate weight in impinger catch (mg): 14.5
 Volume of Water Vapor Condensed (ml): 371.5
 Water Vapor Collected in Silica Gel (mg): 8.4
 Percent Oxygen in Stack by Volume (dry): 5.9
 Percent Carbon Dioxide in Stack by Volume (dry): 16.2
 Leak Rate Correction Factor Used? 1=yes, 2=no: 2

MEASURED DATA FROM TEST RUN no:THREE

Run Time (min)	Pitot Delta p (in H ₂ O, mm H ₂ O)	Orifice Delta H (in H ₂ O, mm H ₂ O)	Average Pressure DGM Temp (in H ₂ O, (F,C) mm H ₂ O)	Stack Temp (F,C)
0	0.55	0.47	100.5	0 421
3	0.65	0.55	103.5	0 422
6	0.75	0.64	105	0 425
9	0.87	0.74	104.5	0 426
12	0.9	0.76	103.5	0 426
15	0.95	0.81	102	0 430
18	0.9	0.76	101	0 429
21	0.75	0.64	101.5	0 429
24	0.7	0.59	101	0 429
27	0.65	0.55	100	0 429
30	0.65	0.55	100	0 427
33	0.55	0.47	100	0 425
0	0.55	0.47	96.5	0 427
3	0.55	0.47	97	0 420
6	0.6	0.51	97.5	0 421
9	0.65	0.55	98	0 425
12	0.76	0.65	99	0 428
15	0.8	0.68	99.5	0 429
18	0.85	0.72	100.5	0 431
21	0.87	0.74	101	0 430

33

0.7

0.59

102

420

418

RESULTS

Percent moisture in stack gas (%):	40.13
Wet Stack Gas Molecular Weight (Ms):	25.7
Average Stack Pressure (Ps)(in Hg,mm Hg):	24.15
Average Stack Gas Temperature (Ts)(R,K):	886
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	73.39
Actual Volumetric Flow Rate (Q)(acfm,acmm):	221357.9
Standard Volumetric Flow Rate (Qstd)(scfm,scmm):	43771.0

AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr):	5.43E+01
Total Catch Pollutant Mass Rate (lbs/hr):	5.89E+01
Dry Catch Pollutant Mass Rate (g/hr):	24639.75
Total Catch Pollutant Mass Rate (g/hr):	26718.15
Dry Catch Concentration (grains/dscf, g/dscm):	9.95E-02
Total Catch Concentration (grains/dscf, g/dscm):	1.08E-01
Isokinetic Check (% I):	97.9
Oxygen-Based Emission Rate (ng/J, lb/million Btu):	2.10E-01
Carbon Dioxide-Based Emission Rate (ng/J, lb/million Btu):	1.71E-01

Ave 3 Tests

Total Catch = 50.87 lb/hr.

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

Run Number: RF-1 **FMC**

Test Site: NS-3

Test Date: 2/14/91

DATA

All data are in: 1=metric, 2=English: 2
 Area of stack (ft2 or m2): 50.27
 Pitot tube calibration coefficient (Cp): 0.84
 Barometric pressure (in. Hg or mm Hg): 24.06
 Nozzle diameter (ft or m): 0.0195
 Dry stack gas molecular weight: 30.91
 Initial Dry Gas Meter reading (ft3 or m3): 17.328
 Final Dry Gas Meter reading (ft3 or m3): 50.075
 Dry Gas Meter calibration factor (Y): 0.9891
 Total run time (min): 72

DATA

Particulate weight in probe rinse (mg): 52.3
 Particulate weight in filter catch (mg): 34.6
 Particulate weight in impinger catch (mg): 14
 Volume of Water Vapor Condensed (ml): 368.1
 Water Vapor Collected in Silica Gel (mg): 6.8
 Percent Oxygen in Stack by Volume (dry): 6.4
 Percent Carbon Dioxide in Stack by Volume (dry): 16.6
 Leak Rate Correction Factor Used? 1=yes, 2=no: 2

