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Section 5.16
Reference #19

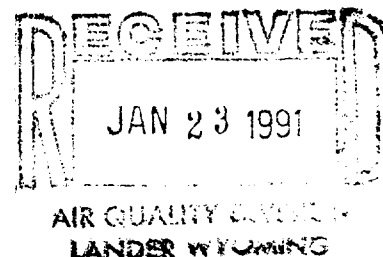
FMC Wyoming Corporation

Box 872
Green River Wyoming 82935
307 875 2580

Certified Mail No.: P 532 942 743

FMC

January 21, 1991



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

Re: Compliance test results - Permit No. MD-120

Dear Mr. Gribovicz:

Enclosed you will find the compliance test report for testwork that was performed on December 13, 1990 on the Mono Dual Ore Crusher (source Mono-11).

Particulate emissions from Mono-11 were measured at 0.55 lb/hr which is well below the 3.0 lb/hr maximum allowable for this source. The particulate emission from Mono-11 equated to 0.011 grams/dscm which is also well below the maximum allowable of 0.05 grams/dscm required by subpart 000 of the Wyoming Air Quality Standards and Regulations.

If you have any questions involving the test report, please give me a call.

Very truly yours,

Dale L. Clark

Dale L. Clark
Senior Environmental Engineer

cc: Charles Collins DEQ/AQD - Cheyenne
KN Dailey - Office
JV Corra - Office

* Summary Table I included with cover letter

FMC Wyoming Corporation
SUMMARY OF STACK SAMPLING CALCULATIONS

Stack MONO-11 (dual ore crusher)	TEST 1	TEST 2	TEST 3
Test Code Number	90-MD-8	90-MD-9	90-MD-10
Ambient Barometric Pressure, (in Hg)	23.89	23.89	23.89
Absolute stack gas pressure., (in. Hg)	23.89	23.89	23.89
Absolute average stack gas temp., (R)	524	524	524
Absolute average dry gas meter temp., (R)	530.6	559.3	561.9
Total volume of water collected, (ml)	15.3	12.4	12.8
Volume of gas through dry gas meter, (ft ³)	34.988	35.95	36.566
Average pressure drop across orifice, (in. H ₂ O)	0.881	0.893	0.926
Pitot tube coefficient	0.84	0.84	0.84
Average velocity head of stack gas, (in. H ₂ O)	0.904	0.91	0.926
Cross sectional area of stack, (ft ²)	4.909	4.909	4.909
Front half particulate collected, (gm)	0.0085	0.0091	0.0047
Back half particulate collected, (gm)	0.0013	0.002	0.0004
Total particulate collected, (gm)	0.0098	0.0111	0.0051
Total sampling time, (min)	60	60	60
Cross sectional area of nozzle, (ft ² *10 ⁻⁴)	1.767	1.767	1.767
Gas volume, (acfm)	16,753	16,851	17,148
Gas volume, (scfm)	13,530	13,609	13,849
Percent isokinetic	98.65	95.2	94.75
Emission rate, (lb/hr)	0.61	0.72	0.33
Emission rate, (grams/dscm)	0.0124	0.0144	0.0065

STACK EMISSIONS SURVEY
FMC WYOMING CORPORATION
GREEN RIVER, WYOMING

DECEMBER 1990

SOURCE MONO-11
(Dual Ore Crusher)
Permit MD - 120

Certification of Report

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

Date: January 21, 1991 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: January 21, 1991 Signature: Wesley K. Nash
Wesley K. Nash
Environmental Manager

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Introduction

Compliance tests for particulate emissions were conducted on the Mono dual ore crusher (Source Mono-11) on December 13, 1990 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
Simon Lee	Environmental Engineering Aide
Ron McNalley	Environmental Engineering Aide

Summary of Results

This section summarizes the results of the particulate emission tests performed on the Dual ore crusher (Source Mono-11). 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 Mono-11 was 0.55 lb/hr, based on the average of the three tests.

Table I

FMC Wyoming Corporation
SUMMARY OF STACK SAMPLING CALCULATIONS

Stack: MONO-11 (dual ore crusher)	TEST 1	TEST 2	TEST 3
Test Code Number	90-MD-8	90-MD-9	90-MD-10
Ambient Barometric Pressure, (in Hg)	23.89	23.89	23.89
Absolute stack gas pressure., (in. Hg)	23.89	23.89	23.89
Absolute average stack gas temp., (R)	524	524	524
Absolute average dry gas meter temp., (R)	530.6	559.3	561.9
Total volume of water collected, (ml)	15.3	12.4	12.8
Volume of gas through dry gas meter, (ft3)	34.988	35.95	36.566
Average pressure drop across orifice, (in. H2O)	0.881	0.893	0.926
Pitot tube coefficient	0.84	0.84	0.84
Average velocity head of stack gas, (in. H2O)	0.904	0.91	0.926
Cross sectional area of stack, (ft2)	4.909	4.909	4.909
Front half particulate collected, (gm)	0.0085	0.0091	0.0047
Back half particulate collected, (gm)	0.0013	0.002	0.0004
Total particulate collected, (gm)	0.0098	0.0111	0.0051
Total sampling time, (min)	60	60	60
Cross sectional area of nozzle, (ft2*10-4)	1.767	1.767	1.767
Gas volume, (acfm)	16,753	16,851	17,148
Gas volume, (scfm)	13,530	13,609	13,849
Percent isokinetic	98.65	95.2	94.75
Emission rate, (lb/hr)	0.61	0.72	0.33
Emission rate, (grams/dscm)	0.0124	0.0144	0.0065

