Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

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: 11.21

Background Chapter: 4

Reference Number: 7

Title: Stack Test Report, J.R. Simplot Company, No. 300 Calciner, Pocatello, Idaho

J.R. Simplot Company

J.R. Simplot Company

May 1990

PLANT NAME: J. R. Simplot Company

LOCATION: Pocatello, Idaho, Hwy 30 W, 3 Miles North of City

SOURCE SAMPLED: #300 Calciner

TESTING COMPANY (IF OTHER THAN PLANT ENVIRONMENTAL PERSONNEL): _____

CERTIFICATION:

1. **Test Team Leader:**

I hereby certify that the test detailed in this report was accomplished in conformance with IDAPA 16.01.1010 (Rules and Regulations for the Control of Air Pollution in Idaho, Sampling and Analytical Procedures) and the procedures Manual for Air Pollution Control. The results submitted herein are accurate and true to the best of my knowledge.

NAME (print): Dennis C. Bowman

SIGNATURE: Dennis C Bowman **DATE:** 5/4/90

TITLE: Environmental Monitoring Technician

AFFILIATION: Plant Environmental <x> Outside Firm < > (see above).

2. **Test Team Report Reviewer.**

I hereby certify that I have reviewed this report and find it to be true and accurate, and in conformance with IDAPA 16.01.1010 (Rules and Regulations for the Control of Air Pollution in Idaho, Sampling and Analytical Procedures) and the Procedures Manual for Air Pollution Control to the best of my knowledge.

NAME (print): Norman F. Self

SIGNATURE: Norman Self **DATE:** 5/4/90

TITLE: Environmental Control Supervisor

AFFILIATION: Plant Environmental <x> Outside Firm < > (see above).

NO PRODUCTION
OR FEED
RATES

INTRODUCTION==========

1. If test purpose was for air permit compliance monitoring, indicate <x> and go to the next section; otherwise explain: _____

2. For the source named on cover page, give test location(s), and describe type of process. Location(s): Tests were conducted at outlet duct of Entoleter scrubber ahead of scrubber fan.

Process: Phosphate rock calcining

3. List test dates: January 13 and 14, 1990

4. List pollutants tested: Particulate and NOx

5. List EPA test methods used: 40 CFR, Part 60, Appendix A, Method 5 and Method 7.

6. Were there any deviations from the above methods? Yes < > No <x> If yes, list Appendix number where deviations are explained: _____

7. Was observer(s) present? Yes < > No <x> If yes, give name(s) and affiliation(s): _____

8. List other information as needed: _____

SUMMARY OF RESULTS==========

1. List emission results in units of standard for each location specified in INTRODUCTION, Section 1, and for each pollutant specified in Section 4.

01-13-90, Run #1 Particulate = 36.8 lb/hr
DCR 10/91 01-13-90 → 03-13-90, Run #2 Particulate = 31.1 lb/hr
01-14-90, Run #3 Particulate = 31.9 lb/hr
01-11-90, Run #1 NOx = 26.5 lb/hr
Run #2 NOx = 8.96 lb/hr
Run #3 NOx = 13.0 lb/hr
Run #4 NOx = 14.1 lb/hr

Result Totals/Averages as Applicable:
Average Particulate = 33.6 lb/hr
Average NOx = 15.6 lb/hr

2. List process data as related to compliance determination: See Appendix 4 - rock feed rate at or near design.

3. List permitted emission levels for this source:
Particulate = 47.3 lb/hr
NOx = 61.0 lb/hr

4. Visible emission summary for each source listed in Section 1 above:
Foul weather prohibited visual emission evaluation. Refer to weekly opacity observation in February and March.

5. Quality assurance procedures are listed in Appendix 6.

6. Discussion of errors:

SOURCE OPERATION==========

1. **Description of Process and Control Devices:** Ore is calcined in a Dorr Fluosolids Reactor. Calcined ore and raw ore bypassed from the pre heat compartment are ducted to the aftercooler. Cyclones from the pre heat compartment calciner and aftercooler remove particulate to an Entoleter scrubber.