MEASURED DATA FROM TEST RUN no:ONE

Run Time (min)	Pitot Delta p (in H2O, mm H2O)	Orifice Delta H (in H2O, mm H2O)	Average Pressure DGM Temp (in H2O, (F,C) mm H2O)	Stack Temp (F,C)
0	0.52	0.38	55	0
3	0.57	0.43	59	0
6	0.68	0.5	61.5	0
9	0.79	0.58	64	0
12	0.87	0.64	67	0
15	0.87	0.64	70.5	0
18	0.89	0.69	73.5	0
21	0.85	0.62	77	0
24	0.77	0.55	79	0
27	0.73	0.53	81	0
30	0.7	0.51	83	0
33	0.64	0.46	85.5	0
0	0.47	0.34	90	0
3	0.53	0.39	91.5	0
6	0.6	0.44	93.5	0
9	0.64	0.47	95	0
12	0.77	0.56	97	0
15	0.83	0.62	99	0
18	0.83	0.62	100.5	0
21	0.85	0.62	101	0

33	0.75	0.54	104.5	0	395
----	------	------	-------	---	-----

RESULTS

Percent moisture in stack gas (%):	41.12
Wet Stack Gas Molecular Weight (Ms):	25.6
Average Stack Pressure (Ps)(in Hg,mm Hg):	24.06
Average Stack Gas Temperature (Ts)(R,K):	863
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	72.69
Actual Volumetric Flow Rate (Q)(acfm,acmm):	219256.6

AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr):	2.89E+01
Total Catch Pollutant Mass Rate (lbs/hr):	3.35E+01
Dry Catch Pollutant Mass Rate (g/hr):	13098.51
Total Catch Pollutant Mass Rate (g/hr):	15208.74
Dry Catch Concentration (grains/dscf,g/dscm):	5.31E-02
Total Catch Concentration (grains/dscf,g/dscm):	6.16E-02
Isokinetic Check (% I):	93.1
Oxygen-Based Emission Rate (ng/J,lb/million Btu):	1.24E-01
Carbon Dioxide-Based Emission Rate (ng/J,lb/million Btu):	9.55E-02

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

Run Number: RF-2 *FMC*
Test Site: NS-3
Test Date: 2/14/91

	DATA
All data are in: 1=metric, 2=English:	2
Area of stack (ft2 or m2):	50.27
Pitot tube calibration coefficient (Cp):	0.84
Barometric pressure (in. Hg or mm Hg):	24.06
Nozzle diameter (ft or m):	0.0195
Dry stack gas molecular weight:	31
Initial Dry Gas Meter reading (ft3 or m3):	50.44
Final Dry Gas Meter reading (ft3 or m3):	85.347
Dry Gas Meter calibration factor (Y):	0.9891
Total run time (min):	72

	DATA
Particulate weight in probe rinse (mg):	63.9
Particulate weight in filter catch (mg):	31.6
Particulate weight in impinger catch (mg):	14.6
Volume of Water Vapor Condensed (ml):	373.7
Water Vapor Collected in Silica Gel (mg):	8.6
Percent Oxygen in Stack by Volume (dry):	5.8
Percent Carbon Dioxide in Stack by Volume (dry):	17.3
Leak Rate Correction Factor Used? 1=yes, 2=no:	2

MEASURED DATA FROM TEST RUN no:RF-2

Run Time (min)	Pitot Delta p (in H2O, mm H2O)	Orifice Delta H (in H2O, mm H2O)	Average Pressure DGM Temp (in H2O, (F,C) mm H2O)	Stack Temp (F,C)
0	0.44	0.33	99.5	410
3	0.64	0.47	101.5	417
6	0.74	0.57	103	420
9	0.86	0.62	104	429
12	0.95	0.69	105	432
15	0.98	0.72	106	433
18	0.91	0.65	106	431
21	0.84	0.62	106.5	431
24	0.84	0.62	106.5	428
27	0.78	0.56	106.5	425
30	0.71	0.51	106.5	424
33	0.66	0.48	107.5	424
0	0.49	0.36	105	409
3	0.57	0.42	107.5	418
6	0.71	0.51	108.5	420
9	0.8	0.58	109	424
12	0.86	0.62	108.5	424
15	0.98	0.71	109	423
18	0.94	0.69	108	420
21	0.98	0.71	108.5	418

RESULTS

Percent moisture in stack gas (%):	40.97
Wet Stack Gas Molecular Weight (Ms):	25.7
Average Stack Pressure (Ps)(in Hg,mm Hg):	24.06
Average Stack Gas Temperature (Ts)(R,K):	881
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	76.64
Actual Volumetric Flow Rate (Q)(acfm,acmm):	231150.3