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 deviated no more than 0.27% of the mean value. The measured flow rates (Qs) were within 1.4% of the mean value. Isokinetic sampling rates on all three tests were maintained well within the 90% to 110% allowable range.

Maximum crusher feed rate was held during Test 1 and Test 2. However, during Test 3, one of the two stockpile reclaim feeders plugged, temporarily reducing the load to the crusher. This may account for the slightly lower emission rate measured during this time.

Description of Process Operation

Trona ore (sodium sesquicarbonate) from the stockpile is fed into the hammer mill crusher by conveyor belt where the trona ore is crushed. The ore is then carried to the Mono plant by conveyor for further processing. Particulate emissions from Mono-11 are the result of ventilating stockpile feeders, conveyor belt transfer points and the crusher to control fugitive dust escape.

The exhaust gases pass through a high pressure drop wet venturi scrubber for particulate removal before emission to the atmosphere.

Sampling and Analysis Procedures

Particulate

Testing for particulate emissions was conducted on December 13 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 six points being sampled on each diameter. Sample points were determined by Reference Method 1. Each point was sampled for five minutes for a total sample time of sixty minutes.

A process equipment malfunction during the first test resulted in a shutdown of feed to the crusher. The testing was stopped at this point and resumed when feed was restored to the crusher. A delay of approximately 1 hour occurred due to the upset. The testwork was completed without further incident and the samples were returned to the FMC Environmental Department work area for recovery and analysis.

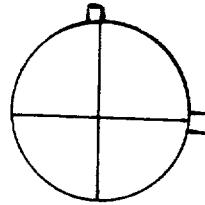
Operational parameters that were logged during the testwork can be found in the Appendix.

APPENDIX A

Location of Sample Points

FMC Wyoming Corporation
Green River Wyoming

Mono-11



B/D = 8

No. of points per traverse = 12

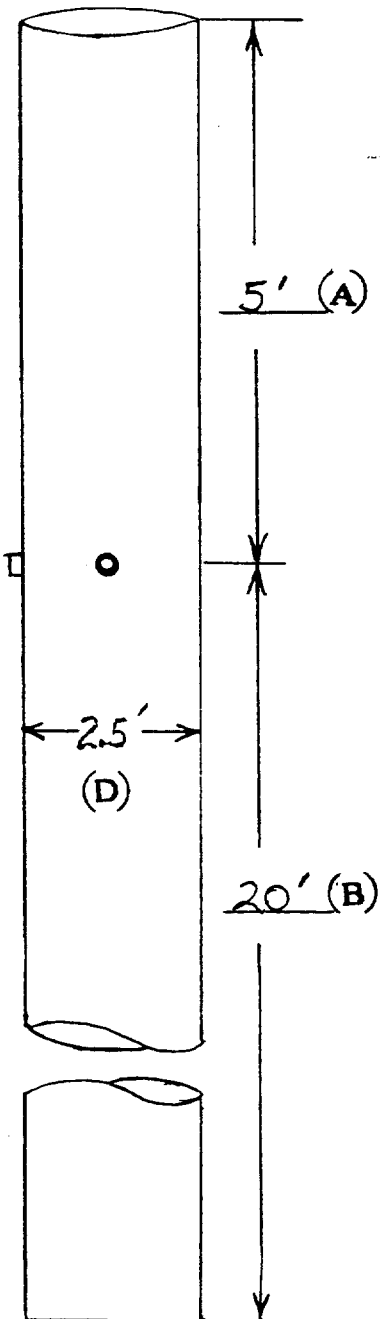
No. of points per diameter = 6

No. diameters per run = 2

Sample time per point = 5 min.