2. **Process and Control Equipment Flow Diagram will be furnished with next report.**

3. **List process and control device operating parameters during test. If these parameters are out of the range of normal operating conditions, explain the difference:** See Appendix 4. Additionally, scrubber parameters monitored in the control room are: scrubber pressure drop, scrubber water flow to inner and outer cages, and scrubber fan amps.

4. **Are raw materials and products during testing the same as those during normal operations? Yes <x> No < > If No, explain the differences:** _____

5. **Were there process startups, shutdowns or other operational changes during the tests? Yes < > No <x> If Yes, explain these changes and times of start and stop:** _____

SAMPLING AND ANALYSIS PROCEDURES==========

1. Sample ports are located 4 diameters downstream, and 1 diameter upstream from the nearest disturbance. The stack diameter is 5 feet 6 inches.
2. The sampling point description is tabulated in Appendix 8.

3. The sampling train(s) is depicted in Appendix 8. Any changes or modifications to the approved description are noted.

4. Sampling procedures are as specified in 40 CFR, Chapter 1 (7-1-89), Appendix A, Method(s) 5 and 7.

Are there deviations to these procedures? Yes < > (No <x > If Yes, explain the deviations. _____

5. Analysis procedures are as specified in 40 CFR, Chapter 1 (7-1-89), Appendix A, Method(s) 5 and 7.

Are there deviations to these procedures? Yes < > No <x> If Yes, explain the deviations: _____

APPENDIX 1 - RESULTS AND EXAMPLE CALCULATIONS

300 Calcine
Run I
morning of 1/13/9

Method 5 Particulate Test
Calculation Form

I. Neccessary Data

A. Reference Method #1
- Area of stack 23.76 ft^2
- No. of equivalent diameters upstream 1
- No. of equivalent diameters downstream 4
- No. of traverse points 12
- Total test time (θ) 72 minutes

B. Reference Method #2
- Average stack temperature T_s 153 °F + 460 = 613 °R
- Stack absolute pressure 23.12 in. Hg.
- Barometric Pressure 25.55 in. Hg.
- $(\sqrt{\Delta p})_{ave}$ .575 (in. H_2O)½

C. Reference Method #3
- %CO_2 9.4 ; %O_2 10.6 ; %CO 0 ; %N_2 80

D. Reference Method #4
- Water collected
  Impinger H_2O 450 ml
  Silica Gel 55.5 gm

E. Reference Method #5
- Area of nozzle 5.9x10^{-4} ft^2
- Average ΔH 1.57 in. H_2O
- Average meter temperature T_m 70 °F + 460 = 530 °R
- Dry gas meter correction factor .993
- Volume metered V_m = 50.952 CF
- Particulate Weight .5392 gm

II. Calculations

A. Standard Volume Metered Y = Dry Gas Meter calibration factor

$$V_{m(std)} = V_m Y \frac{T_{std}}{P_{std}} \left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m} \right)$$

1.57 / 13.6

$$V_{m(std)} = (50.952 \text{ CF}) \left(\frac{528 \text{ °R}}{29.92 \text{ in. Hg}} \right) \left(\frac{25.66 \text{ in. Hg}}{530 \text{ °R}} \right) = 43.533 \text{ dscf}$$

23.193

Met not used

B. Moisture Content of Stack Gas

1. H_2O collected in impingers in standard cubic feet

$V_{wc(std)} = K\ (V_f - V_i)$

$V_{wc} = 0.04707\ ft^3/ml\ (\underline{450}\ ml) = \underline{21.815}\ scf$

2. H_2O collected in silica gel in standard cubic feet

$V_{wsg(std)} = K\ (W_f - W_i)$

$V_{wsg(std)} = 0.04715\ ft^3/gm\ (\underline{55.5}\ gm) = \underline{2.617}\ scf$

3. Moisture content of stack gas (B_{ws})

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws} = \frac{(\underline{21.815}\ scf) + (\underline{2.617}\ scf)}{(\underline{21.815}\ scf) + (\underline{2.617}\ scf) + (\underline{43.533}\ scf)} = \underline{.359}$$