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

=====

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr):	3.20E+01
Total Catch Pollutant Mass Rate (lbs/hr):	3.69E+01
Dry Catch Pollutant Mass Rate (g/hr):	14525.42
Total Catch Pollutant Mass Rate (g/hr):	16746.07
Dry Catch Concentration (grains/dscf,g/dscm):	5.69E-02
Total Catch Concentration (grains/dscf,g/dscm):	6.56E-02
Isokinetic Check (% I):	92.2
Oxygen-Based Emission Rate (ng/J,lb/million Btu):	1.27E-01
Carbon Dioxide-Based Emission Rate (ng/J,lb/million Btu):	9.74E-02

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

Run Number: RF-3
Test Site: NS-3
Test Date: 2/21/91

FMC

DATA

All data are in: 1=metric, 2=English: 2
Area of stack (ft2 or m2): 50.27
Pitot tube calibration coefficient (Cp): 0.84
Barometric pressure (in. Hg or mm Hg): 24.11
Nozzle diameter (ft or m): 0.0195
Dry stack gas molecular weight: 30.74
Initial Dry Gas Meter reading (ft3 or m3): 105.23
Final Dry Gas Meter reading (ft3 or m3): 139.501
Dry Gas Meter calibration factor (Y): 0.9891
Total run time (min): 72

DATA

Particulate weight in probe rinse (mg): 48.1
Particulate weight in filter catch (mg): 25.1
Particulate weight in impinger catch (mg): 12.7
Volume of Water Vapor Condensed (ml): 350.9
Water Vapor Collected in Silica Gel (mg): 8
Percent Oxygen in Stack by Volume (dry): 7.8
Percent Carbon Dioxide in Stack by Volume (dry): 15.2
Leak Rate Correction Factor Used? 1=yes, 2=no: 2

MEASURED DATA FROM TEST RUN no:RF-3

Run Time (min)	Pitot Delta p (in H2O, mm H2O)	Orifice Delta H (in H2O, mm H2O)	Average Pressure DGM Temp (in H2O, (F,C) mm H2O)	Stack Temp (F,C)
0	0.57	0.44	65	380
3	0.64	0.51	67.5	392
6	0.77	0.6	70.5	399
9	0.85	0.66	73	401
12	0.9	0.7	75.5	406
15	0.94	0.74	78	408
18	0.93	0.74	80.5	409
21	0.88	0.68	82.5	409
24	0.83	0.64	85	409
27	0.79	0.63	86	407
30	0.74	0.55	87.5	405
33	0.67	0.53	89	405
0	0.51	0.4	91	382
3	0.58	0.44	93.5	390
6	0.6	0.47	94.5	399
9	0.64	0.5	95.5	400
12	0.7	0.55	97.5	401
15	0.84	0.66	99	404
18	0.87	0.68	100.5	401
21	0.89	0.7	101.5	401

33	0.7	0.55	104	0	392
----	-----	------	-----	---	-----

RESULTS

Percent moisture in stack gas (%):	39.09
Wet Stack Gas Molecular Weight (Ms):	25.8
Average Stack Pressure (Ps)(in Hg,mm Hg):	24.11
Average Stack Gas Temperature (Ts)(R,K):	859
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	73.58
Actual Volumetric Flow Rate (Q)(acfm,acmm):	221942.8
Standard Volumetric Flow Rate (Qstd)(scfm,acmm dry):	44000.4

AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr):	2.46E+01
Total Catch Pollutant Mass Rate (lbs/hr):	2.89E+01
Dry Catch Pollutant Mass Rate (g/hr):	11161.04
Total Catch Pollutant Mass Rate (g/hr):	13097.44
Dry Catch Concentration (grains/dscf,g/dscm):	4.29E-02
Total Catch Concentration (grains/dscf,g/dscm):	5.04E-02
Isokinetic Check (% I):	92.0
Oxygen-Based Emission Rate (ng/J,lb/million Btu):	1.12E-01
Carbon Dioxide-Based Emission Rate (ng/J,lb/million Btu):	8.52E-02

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

Run Number: RF-4 *FMC*
Test Site: NS-3
Test Date: 2/21/91

DATA

All data are in: 1=metric, 2=English: 2
Area of stack (ft² or m²): 50.27
Pitot tube calibration coefficient (Cp): 0.84
Barometric pressure (in. Hg or mm Hg): 24.11
Nozzle diameter (ft or m): 0.0195
Dry stack gas molecular weight: 30.94
Initial Dry Gas Meter reading (ft³ or m³): 139.915
Final Dry Gas Meter reading (ft³ or m³): 175.202
Dry Gas Meter calibration factor (Y): 0.9891
Total run time (min): 72