Traverse Points on Each Diameter

	% of Diameter	Distance From Inside Wall (in)	Distance From Coupling (in)
1	4.4	1.32	7.82
2	14.7	4.41	10.66
3	29.5	8.85	15.10
4	40.5	21.15	27.40
5	85.3	25.59	31.84
6	95.6	28.68	34.68
7			
8			
9			
10			
11			
12			



APPENDIX B

Source Emission Calculations

VELOCITY AND VOLUME DETERMINATION

DRY GAS VOLUME

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

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)

$$Vmstd = 17.71 \cdot 34.99 \cdot (23.89 + 0.881 / 13.6) / 530.6 = 27.975 \text{ ft}^3$$

VOLUME OF WATER VAPOR

Where Vwstd=Volume (ft3) of water vapor

Vlc=Total volume of water collected (ml)

$$Vwstd = .00474 \cdot 15.3 = 0.725 \text{ ft}^3$$

MOISTURE CONTENT

$$Bwo = Vwstd \cdot 100 / (Vwstd + Vmstd)$$

Where Bwo=Percent moisture

$$Bwo = 0.73 \cdot 100 / (0.73 + 27.97) = 2.527 \text{ percent}$$

CONCENTRATION

0

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

Where Cs'=Concentration (grains/scf)

Mn=Total particulate collected (gm)

$$Cs' = 15.43 \cdot 0.0098 / (27.97 + 0.73) = 0.0053 \text{ grains/scf}$$

STACK VELOCITY

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

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

$$Mw = 0.18 \cdot 2.53 + 0.44 \cdot 0.00 + 0.32 \cdot 20.47 + 0.28 \cdot 77.00 = 28.566 \text{ lb/mole}$$

$$V = 0.84 \cdot 85.48 \cdot 0.904 \cdot \text{SQR}(524.0 / (28.57 \cdot 23.89)) = 56.878 \text{ ft/sec}$$

STACK VOLUME

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

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)

$$ACFM = 56.88 \cdot 4.909 \cdot 60 = 16753 \text{ acfm}$$

$$SCFM = 16753 \cdot 530 \cdot 23.89 / (524.0 \cdot 29.92) = 13530 \text{ scfm}$$

CALCULATED DUST LOAD

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

$$\text{DUST LOAD} = 0.0053 \cdot 13530 \cdot 60 / 7000 = 0.61 \text{ Lb/Hr}$$

ISOKINETIC RATE

$$I = 98.64688 \%$$

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)

$$Vmstd = 17.71 * 35.95 * (23.89 + 0.893 / 13.6) / 559.3 = 27.270 \text{ ft}^3$$

VOLUME OF WATER VAPOR

Where Vwstd=Volume (ft3) of water vapor

Vlc=Total volume of water collected (ml)

$$Vwstd = .00474 * 12.4 = 0.588 \text{ ft}^3$$

MOISTURE CONTENT

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

Where Bwo=Percent moisture

$$Bwo = 0.59 * 100 / (0.59 + 27.27) = 2.110 \text{ percent}$$

CONCENTRATION

0

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

Where Cs'=Concentration (grains/scf)

Mn=Total particulate collected (gm)

$$Cs' = 15.43 * 0.0111 / (27.27 + 0.59) = 0.0061 \text{ grains/scf}$$

STACK VELOCITY

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

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

$$Mw = 0.18 * 2.11 + 0.44 * 0.00 + 0.32 * 20.56 + 0.28 * 77.33 = 28.611 \text{ lb/mole}$$

$$V = 0.84 * 85.48 * 0.910 * \text{SQR}(524.0 / (28.61 * 23.89)) = 57.210 \text{ ft/sec}$$

STACK VOLUME

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

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)

$$ACFM = 57.21 * 4.909 * 60 = 16851 \text{ acfm}$$

$$SCFM = 16851 * 530 * 23.89 / (524.0 * 29.92) = 13609 \text{ scfm}$$

CALCULATED DUST LOAD

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

$$\text{DUST LOAD} = 0.0061 * 13609 * 60 / 7000 = 0.72 \text{ Lb/Hr}$$

ISOKINETIC RATE

$$I = 95.19577 \%$$

VELOCITY AND VOLUME DETERMINATION

DRY GAS VOLUME

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

Where $Vmstd$ = Volume (ft³) of gas sample at 70°F 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)

$$Vmstd = 17.71 \cdot 36.57 \cdot (23.89 + 0.926 / 13.6) / 561.9 = 27.611 \text{ ft}^3$$

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

$$Vwstd = .00474 \cdot 12.8 = 0.607 \text{ ft}^3$$

MOISTURE CONTENT

$$Bwo = Vwstd \cdot 100 / (Vwstd + Vmstd)$$

Where Bwo = Percent moisture

$$Bwo = 0.61 \cdot 100 / (0.61 + 27.61) = 2.150 \text{ percent}$$

CONCENTRATION

0

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

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

$$Cs' = 15.43 \cdot 0.0051 / (27.61 + 0.61) = 0.0028 \text{ grains/scf}$$

STACK VELOCITY

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

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

$$Mw = 0.18 \cdot 2.15 + 0.44 \cdot 0.00 + 0.32 \cdot 20.55 + 0.28 \cdot 77.30 = 28.607 \text{ lb/mole}$$

$$V = 0.84 \cdot 85.48 \cdot 0.926 \cdot \text{SQR}(524.0 / (28.61 \cdot 23.89)) = 58.221 \text{ ft/sec}$$