C. Molecular Weight of Stack Gas (lb/lb-mole)

1. M_d (Dry molecular weight) = $\Sigma M_x B_x$

$M_d = (.44)\ \underline{9.4}\ \%CO_2 + (.32)\ \underline{10.6}\ \%O_2 +$

$(.28)\ \underline{0}\ \%CO + (.28)\ \underline{80}\ \%N_2 = \underline{29.93}$ lb/lb-mole

2. M_s (Wet Molecular Weight) = $M_d(1 - B_{ws}) + 18\ B_{ws}$

$M_s = \underline{29.93}\ (1 - \underline{.359}) + 18(\underline{.359}) = \underline{25.65}$ lb/lb-mole

D. Average Stack Gas Velocity

$$\bar{v}_s = K_p C_p \sqrt{\frac{T_s}{P_s M_s}} \left(\sqrt{\Delta p}\right)_{ave}$$

$$\bar{v}_s = 85.49\ ft/sec \left(\frac{lb/lb\text{-}mole\ (in.\ Hg)}{°R(in.H_2O)}\right)^{1/2} \underline{.76} \sqrt{\frac{(\ 613\ )°R}{(\ \ \ in.\ Hg)(\ \ \ lb/lb\text{-}mole)}}$$

23.12 25.65

$\sqrt{\underline{.575}\ (in.\ H_2O)} = \underline{39.0}$ ft/sec

E. Average Stack Gas Volumetric Flow Rate

$$Q_s = (3600\ sec/hr)(v_s)(A_s)(1 - B_{ws})\ \frac{T_{std}}{P_{std}}\ \frac{P_s}{T_s}$$

$$Q_s = (3600\ sec/hr)(\underline{38.0}\ ft/sec)(\underline{23.76}\ ft^2)(1 - \underline{.359})\ \frac{528°R}{29.92\ in.\ Hg}\ \frac{\underline{23.12}\ in.\ Hg}{\underline{613}\ °R}$$

$Q_s = \underline{1,386,725}$ dscf/hr

ACFM = 60 X 38 X 23.76 = 54,173

F. Pollutant Mass Rate

$$PMR = \frac{mass}{V_{m(std)}} \times Q_s$$

$$PMR = \frac{(.5392)\,gm}{43.533\ dscf} \times 1386.525\ dscf/hr \times \frac{1}{454\ gm/lb} = 37.8\ lb/hr$$

G. %Isokinetic Variation (Intermediate Data)

$$\%I = \frac{T_s V_{m(std)} P_{std} 100}{A_n \theta v_s P_s T_{std} 60 (1 - B_{ws})}$$

$$\% = \frac{(613\ °R)(43.533\ dscf)(29.92\ in.\ Hg)}{(5.94\ ft^2)(72\ min)(38\ ft/sec)(23.12\ in.\ Hg)(528\ °R)(60\ sec/min)(1 - .359)}$$

= 104.6 %

Probe 70.1642 x .3579 = 25.1 #/hr

Filter " x .1813 = 12.7 #/hr

300 Cal.
R-2
1/13/90

Method 5 Particulate Test
Calculation Form

I. Neccessary Data

A. Reference Method #1
- Area of stack 23.76 ft^2
- No. of equivalent diameters upstream 1
- No. of equivalent diameters downstream 4
- No. of traverse points 12
- Total test time (θ) 72 minutes

B. Reference Method #2
- Average stack temperature T_s 149 °F + 460 = 609 °R
- Stack absolute pressure 23.12 in. Hg.
- Barometric Pressure 25.55 in. Hg.
- $(\sqrt{\Delta p})_{ave}$ .599 (in. $H_2O)^{1/2}$

C. Reference Method #3
- %CO_2 9.4 ; %O_2 10.6 ; %CO 0 : %N_2 80

D. Reference Method #4
- Water collected
  Impinger H_2O 425 ml
  Silica Gel 51 gm

E. Reference Method #5 9×10^{-4}
- Area of nozzle 5.9 ft^2
- Average ΔH 1.69 in. H_2O
- Average meter temperature T_m 72 °F + 460 = 532 °R
- Dry gas meter correction factor .993.
- Volume metered V_m = 52.859 CF
- Particulate Weight .4238 gm