DATA

Particulate weight in probe rinse (mg): 51.1
Particulate weight in filter catch (mg): 35.5
Particulate weight in impinger catch (mg): 14.5
Volume of Water Vapor Condensed (ml): 380.6
Water Vapor Collected in Silica Gel (mg): 7.3
Percent Oxygen in Stack by Volume (dry): 6.4
Percent Carbon Dioxide in Stack by Volume (dry): 16.8
Leak Rate Correction Factor Used? 1=yes, 2=no: 2

MEASURED DATA FROM TEST RUN no:RF-4

Run Time (min)	Pitot Delta p (in H ₂ O, mm H ₂ O)	Orifice Delta H (in H ₂ O, mm H ₂ O)	Average Pressure DGM Temp (in H ₂ O, (F,C) mm H ₂ O)	Stack Temp (F,C)
0	0.61	0.48	104	0
3	0.67	0.52	106	0
6	0.8	0.63	106.5	0
9	0.9	0.7	106.5	0
12	0.9	0.7	106.5	0
15	1	0.78	105.5	0
18	0.91	0.71	105	0
21	0.85	0.66	103.5	0
24	0.8	0.63	103	0
27	0.76	0.6	101.5	0
30	0.7	0.55	101	0
33	0.64	0.5	100	0
0	0.5	0.39	97	0
3	0.58	0.46	97.5	0
6	0.61	0.48	98	0
9	0.65	0.51	97.5	0
12	0.74	0.59	98	0
15	0.9	0.7	98	0
18	0.97	0.75	98.5	0
21	1	0.78	98.5	0

33

0.78

0.6

96.5

0

396

RESULTS

Percent moisture in stack gas (%):	40.78
Wet Stack Gas Molecular Weight (Ms):	25.7
Average Stack Pressure (Ps)(in Hg,mm Hg):	24.11
Average Stack Gas Temperature (Ts)(R,K):	867
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	75.18
Actual Volumetric Flow Rate (Q)(acfm,acmm):	226760.6

PRESENTATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr):	2.85E+01
Total Catch Pollutant Mass Rate (lbs/hr):	3.32E+01
Dry Catch Pollutant Mass Rate (g/hr):	12914.29
Total Catch Pollutant Mass Rate (g/hr):	15076.61
Dry Catch Concentration (grains/dscf, g/dscm):	5.04E-02
Total Catch Concentration (grains/dscf, g/dscm):	5.89E-02
Isokinetic Check (% I):	94.1
Oxygen-Based Emission Rate (ng/J, lb/million Btu):	1.19E-01
Carbon Dioxide-Based Emission Rate (ng/J, lb/million Btu):	9.01E-02

Ave Total

4 Tests

33.2

28.9

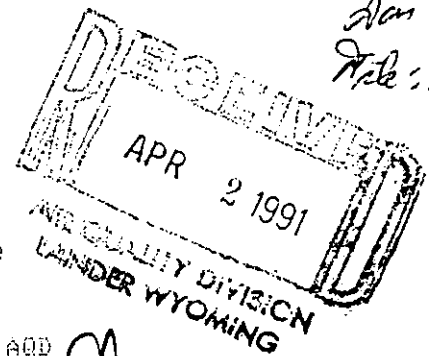
36.9

33.5

$\Rightarrow 33.1 \text{ lb/hr}$

Ave of 3 lowest = 31.9 lb/hr

MEMORANDUM



TO: FMC Wyoming Corporation Compliance File

THROUGH: Charles Collins, Administrator, AOD
Bernie Dailey, Engineering Supervisor, AOD

FROM: Dan Olson, Compliance Officer, AOD

DATE: March 28, 1991

Subject: Stack Test Analysis on Mono 2 Calciner (Source NS-3) for
the Compliance Test conducted on March 5, 1991