STACK VOLUME

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

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)

$$ACFM = 58.22 \cdot 4.909 \cdot 60 = 17148 \text{ acfm}$$

$$SCFM = 17148 \cdot 530 \cdot 23.89 / (524.0 \cdot 29.92) = 13849 \text{ scfm}$$

CALCULATED DUST LOAD

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

$$\text{DUST LOAD} = 0.0028 \cdot 13849 \cdot 60 / 7000 = 0.33 \text{ Lb/Hr}$$

ISOKINETIC RATE

$$I = 94.75494 \%$$

APPENDIX C

Calibration of Equipment

FMC, WYOMING CORPORATION
GREEN RIVER, WYOMING

METER BOX CALIBRATION DATA AND CALCULATION FORM

DATE: 3/29/90
Pb: 23.83

METER BOX NUMBER: NAPP, D514
CALIBRATED BY: SCOT ALER

DH (IWC)	Vw (FT3)	Vd (FT3)	Tw (F)	Td (F)	DP (IWC)	TIME (MIN)	Yd	DH@	Q
0.5	6.159	6.555	73	96	-0.3	15.00	0.9777	2.016	0.324
0.5	6.177	6.495	73	93	-0.3	15.00	0.9843	2.015	0.325
1.5	6.806	7.298	73	100	-0.5	10.00	0.9738	2.185	0.537
1.5	6.815	7.230	73	94	-0.5	10.00	0.9737	2.203	0.537
3.0	10.004	10.440	73	98	-1.0	10.33	0.9909	2.168	0.764
3.0	10.001	10.490	73	100	-1.0	10.31	0.9894	2.151	0.765

AVERAGES: 0.9816 2.123

METER BOX NUMBER: Napp 7514

CALIBRATED BY: Scott Allen

DATE: 3/29/90

BAROMETRIC: 23.83

VOLUME WET TEST METER	VOLUME DRY GAS METER	DH	TEMP WET TEST METER	TEMP DRY GAS METER	DP	TIME
0 <u>6.159</u> 6.159	423.227 <u>429.782</u> 6.555	0.5	73	96 93 97 94 99 94 (96)	-0.3	15
0 <u>6.177</u> 6.177	442.359 <u>448.854</u> 6.495	0.5	73	95 88 97 89 98 90 (93)	-0.3	15
0 <u>6.806</u> 6.806	433.70 <u>440.998</u> 7.298	1.5	73	102 95 105 96 105 96 (100)	-0.5	10
0 <u>6.815</u> 6.815	462.02 <u>469.25</u> 7.230	1.5	73	95 88 99 89 100 90 (94)	-0.5	10
0 <u>10.004</u> 10.004	471.01 <u>481.45</u> 10.44	3.0	73	103 91 105 92 106 93 (98)	-1.0	10.333
0 <u>10.001</u> 10.001	481.45 <u>491.94</u> 10.49	3.0	73	104 93 107 94 108 95 (100)	-1.0	10.308

APPENDIX D

Field Testing
and
Analytical Data



STACK SAMPLING FIELD DATA

A

Company SMC WY. Corp.

Assumed Moisture % 1

Plant Location Green River, WY.

Probe Tip Diameter, in. 0.18 1.7675

Run No. 90-MD-8

Probe Length, ft. 3'

Sampling Location Monoll

Ambient Temperature, °F 21°F

Date 12-13-90

Bar. Pressure, in. Hg. 23.89

Start Time 09:47

Initial Leak Check, CFM .002 at 6 in. Hg.

Finish Time 11:56

Final Leak Check, CFM 002 at 3 in. Hg.

Meter Correction 0.9853 ^{Unit} 0-514

Orgat. %CO₂ 0.0

% O₂ 21%

Stock Area 4.909

% CO _____

[illegible]

"A"

FMC Wyoming Corporation
Emission Testing
Laboratory Data

Date: 12-13-90

Run No.: 90-MD-8

Location: Mono-11

MOISTURE COLLECTED

GM/ML

Impinger 1	Final Weight	<u>564.5</u>		
	Initial Weight	<u>532.9</u>		
		<u>31.6</u>	Increase	<u>31.6</u>
Impinger 2	Final Weight	<u>523.4</u>		
	Initial Weight	<u>549.4</u>		
		<u>-26.0</u>	Increase	<u>-26.0</u>
Impinger 3	Final Weight	<u>451.4</u>		
	Initial Weight	<u>449.8</u>		
		<u>2.6</u>	Increase	<u>2.6</u>
Impinger 4	Final Weight	<u>600.5</u>		
	Initial Weight	<u>593.4</u>		
		<u>7.1</u>	Increase	<u>7.1</u>