II. Calculations

A. Standard Volume Metered Y = Dry Gas Meter calibration factor

$$V_{m(std)} = V_m Y \frac{T_{std}}{P_{std}} \left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m} \right) \quad \frac{1.69}{13.6}$$

$$V_{m(std)} = (52.859 \text{ CF}) \left(\frac{528 °R}{29.92 \text{ in. Hg}} \right) \left(\frac{25.67 \text{ in. Hg}}{532 \text{ °R}} \right) = 45.010 \text{ dscf}$$

B. Moisture Content of Stack Gas

1. H_2O collected in impingers in standard cubic feet

$V_{wc(std)} = K\ (V_f - V_i)$

$V_{wc} = 0.04707\ ft^3/ml$ (425 ml) = 20.005 scf

2. H_2O collected in silica gel in standard cubic feet

$V_{wsg(std)} = K\ (W_f - W_i)$

$V_{wsg(std)} = 0.04715\ ft^3/gm$ (51 gm) = 2.405 scf

3. Moisture content of stack gas (B_{ws})

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws} = \frac{(20.005\ scf) + (2.405\ scf)}{(20.005\ scf) + (2.405\ scf) + (45.010\ scf)} = .332$$

C. Molecular Weight of Stack Gas (lb/lb-mole)

1. M_d (Dry molecular weight) = $\Sigma M_x B_x$

$M_d = (.44)$ 9.4 $\%CO_2 + (.32)$ 12.6 $\%O_2$ +

$(.28)$ 0 $\%CO + (.28)$ 80 $\%N_2$ = 29.93 lb/lb-mole

2. M_s (Wet Molecular Weight) = $M_d(1 - B_{ws}) + 18\ B_{ws}$

M_s = 29.93 (1 − .332) + 18(.332) = 25.97 lb/lb-mole

D. Average Stack Gas Velocity 668

$$\bar{v}_s = K_p C_p \sqrt{\frac{T_s}{P_s M_s}} \left(\sqrt{\Delta p}\right)_{ave}$$

$$\bar{v}_s = 85.49\ ft/sec \left(\frac{lb/lb\text{-}mole\ (in.\ Hg)}{°R(in.H_2O)}\right)^{1/2} .76 \sqrt{\frac{(609)°R}{(23.12\ in.\ Hg)(25.97\ lb/lb\text{-}mole)}} \sqrt{.599\ (in.\ H_2O)} = 39.2\ ft/sec$$

E. Average Stack Gas Volumetric Flow Rate

$$Q_s = (3600\ sec/hr)(v_s)(A_s)(1 - B_{ws})\ \frac{T_{std}}{P_{std}}\ \frac{P_s}{T_s}$$

$$Q_s = (3600\ sec/hr)(39.2\ ft/sec)(23.76\ ft^2)(1 - .332)\ \frac{528°R}{29.92\ in.\ Hg}\ \frac{23.12\ in.\ Hg}{609°R}$$

Q_s = 1,500,563 dscf/hr

ACFM = 23.76 x 60 x 39.2 = 55,883

F. Pollutant Mass Rate

$$PMR = \frac{mass}{V_{m(std)}} \times Q_s$$

$$PMR = \frac{(.4238)\,gm}{45.010\ dscf} \times 1{,}500{,}563\ dscf/hr \times \frac{1}{454\ gm/lb} = 31.1\ lb/hr$$

G. %Isokinetic Variation (Intermediate Data)

$$\%I = \frac{T_s V_{m(std)} P_{std} 100}{A_n \theta v_s P_s T_{std} 60 (1 - B_{ws})}$$

$$\% = \frac{(609\ °R)(45.010\ dscf)(29.92\ in.\ Hg)}{(5.94 \times 10^{-4}\ ft^2)(72\ min)(39.2\ ft/sec)(23.12\ in.\ Hg)(528\ °R)(60\ sec/min)(1 - .332)}$$

$= 100.0$

99.98

Probe = 73.433 × .2233 = 16.4 #/hr

Filter " × .2005 = 14.7 #/hr

300 Column
R-3
1/14/90

Method 5 Particulate Test
Calculation Form

I. Neccessary Data

A. Reference Method #1
- Area of stack 23.76 ft^2
- No. of equivalent diameters upstream 1
- No. of equivalent diameters downstream 4
- No. of traverse points 12
- Total test time (θ) 72 minutes