This source was initially tested on October 11, 1990 for compliance with particulate emission levels as a result of Division concerns with elevated opacities. The results of this test were reviewed by my memo of December 10, 1990, which indicated a tested emission rate of 52.3 pph against an allowable of 41.0 pph. The source was again tested on January 31, 1991 after some modifications were made to the system (these mods are detailed in Lee Gribovicz's memo of February 7, 1991). Because of the negative nature of the results of this second attempt, FMC did not transmit them to the Division, choosing instead to make additional modifications to the system and then conduct a series of "internal" tests in February 1991 to verify that the modifications had the desired effect (Lee Gribovicz's memo of March 6, 1991 details these additional modifications). In the meantime, the Administrator in a February 21, 1991 letter, required FMC to immediately transmit the results of the January test to the Division. On February 28, 1991, FMC transmitted the results of the January official compliance test along with the results of the "internal" tests conducted in February. This transmittal was received by the Division on March 4, 1991. The results of the January test are presented in my memo of March 14, 1991, and indicate that the source remained out of compliance with a tested emission rate of 50.9 pph.

FMC, because of their satisfaction with the results of the "internal" tests, arranged for an official retest on March 5, 1991. The test report for this test was received by the Division on March 27, 1991 and is the subject of this memo.

The three test series was in fact conducted on March 5, 1991 and a review of the report indicates that all test runs were conducted in accordance with the requirements of Reference Method 5 for particulate. The raw test data included with the test report was reviewed for consistency and accuracy and independent calculations made in accordance with the requirements of Method 5 to determine emission rates for particulate based on these data. The results of these calculations are summarized below and included as attachments to this memo.

TESTED EMISSION RATES
MONO 2 CALCINER
(NS-3)

TEST RUN	AQD RESULTS(pph)	FMC RESULTS(pph)	ALLOWABLE(pph)
NS-3-4	27.1	26.9	41.0
NS-3-5	29.0	28.7	41.0
NS-3-6	31.2	31.0	41.0
AVERAGE	29.1	28.9	41.0

The results of the latest test indicates a that the Mono 2 Calciner stack is now operating in compliance with applicable standards and regulations. All emission rates listed above are for the total catch, both front and back halves of the sampling train. These results should be accepted by the Division as proof of compliance for this source.

cc: Lee Gribovicz

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

Run Number: NS3-4
Test Site: NS-3
Test Date: 3/5/91

DATA

All data are in: 1=metric, 2=English: 2
Area of stack (ft2 or m2): 50.27
Pitot tube calibration coefficient (Cp): 0.84
Barometric pressure (in. Hg or mm Hg): 23.52
Nozzle diameter (ft or m): 0.0195
Dry stack gas molecular weight: 30.98
Initial Dry Gas Meter reading (ft3 or m3): 202
Final Dry Gas Meter reading (ft3 or m3): 235.835
Dry Gas Meter calibration factor (Y): 0.9891
Total run time (min): 72

DATA

Particulate weight in probe rinse (mg): 30.5
Particulate weight in filter catch (mg): 44.8
Particulate weight in impinger catch (mg): 12.1
Volume of Water Vapor Condensed (ml): 391.7
Water Vapor Collected in Silica Gel (mg): 7.4
Percent Oxygen in Stack by Volume (dry): 5.7
Percent Carbon Dioxide in Stack by Volume (dry): 17.2
Leak Rate Correction Factor Used? 1=yes, 2=no: 2

MEASURED DATA FROM TEST RUN no: NS3-4

Run Time (min)	Pitot Delta p (in H2O, mm H2O)	Orifice Delta H (in H2O, mm H2O)	Average Pressure SGM Temp (in H2O, (F,C) mm H2O)	Stack Temp (F,C)
0	0.37	0.3	57	389
3	0.52	0.43	60.5	403
6	0.52	0.43	62.5	409
9	0.54	0.45	65.5	410
12	0.59	0.49	67	413
15	0.77	0.63	70	415
18	0.91	0.75	72	420
21	0.88	0.71	74.5	418
24	0.77	0.63	77.5	418
27	0.77	0.63	79.5	418
30	0.8	0.65	80.5	415
33	0.66	0.54	83	413
0	0.4	0.33	80	382
3	0.53	0.44	85	393
6	0.56	0.45	87.5	401
9	0.68	0.55	89.5	405
12	0.76	0.61	92.5	407
15	0.9	0.74	93.5	408
18	0.85	0.69	95.5	406
21	0.85	0.69	96.5	404