Total Moisture Catch 15.3

PARTICULATE COLLECTED

FRONT HALF WASH

Beaker (Gross Weight) 74.4382
Beaker (Tare Weight) 74.4304

TOTAL WASH CATCH .0078

ACETONE BLANK

Beaker (Gross Weight) 74.5711
Beaker (Tare Weight) 74.5708

TOTAL BLANK .0003

FRONT HALF ANALYSIS

(Nozzle, Probe, Cyclone, Filter)

Filter (Gross Weight) 0.5430
Filter (Tare Weight) 0.5420
Filter Catch .0010

Washings .0078
Total Catch .0088
Acetone Blank -.0003

TOTAL FRONT CATCH .0085

BACK HALF ANALYSIS

(Impingers, Filter Back-Half)

Beaker (Gross Weight) 75.5427
Beaker (Tare Weight) 75.5474

TOTAL BACK HALF CATCH .0013

TOTAL TRAIN CATCH 0.0098

"B"

% CO. _____

[illegible]

"B"

FMC Wyoming Corporation

Emission Testing

Laboratory Data

Date: 12-13-90

Run No.: 90-MD-9

Location: Mono-11

MOISTURE COLLECTED

GM/ML

Impinger 1	Final Weight	<u>507.5</u>	
	Initial Weight	<u>503.0</u>	
		<u>4.5</u>	Increase <u>4.5</u>
Impinger 2	Final Weight	<u>536.7</u>	
	Initial Weight	<u>534.4</u>	
		<u>2.3</u>	Increase <u>2.3</u>
Impinger 3	Final Weight	<u>440.4</u>	
	Initial Weight	<u>440.1</u>	
		<u>0.3</u>	Increase <u>0.3</u>
Impinger 4	Final Weight	<u>577.9</u>	
	Initial Weight	<u>572.6</u>	
		<u>5.3</u>	Increase <u>5.3</u>
Total Moisture Catch			<u>12.4</u>

PARTICULATE COLLECTED

FRONT HALF WASH

Beaker (Gross Weight) 75.2094
Beaker (Tare Weight) 75.2006

TOTAL WASH CATCH .0088

ACETONE BLANK

Beaker (Gross Weight)
Beaker (Tare Weight)

TOTAL BLANK .0003

FRONT HALF ANALYSIS

(Nozzle, Probe, Cyclone, Filter)

Filter (Gross Weight) 0.5469
Filter (Tare Weight) 0.5463
Filter Catch .0006

Washings .0088
Total Catch .0094
Acetone Blank .0003

TOTAL FRONT CATCH .0091

BACK HALF ANALYSIS

(Impingers, Filter Back-Half)

Beaker (Gross Weight) 73.9080
Beaker (Tare Weight) 73.9060

TOTAL BACK HALF CATCH .0020

TOTAL TRAIN CATCH .0111

"C"

Assumed Moisture % 7

Probe Tip Diameter, in. 0.18

Probe Length, ft. 3'

Ambient Temperature, °F 21 F

Bar. Pressure, in. Hg. 29.81

Initial Leak Check, CFM .004 at 4 in. Hg

Final Leak Check, CFM 1.00 at 4 in. Hg

$\frac{0.002}{0.002} = 1$
 $\frac{0.002}{0.002} = 1$

200

Point	Time	Dry Gas Meter FT ³	Pitot In. H ₂ O = $\sqrt{P}$	Orifice ΔH In. H ₂ O		Dry Gas Temp. °F		Pump Vacuum In. Hg	Sample Box Temp. °F	Impinger Temp. °F	Stack Press. In. Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
*												
1	0	244.889	.68	.825	.74	.74	104	100	2.0	326	30	164°F
2	5	247.7	.72	.883	.84	.84	109	101	2.1	350	29	
3	10	250.7	.81	.900	.87	.87	111	102	2.3	311	30	
4	15	253.7	.89	.943	.96	.96	110	100	2.4	308	30	
5	20	256.8	.94	.970	1.01	1.01	110	99	2.5	305	30	
6	25	260.1	.93	.964	1.00	1.00	109	98	2.5	302	29	
	30	263.3										
1	0	263.3	.71	.843	.76	.76	98	94	2.1	322	28	1
2	5	266.1	.79	.889	.85	.85	103	94	2.3	285	30	
3	10	269.1	.80	.894	.86	.86	104	94	2.3	298	30	
4	15	272.1	.99	.995	1.07	1.07	106	95	2.5	310	30	
5	20	275.4	1.05	1.025	1.13	1.13	107	95	2.8	297	29	
6	25	278.8	.95	.975	1.02	1.02	107	95	2.6	278	31	
	30	282.001										
		37.112	11.106		11.11	20.45						
		101.9°F										
TOTAL	60	365.66	.926		.926	561.9°F						
AVG.												
524°F												