B. Reference Method #2
- Average stack temperature T_s 149 °F + 460 = 609 °R
- Stack absolute pressure 23.05 in. Hg.
- Barometric Pressure 25.49 in. Hg.
- $(\sqrt{\Delta p})_{ave}$ .599 (in. H_2O)½

C. Reference Method #3
- %CO_2 9.4 ; %O_2 10.6 ; %CO 0 ; %N_2 80

D. Reference Method #4
- Water collected
  Impinger H_2O 392 ml
  Silica Gel 30.3 gm

E. Reference Method #5
- Area of nozzle 5.9×10^{-4} ft^2
- Average ΔH 1.7 in. H_2O
- Average meter temperature T_m 56 °F + 460 = 516 °R
- Dry gas meter correction factor .993.
- Volume metered V_m = 51.445 CF
- Particulate Weight .4218 gm

II. Calculations

A. Standard Volume Metered Y = Dry Gas Meter calibration factor

$$V_{m(std)} = V_m Y \frac{T_{std}}{P_{std}} \left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m} \right) \quad \frac{1.7}{13.6}$$

$$V_{m(std)} = (51.445 \text{ CF}) \left(\frac{528 \text{ °R}}{29.92 \text{ in. Hg}} \right) \left(\frac{25.60 \text{ in. Hg}}{516 \text{ °R}} \right) = 45.041 \text{ dscf}$$

B. Moisture Content of Stack Gas

1. H_2O collected in impingers in standard cubic feet

$V_{wc(std)} = K\ (V_f - V_i)$

$V_{wc} = 0.04707\ ft^3/ml\ (\underline{392}\ ml) = \underline{18.451}\ scf$

2. H_2O collected in silica gel in standard cubic feet

$V_{wsg(std)} = K\ (W_f - W_i)$

$V_{wsg(std)} = 0.04715\ ft^3/gm\ (\underline{30.3}\ gm) = \underline{1.429}\ scf$

3. Moisture content of stack gas (B_{ws})

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws} = \frac{(\underline{18.451}\ scf) + (\underline{1.429}\ scf)}{(\underline{18.451}\ scf) + (\underline{1.429}\ scf) + (\underline{45.041}\ scf)} = \underline{.306}$$

C. Molecular Weight of Stack Gas (lb/lb-mole)

1. M_d (Dry molecular weight) = $\Sigma M_x B_x$

$M_d = (.44)\ \underline{9.4}\ \%CO_2 + (.32)\ \underline{16.6}\ \%O_2 +$

$(.28)\ \underline{0}\ \%CO + (.28)\ \underline{80}\ \%N_2 = \underline{29.93}$ lb/lb-mole

2. M_s (Wet Molecular Weight) = $M_d(1 - B_{ws}) + 18\ B_{ws}$

$M_s = \underline{29.93}\ (1 - \underline{.306}) + 18(\underline{.306}) = \underline{26.28}$ lb/lb-mole

D. Average Stack Gas Velocity

$$\bar{v}_s = K_p C_p \sqrt{\frac{T_s}{P_s M_s}} \left(\sqrt{\Delta p}\right)_{ave}$$

$$\bar{v}_s = 85.49\ ft/sec \left(\frac{lb/lb\text{-}mole\ (in.\ Hg)}{°R(in.H_2O)}\right)^{1/2} \underline{.76} \sqrt{\frac{(\cancel{23.05}\ 609)°R}{(23.05\ in.\ Hg)(26.28\ lb/lb\text{-}mole)}}$$

$$\sqrt{\underline{.599}\ (in.\ H_2O)} = \underline{39.0}\ ft/sec$$

E. Average Stack Gas Volumetric Flow Rate

$$Q_s = (3600\ sec/hr)(v_s)(A_s)(1 - B_{ws})\ \frac{T_{std}}{P_{std}}\ \frac{P_s}{T_s}$$

$$Q_s = (3600\ sec/hr)(\underline{39.0}\ ft/sec)(\underline{23.76}\ ft^2)(1 - \underline{.306})\ \frac{528°R}{29.92\ in.\ Hg}\ \frac{\underline{23.05}\ in.\ Hg}{\underline{609}\ °R}$$