33

0.73

0.6

100.5

0

397

RESULTS

Percent moisture in stack gas (%):	42.26
Wet Stack Gas Molecular Weight (Ms):	25.5
Average Stack Pressure (Ps)(in Hg,mm Hg):	23.52
Average Stack Gas Temperature (Ts)(R,K):	866
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	72.14
Actual Volumetric Flow Rate (Q)(acfm,acmm):	217579.2
Standard Volumetric Flow Rate (Qstd)(scfm,scmm-dry):	60194.6

AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr):	2.34E+01
Total Catch Pollutant Mass Rate (lbs/hr):	2.71E+01
Dry Catch Pollutant Mass Rate (g/hr):	10595.06
Total Catch Pollutant Mass Rate (g/hr):	12297.53
Dry Catch Concentration (grains/dscf,g/dscm):	4.53E-02
Total Catch Concentration (grains/dscf,g/dscm):	5.26E-02
Isokinetic Check (% I):	99.7
Oxygen-Based Emission Rate (ng/J,lb/million Btu):	1.01E-01
Carbon Dioxide-Based Emission Rate (ng/J,lb/million Btu):	7.86E-02

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

Run Number: NS3-5
Test Site: NS-3
Test Date: 3/5/91

DATA

All data are in: 1=metric, 2=English: 2
Area of stack (ft2 or m2): 50.27
Pitot tube calibration coefficient (Cp): 0.84
Barometric pressure (in. Hg or mm Hg): 23.52
Nozzle diameter (ft or m): 0.0195
Dry stack gas molecular weight: 30.78
Initial Dry Gas Meter reading (ft3 or m3): 236.214
Final Dry Gas Meter reading (ft3 or m3): 273.6
Dry Gas Meter calibration factor (Y): 0.9891
Total run time (min): 72

DATA

Particulate weight in probe rinse (mg): 38
Particulate weight in filter catch (mg): 41.1
Particulate weight in impinger catch (mg): 11.1
Volume of Water Vapor Condensed (ml): 404
Water Vapor Collected in Silica Gel (mg): 12.3
Percent Oxygen in Stack by Volume (dry): 7.2
Percent Carbon Dioxide in Stack by Volume (dry): 15.6
Leak Rate Correction Factor Used? 1=yes, 2=no: 2

MEASURED DATA FROM TEST RUN no: NS3-5

Run Time (min)	Pitot Delta p (in H2O, mm H2O)	Orifice Delta H (in H2O, mm H2O)	Average Pressure DGM Temp (in H2O, (F,C) mm H2O)	Stack Temp (F,C)
0	0.4	0.33	99	385
3	0.55	0.45	102	396
6	0.68	0.57	102.5	399
9	0.72	0.58	103	403
12	0.76	0.62	103	406
15	0.93	0.76	102.5	400
18	0.98	0.81	103	408
21	1.1	0.9	104	411
24	0.95	0.78	104.5	409
27	0.93	0.77	105	404
30	0.9	0.74	105.5	407
33	0.8	0.65	106	409
0	0.53	0.44	104	393
3	0.62	0.5	105	405
6	0.66	0.53	106	410
9	0.74	0.61	107	414
12	1	0.82	108.5	418
15	0.99	0.81	108.5	417
18	1	0.82	108.5	414
21	1	0.82	108.5	413

24 0.93 0.74 109.5 0 410

33

0.85

0.69

110

0

401

RESULTS

Percent moisture in stack gas (%):	41.89
Wet Stack Gas Molecular Weight (Ms):	25.4
Average Stack Pressure (Ps)(in Hg,mm Hg):	23.52
Average Stack Gas Temperature (Ts)(R,K):	866
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	78.57
Actual Volumetric Flow Rate (Q)(acfm,acmm):	236993.2
Standard Volumetric Flow Rate (Qstd)(scfm,scmm,dry):	65974.9

AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr):	2.54E+01
Total Catch Pollutant Mass Rate (lbs/hr):	2.90E+01
Dry Catch Pollutant Mass Rate (g/hr):	11518.61
Total Catch Pollutant Mass Rate (g/hr):	13135.00
Dry Catch Concentration (grains/dscf,g/dscm):	4.49E-02
Total Catch Concentration (grains/dscf,g/dscm):	5.12E-02
Isokinetic Check (% I):	96.3
Oxygen-Based Emission Rate (ng/J.lb/million Btu):	1.09E-01
Carbon Dioxide-Based Emission Rate (ng/J.lb/million Btu):	8.44E-02