FMC Wyoming Corporation

Emission Testing

Laboratory Data

Date: 12-13-90

Run No.: 90-MD-10

Location: Mono-11

MOISTURE COLLECTED

GM/ML

Impinger 1 Final Weight 551.8
Initial Weight 546.9

Increase 4.9

Impinger 2 Final Weight 534.7
Initial Weight 532.4

Increase 2.3

Impinger 3 Final Weight 435.0
Initial Weight 434.6

Increase 0.4

Impinger 4 Final Weight 613.0
Initial Weight 607.9

Increase 5.2

Total Moisture Catch 12.8

PARTICULATE COLLECTED

FRONT HALF WASH

Beaker (Gross Weight) 74.0735

Beaker (Tare Weight) 74.0699

TOTAL WASH CATCH .0036

ACETONE BLANK

Beaker (Gross Weight) _____

Beaker (Tare Weight) _____

TOTAL BLANK .0003

FRONT HALF ANALYSIS

(Nozzle, Probe, Cyclone, Filter)

Filter (Gross Weight) 0.5412

Filter (Tare Weight) 0.5395

Filter Catch .0014

Washings .0036

Total Catch .0050

Acetone Blank .0003

TOTAL FRONT CATCH .0047

BACK HALF ANALYSIS

(Impingers, Filter Back-Half)

Beaker (Gross Weight) 74.9916

Beaker (Tare Weight) 74.9912

TOTAL BACK HALF CATCH 0.0004

TOTAL TRAIN CATCH 0.0051

APPENDIX E

Operating Conditions

Summary of operating conditions

Source Mono - 11

December 13, 1990

Test #1

Scrubber Pressure Drop 18.1" W.G. (Water Manometer)
Scrubber Pressure Drop 18.3" W.G. (Recorder - .61*30)
Inlet belt motor amps 22 amps
Crusher motor amps 27 amps
Outlet belt motor amps 56 amps
Crusher feed rate 432 Tons/hour ✓

Test #2

Scrubber Pressure Drop 19.0" W.G. (Water Manometer)
Scrubber Pressure Drop 18.3" W.G. (Recorder - .61*30)
Inlet belt motor amps 23 amps
Crusher motor amps 32 amps
Outlet belt motor amps 56 amps
Crusher feed rate 432 Tons/Hour ✓

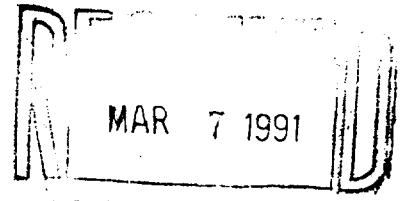
Test #3

Scrubber Pressure Drop 18.9" W.G. (Water Manometer)
Scrubber Pressure Drop 18.9" W.G. (Recorder - .63*30)
Inlet belt motor amps 22 amps
Crusher motor amps 27 amps
Outlet belt motor amps 52 amps
Crusher feed rate 432 Tons/Hour* ✓

* Rate at above conditions. Feeder problems during testing may have caused actual rate to have been slightly lower.

*Don My
File;*

MEMORANDUM



AIR QUALITY DIVISION
LANDER WYOMING

TO: FMC Wyoming Corporation Compliance File

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

FROM: Dan Olson, Compliance Officer, AQD *[Signature]*

DATE: March 6, 1991

SUBJECT: Stack Test Analysis on Mono-11, Dual Ore Crusher

On January 24, 1991, the Division received a copy of the stack test report covering a compliance test conducted on the Mono Dual Ore Crusher (Mono-11). This test was conducted by FMC personnel at the plant location near Green River, Sweetwater County, Wyoming on December 13, 1990. Three successful repetitions of Method 5 (Particulate) were conducted during the day. The feed rate to the crusher was held near maximum for the first two test runs, however the third was at a slightly reduced load due to one of the reclaim feeders being plugged for a short while.

The raw test data included with the test report were reviewed for consistency and accuracy and independent calculations were made of emission rates based on these data. The results of these calculations are given below and are included as attachments to this memo.

TESTED EMISSION RATES

	AQD	FMC	ALLOWABLE
PARTICULATE	0.474 lb/hr(front)		
	0.532 lb/hr (total)	0.55 lb/hr	3.0 lb/hr

Based on these results, the Mono Dual Ore Crusher (Mono-11) is operating in compliance with allowable mass emission limits.