$Q_s = \underline{1,546,318}$ dscf/hr

ACFm = 60 x 23.76 x 39 = 55,598

F. Pollutant Mass Rate

$$PMR = \frac{mass}{V_{m(std)}} \times Q_s$$

$$PMR = \frac{(.4218)gm}{45.041\ dscf} \times 1,516,318\ dscf/hr \times \frac{1}{454\ gm/lb} = 31.9\ lb/hr$$

G. %Isokinetic Variation (Intermediate Data)

$$\%I = \frac{T_s V_{m(std)} P_{std} 100}{A_n \theta v_s P_s T_{std} 60(1 - B_{ws})}$$

$$\% = \frac{(609\ °R)(45.041\ dscf)(29.92\ in.\ Hg)}{(5.94 \times 10^{-4}\ ft^2)(72\ min)(39.0\ ft/sec)(23.05\ in.\ Hg)(528\ °R)(60\ sec/min)(1 - .306)}$$

= 97.1 %

Probe 75.62 × .0936 = 7.1 #/h

Filter " × .3282 = 24.8 #/h

APPENDIX 2 - RAW FIELD DATA

Plant 300 Cal
Run no. ONE
Location Smith
Date 4/13/90
Operator Dennis
Sample box no.
Meter box no.
Nomograph ID no.
Orsat no. ___ Date rebuilt ___
Fyrite no. ___ Date rebuilt ___

C_p .76
$\Delta H_@$ 1.9
P_m, in. Hg
P_s, in. Hg 23.12
B_{ws} (assumed)
M_d
M_s
T_m, °R
T_s, °R
$\Delta p_{avg.}$, in. H_2O

Test start time 930
Stop time 1050
D_n calculated (in.)
D_n used (in.) .33
Ambient temp., °F
Bar. pressure, in. Hg 25.55
Heater box setting, 200
Probe heater setting, 55
Average ΔH
Leak rate @15 in. Hg Pre-test OK Post-test OK
Pitot leak check Pre OK Post OK

Point	Clock time (min)	Dry gas meter CF	Pitot in H_2O Δp	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry gas temp. °F Inlet	Dry gas temp. °F Outlet	Pump vacuum in. Hg gauge	Box temp. °F	Impinger temp. °F	Stack press. in. Hg	Stack temp. °F	Fyr %C
1	0	238.000	.37	1.7		—	—	9.0	250	50	-33	150	
2	3	239.9	.37	1.7		54	52	9.0	250	50		160	
3	6	242.2	.34	1.6		56	52	9.0	250	50		160	
4	9	244.2	.40	1.9		64	54	10.0	270	56		158	
5	12	246.5	.33	1.6		68	54	10.0	250	60		160	
6	15	248.6	.32	1.5		72	54	11.0	250	65		154	
7	18	250.7	.30	1.4		74	56	12.0	250	65		160	
8	21	252.7	.31	1.5		78	60	12.0	250	68		150	
9	24	254.8	.33	1.6		80	62	11.0	270	70		140	
10	27	257.0	.30	1.4		80	62	11.0	270	80		160	
11	30	259.1	.32	1.5		80	62	11.0	260	68		160	
12	33	261.2	.32	1.5		82	64	11.0	265	68		154	
end	36	263.391				82	64						
		25.391 ✓											
						62.5							