CALCULATION OF PARTICULATE CONCENTRATION
AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

Run Number: NS3-6
Test Site: NS-3
Test Date: 3/5/91

DATA

All data are in: 1=metric, 2=English: 2
Area of stack (ft2 or m2): 50.27
Pitot tube calibration coefficient (Cp): 0.84
Barometric pressure (in. Hg or mm Hg): 23.52
Nozzle diameter (ft or m): 0.0195
Dry stack gas molecular weight: 30.88
Initial Dry Gas Meter reading (ft3 or m3): 275.171
Final Dry Gas Meter reading (ft3 or m3): 310.804
Dry Gas Meter calibration factor (Y): 0.9891
Total run time (min): 72

DATA

Particulate weight in probe rinse (mg): 32.7
Particulate weight in filter catch (mg): 51
Particulate weight in impinger catch (mg): 13.2
Volume of Water Vapor Condensed (ml): 394
Water Vapor Collected in Silica Gel (mg): 8.2
Percent Oxygen in Stack by Volume (dry): 6.5
Percent Carbon Dioxide in Stack by Volume (dry): 16.4
Leak Rate Correction Factor Used? 1=yes, 2=no: 2

MEASURED DATA FROM TEST RUN no: NS3-6

Run Time (min)	Pitot Delta p (in H2O, mm H2O)	Orifice Delta H (in H2O, mm H2O)	Average Pressure DGM Temp (in H2O, (F,C) mm H2O)	Stack Temp (F,C)
0	0.52	0.43	101.5	0
3	0.54	0.45	102.5	0
6	0.58	0.48	103	0
9	0.67	0.55	103	0
12	0.63	0.52	103.5	0
15	0.7	0.57	102.5	0
18	0.95	0.78	101.5	0
21	0.93	0.75	101.5	0
24	0.9	0.74	101	0
27	0.84	0.68	100.5	0
30	0.78	0.63	99.5	0
33	0.75	0.61	98.5	0
0	0.47	0.39	92.5	0
3	0.55	0.45	95.5	0
6	0.68	0.55	97	0
9	0.75	0.61	98	0
12	0.85	0.69	98.5	0
15	0.95	0.78	100	0
18	0.97	0.8	101	0
21	1.02	0.82	102	0

34 0.82 0.75 103 0 404

33 0.97 0.72 104.5 0 396

RESULTS

Percent moisture in stack gas (%):	42.01
Wet Stack Gas Molecular Weight (Ms):	25.5
Average Stack Pressure (Ps)(in Hg,mm Hg):	23.52
Average Stack Gas Temperature (Ts)(R,K):	864
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	75.68
Actual Volumetric Flow Rate (Q)(acfm,acmm):	228262.4
Standard Volumetric Flow Rate (Qstd)(scfm,scmm,drv):	43596.8

AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr): 2.70E+01
 Total Catch Pollutant Mass Rate (lbs/hr): 3.12E+01
 Dry Catch Pollutant Mass Rate (g/hr): 12222.66
 Total Catch Pollutant Mass Rate (g/hr): 14150.25
 Dry Catch Concentration (grains/dscf, g/dscm): 4.94E-02
 Total Catch Concentration (grains/dscf, g/dscm): 5.72E-02
 Isokinetic Check (% I): 96.1
 Oxygen-Based Emission Rate (ng/J, lb/million Btu): 1.16E-01
 Carbon Dioxide-Based Emission Rate (ng/J, lb/million Btu): 8.97E-02

$$\begin{array}{r}
 3 \text{ Test Average} \quad 27.1 \\
 \phantom{3 \text{ Test Average}} \quad 29.0 \\
 \phantom{3 \text{ Test Average}} \quad 31.2 \\
 \hline
 \phantom{3 \text{ Test Average}} \quad 87.3 \\
 \phantom{3 \text{ Test Average}} \quad \underline{3} \\
 \phantom{3 \text{ Test Average}} \quad 29.1^{15}/_{hr}
 \end{array}$$

acfm

$$\begin{array}{r}
 217,579.2 \\
 236,993.2 \\
 228,262.4 \\
 \hline
 682,834.8 \\
 \quad \underline{3} \\
 \quad 227,612
 \end{array}$$

avg
acfm

$$\begin{array}{r}
 26.9 \\
 26.7 \\
 26.0 \\
 \hline
 79.6 \\
 \quad \underline{3} \\
 \quad 26.5^{15}/_{hr}
 \end{array}$$