[Circled]
cc: Lee Gribovicz

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

Run Number: A
Test Site: Mono-11
Test Date: 12/13/90

DATA

All data are in: 1=metric, 2=English: 2
Area of stack (ft2 or m2): 4.909
Pitot tube calibration coefficient (Cp): 0.84
Barometric pressure (in. Hg or mm Hg): 23.89
Nozzle diameter (ft or m): 0.015
Dry stack gas molecular weight: 29
Initial Dry Gas Meter reading (ft3 or m3): 172.558
Final Dry Gas Meter reading (ft3 or m3): 208.068
Dry Gas Meter calibration factor (Y): 0.9853
Total run time (min): 50

DATA

Particulate weight in probe rinse (mg): 7.5
Particulate weight in filter catch (mg): 1
Particulate weight in impinger catch (mg): 1.3
Volume of Water Vapor Condensed (ml): 8.2
Water Vapor Collected in Silica Gel (mg): 7.1
Percent Oxygen in Stack by Volume (dry): 21
Percent Carbon Dioxide in Stack by Volume (dry): 0
Leak Rate Correction Factor Used? 1=yes, 2=no: 2

MEASURED DATA FROM TEST RUN no:A

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	0.64	0.69	47.5	64
5	0.76	0.82	52	64
10	0.78	0.84	56.5	64
15	0.84	0.9	61	64
20	0.9	0.97	65.5	64
25	0.84	0.9	69.5	64
30	0.75	0.81	74	64
35	0.76	0.82	78.5	64
40	0.77	0.85	81.5	64
45	0.95	1.02	84.5	64
50	0.97	1.04	88.5	64
55	0.85	0.91	88	64

RESULTS

Percent moisture in stack gas (%):	2.52
Wet Stack Gas Molecular Weight (Ms):	29.7
Average Stack Pressure (Ps)(in Hg,mm Hg):	23.89
Average Stack Gas Temperature (Ts)(R,K):	524
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	56.80
Actual Volumetric Flow Rate (Q)(acfm,acmm):	16729.0
Standard Volumetric Flow Rate (Qstd)(scfm,scmm,dry):	13114.9
Standard Volume Metered on DGM (Vstd)(scf,scm,dry):	27.865

$$\times \frac{(4.909 \text{ ft}^3 \times \frac{60 \text{ sec}}{\text{min}})}{294.54} = 16,730 \text{ acfm}$$

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

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr):	3.29E-01
Total Catch Pollutant Mass Rate (lbs/hr):	6.10E-01
Dry Catch Pollutant Mass Rate (g/hr):	240.04
Total Catch Pollutant Mass Rate (g/hr):	276.75
Dry Catch Concentration (grains/dscf,g/dscm):	4.71E-03
Total Catch Concentration (grains/dscf,g/dscm):	6.43E-03
Isokinetic Check (% D):	98.4
Oxygen-Based Emission Rate (ng/J,lb/million Btu):	ERR
Carbon Dioxide-Based Emission Rate (ng/J,lb/million Btu):	ERR

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

Run Number: 8
Test Site: Mono-11
Test Date: 12/13/90

DATA

All data are in: 1=metric, 2=English: 2
Area of stack (ft2 or m2): 4.909
Pitot tube calibration coefficient (Cp): 0.84
Barometric pressure (in. Hg or mm Hg): 23.89
Nozzle diameter (ft or m): 0.015
Dry stack gas molecular weight: 29
Initial Dry Gas Meter reading (ft3 or m3): 208.223
Final Dry Gas Meter reading (ft3 or m3): 244.709
Dry Gas Meter calibration factor (Y): 0.9853
Total run time (min): 60

DATA

Particulate weight in probe rinse (mg): 8.3
Particulate weight in filter catch (mg): 0.6
Particulate weight in impinger catch (mg): 2
Volume of Water Vapor Condensed (ml): 7.1
Water Vapor Collected in Silica Gel (mg): 3.3
Percent Oxygen in Stack by Volume (dry): 21
Percent Carbon Dioxide in Stack by Volume (dry): 0
Leak Rate Correction Factor Used? 1=yes, 2=no: 2

MEASURED DATA FROM TEST RUN no: 8

Run Time (min)	Pitot Delta p (in H2O, mm H2O)	Orifice Delta H (in H2O, mm H2O)	Average Pressure OGM Temp (in H2O, (F,C) mm H2O)	Stack Temp (F,C)
0	0.78	0.84	89	64
5	0.81	0.87	91.5	64
10	0.82	0.88	93.5	64
15	0.87	0.94	95.5	64
20	0.9	0.97	96.5	64
25	0.8	0.86	98.5	64
30	0.73	0.79	98	64
35	0.76	0.82	102.5	64
40	0.73	0.84	105.5	64
45	0.92	0.99	107	64
50	0.9	0.97	106.5	64
55	0.87	0.94	107	64

RESULTS

Percent moisture in stack gas (Z):	2.10
Wet Stack Gas Molecular Weight (Ms):	28.8
Average Stack Pressure (Ps)(in Hg,mm Hg):	23.89
Average Stack Gas Temperature (Ts)(R,K):	524
Average Stack Velocity (Vs-avg) (ft/sec,m/sec):	57.07
Actual Volumetric Flow Rate (Q)(acfm,acmm):	16809.0
Standard Volumetric Flow Rate (Qstd)(scfm,scmm,dry):	13233.8
Standard Volume Metered on DGM (Vstd)(scf,scm,dry):	27.164