Point	Clock time (min)	Dry gas meter CF	Pitot in H_2O Δp	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry gas temp. °F Inlet	Dry gas temp. °F Outlet	Pump vacuum in. Hg gauge	Box temp. °F	Impinger temp. °F	Stack press. in. Hg	Stack temp. °F	Fyr %C
1	0	263.900	.34	1.6		—	—	10.0	280	54	-33	144	
2	3	265.9	.35	1.7		76	66	10.0	250	54		146	
3	6	268.1	.31	1.5		78	66	10.0	270	54		150	
4	9	270.1	.37	1.7		80	66	11.0	270	54		150	
5	12	272.4	.36	1.7		80	66	13.0	270	54		160	
6	15	274.4	.30	1.4		82	68	10.0	250	54		150	
7	18	276.6	.32	1.5		82	68	11.0	250	56		156	
8	21	278.6	.31	1.5		84	68	11.0	250	56		156	
9	24	280.8	.34	1.6		84	70	11.0	260	60		144	
10	27	283.2	.30	1.4		86	70	13.0	260	60		154	
11	30	285.1	.31	1.5		86	70	11.0	260	64		154	
12	33	287.2	.33	1.6		86	70	11.0	260	68		154	
end	36	289.461				88	72						
		25.561 ✓											
		50.952 ✓	.575	1.57 ✓		70°F ✓	530°R ✓					153°F ✓	
												613°R	

Comments: Red 105 78H Smaller Δp 28.31 1/20 inner 300 Impinger outer 250 spy 144 tbl 69

Test observers:

LOCATION: JR Simplot

TEST: METHOD 3 INTIGRATED SAMPLE

DATE: 1/13/90 Run I

TECH: JO + TR

BAROMETRIC PRESS: 25.55

SAMPLE LOCATION IN STACK PITOT TUBE

Leak Check of equipment ok

TIME	INDICATED FLOW RATE	TEMP °F. STACK	ΔP PITOT TUBE
930	.02	153 avg	.34
1050	.02		

ORSAT ANALYSIS	RUN I	RUN II	RUN III	RUN IV	RUN V
% CO_2	9.4	9.4	9.4		
% O_2	10.6 20	10.6 20	10.6 20		
% CO	0	0	0		

% N by difference 80 80 80

Md (dry molecular weight) lb/lb mole = 0.44 (% CO_2) + 0.32 (% O_2) + 0.23 (% N + % CO)

Md =

Md =

Md =

Plant 300 Cal.
Run no. Two
Location JR Sample
Date 1/13/90
Operator Dennis
Sample box no.
Meter box no.
Nomograph ID no.
Orsat no. ___ Date rebuilt 1/14/90
Fyrite no. ___ Date rebuilt ___

C_p .76
$\Delta H_@$ 1.9
P_m, in. Hg
P_s, in. Hg 23.12
B_{ws} (assumed)
M_d
M_s
T_m, °R
T_s, °R
$\Delta p_{avg.}$, in. H_2O

1st start time 120
Stop time 245
D_n calculated (in.)
D_n, used (in.) .33
Ambient temp., °F
Bar. pressure, in. Hg 25.55
Heater box setting, °F 230
Probe heater setting, °F 60
Average ΔH
Leak rate @ 15 in. Hg Pre-test @ ok Post-test ok
Pitot leak & Post @ ok

Point	Clock time (min)	Dry gas meter CF	Pitot in H_2O Δp	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry gas temp. °F Inlet	Dry gas temp. °F Outlet	Pump vacuum in. Hg gauge	Box temp. °F	Impinger temp. °F	Stack press. ~~in. Hg~~ in H_2O	Stack temp. °F	Fyr %C
1	0	290.100	.37	1.7		—	—	6.0	230	50	33	155	
2	3	292.2	.38	1.8		54	54	6.5	230	50		155	
3	6	294.3	.42	2.0		56	54	8.5	230	50		162	
4	9	296.6	.38	1.8		62	54	9.0	255	56		148	
5	12	298.9	.40	1.9		70	56	9.0	235	60		152	
6	15	301.2	.40	1.9		74	58	11.0	240	60		140	
7	18	303.5	.34	1.6		78	60	11.0	245	64		155	
8	21	305.6	.37	1.7		80	60	11.0	250	66		142	
9	24	307.8	.33	1.6		82	64	11.0	255	68		150	
10	27	310.0	.38	1.8		84	64	11.0	260	70		147	
11	30	312.2	.34	1.6		84	66	11.0	260	70		143	
12	33	314.3	.36	1.7		86	68	11.0	255	70		152	
end	36	316.659				86	68						
		26.559											