$\times 294.54 = 16,809 \text{ acfm}$

CALCULATION OF PARTICULATE CONCENTRATION

AND EMISSION RATE RESULTS WITH EPA METHOD 5 DATA

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr):	5.87E-01
Total Catch Pollutant Mass Rate (lbs/hr):	7.15E-01
Dry Catch Pollutant Mass Rate (g/hr):	266.00
Total Catch Pollutant Mass Rate (g/hr):	324.46
Dry Catch Concentration (grains/dscf,g/dscm):	5.17E-03
Total Catch Concentration (grains/dscf,g/dscm):	6.31E-03
Isokinetic Check (% I):	95.0
Oxygen-Based Emission Rate (ng/J,lb/million Btu):	ERR
Carbon Dioxide-Based Emission Rate (ng/J,lb/million Btu):	ERR

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

Run Number: C
Test Site: Mono-II
Test Date: 12/13/90

	DATA
All data are in: 1=metric, 2=English:	2
Area of stack (ft2 or m2):	4.909
Pitot tube calibration coefficient (Cp):	0.84
Barometric pressure (in. Hg or mm Hg):	23.89
Nozzle diameter (ft or m):	0.015
Dry stack gas molecular weight:	29
Initial Dry Gas Meter reading (ft3 or m3):	244.689
Final Dry Gas Meter reading (ft3 or m3):	282.001
Dry Gas Meter calibration factor (Y):	0.9853
Total run time (min):	60

	DATA
Particulate weight in probe rinse (mg):	3.3
Particulate weight in filter catch (mg):	1.4
Particulate weight in impinger catch (mg):	0.4
Volume of Water Vapor Condensed (ml):	7.6
Water Vapor Collected in Silica Gel (mg):	5.2
Percent Oxygen in Stack by Volume (dry):	21
Percent Carbon Dioxide in Stack by Volume (dry):	0
Leak Rate Correction Factor Used? 1=yes, 2=no:	2

MEASURED DATA FROM TEST RUN no:C

Run Time (min)	Pitot Delta p (in H2O, mm H2O)	Griffice Delta H (in H2O, mm H2O)	Average Pressure DGM Temp (in H2O, (F,C) mm H2O)	Stack Temp (F,C)
0	0.68	0.74	102	64
5	0.78	0.84	105	64
10	0.81	0.87	106.5	64
15	0.89	0.96	105	64
20	0.94	1.01	104.5	64
25	0.93	1	103.5	64
30	0.71	0.76	96	64
35	0.79	0.85	98.5	64
40	0.8	0.86	99	64
45	0.99	1.07	100.5	64
50	1.05	1.13	101	64
55	0.95	1.02	101	64

RESULTS

Percent moisture in stack gas (%): 2.14
Wet Stack Gas Molecular Weight (Ms): 28.8
Average Stack Pressure (Ps)(in Hg, mm Hg): 23.89
Average Stack Gas Temperature (Ts)(R, K): 524
Average Stack Velocity (Vs-avg) (ft/sec, m/sec): 58.15
Actual Volumetric Flow Rate (Q)(acfm, acmm): 17128.6
Standard Volumetric Flow Rate (Qstd)(scfm, scmm, dry): 13479.9
Standard Volume Metered on DGM (Vmetd)(scf, scm, dry): 27.504

$$294.54 = 17,178 \text{ acfm}$$

$$+ 16,809$$

$$\frac{+ 16,730}{50,667/3} = \boxed{16,889}$$

avg
acfm

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

RESULTS

Dry Catch Pollutant Mass Rate (lbs/hr): 3.05E-01
Total Catch Pollutant Mass Rate (lbs/hr): 3.31E-01
Dry Catch Pollutant Mass Rate (g/hr): 138.21
Total Catch Pollutant Mass Rate (g/hr): 149.97
Dry Catch Concentration (grains/dscf, g/dscm): 2.64E-03
Total Catch Concentration (grains/dscf, g/dscm): 2.86E-03
Isokinetic Check (% I): 94.5
Oxygen-Based Emission Rate (ng/J, lb/million Btu): ERR
Carbon Dioxide-Based Emission Rate (ng/J, lb/million Btu): ERR

Summary:

	TOTAL lb/hr	Dry lb/hr
Test A	0.61	0.529
B	0.715	0.587
C	0.331	0.35
Ave. TOTAL	0.552	0.474

FT
grain/dscf

$$\frac{0.00471 + 0.00517 + 0.00264}{3} = 0.00417 \text{ grain/dscf}$$

$$\times (0.0648 \text{ grain})$$

$$\times \left(\frac{35.31}{m^3} \right) = 0.0096 \text{ grain/dscf}$$

avg

Allowable 3.0 lb/hr.

$$\frac{2.288 \text{ grain/dscf}}{94.5} = 0.0242 \text{ grain/dscf}$$