Point	Clock time (min)	Dry gas meter CF	Pitot in H_2O Δp	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry gas temp. °F Inlet	Dry gas temp. °F Outlet	Pump vacuum in. Hg gauge	Box temp. °F	Impinger temp. °F	Stack press. ~~in. Hg~~ in H_2O	Stack temp. °F	Fyri %CC
1	0	317.200	.38	1.8		—	—	8.0	255	50	33	154	
2	3	319.4	.37	1.7		76	68	8.0	255	50		145	
3	6	321.6	.40	1.9		78	68	8.0	250	52		152	
4	9	323.9	.32	1.5		80	70	9.0	250	52		136	
5	12	326.0	.37	1.7		82	70	9.0	255	52		155	
6	15	328.2	.34	1.6		84	70	9.0	260	52		150	
7	18	330.5	.39	1.8		86	70	9.0	260	52		138	
8	21	332.7	.32	1.5		86	72	9.0	255	54		160	
9	24	334.9	.28	1.3		88	72	9.0	250	52		140	
10	27	336.9	.30	1.4		86	72	9.0	255	52		149	
11	30	338.99	.32	1.5		86	72	9.0	265	52		152	
12	33	341.2	.38	1.8		86	72	9.0	270	52		136	
end	36	343.500				86	72						
		26.300	.599										
			.359										
	72 min	52.859	.599	1.69		72°F	532°R					149°F 609°R	

Comments: Rate 105 T/h Scrubber Δp 26.30 H_2O inner 300
outer 250
total 144

Test observers:

LOCATION: 300 Calciner

TEST: METHOD 3 INTIGRATED SAMPLE

Run II

DATE: 1/13/90

TECH: NS

BAROMETRIC PRESS: 25.55

SAMPLE LOCATION IN STACK PITOT TUBE

Leak Check of equipment ok

TIME	INDICATED FLOW RATE	TEMP °F. STACK	ΔP PITOT TUBE
120	.02	149	.38
245	.02	149	.38

ORSAT ANALYSIS	RUN I	RUN II	RUN III	RUN IV	RUN V
% CO_2	9.4	9.4	9.4		
% O_2	10.6 20	10.6 20	10.6 20		
% CO	0	0	0		
% N by difference	80	80	80		

Md (dry molecular weight) lb/lb mole = 0.44 (% CO_2) + 0.32 (% O_2) + 0.23 (% N + % CO)

Md =

Md =

Md =

Plant 300 Cl.
Run no. three
Location Dunglas
Date 1/10/9
Operator Bowman
Sample box no. Bauer
Meter box no. 2343
Nomograph ID no. all one
Orsat no. ___ Date rebuilt ___
Fyrite no. ___ Date rebuilt ___

C_p .76
$\Delta H_@$ 1.9
P_m, in. Hg
P_s, in. Hg 23.05
B_{ws} (assumed)
M_d
M_s
T_m, °R
T_s, °R
$\Delta p_{avg.}$, in. H_2O

1st start time 1015
Stop time 1200
D_n calculated (in.)
D_n, used (in.) .33
Ambient temp., °F
Bar. pressure, in. Hg 25.48
Heater box setting, °F 210
Probe heater setting, °F 70
Average ΔH
Leak rate @ 15 in. Hg Pre-test OK Post-test OK
Leak check Pitots OK OK OK

Point	Clock time (min)	Dry gas meter CF	Pitot in H_2O Δp	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry gas temp. °F Inlet	Dry gas temp. °F Outlet	Pump vacuum in. Hg gauge	Box temp. °F	Impinger temp. °F	Stack press. ~~in. Hg~~	Stack temp. °F	Fyrite %CO
1	0	344.000	.38	1.8		—	—	6.0	250	50	-.33	154	
2	3	346.1	.42	2.0		46	46	6.5	250	50		154	
3	6	346.3	.38	1.8		46	46	6.5	250	44		134	
4	9	350.5	.40	1.9		46	46	6.5	250	44		154	
5	12	352.7	.34	1.6		48	44	6.5	250	44		154	
6	15	354.7	.36	1.7		50	44	7.5	240	44		158	
7	18	356.9	.38	1.8		54	44	7.5	254	50		140	
8	21	358.9	.38	1.8		56	44	7.5	254	50		156	
9	24	361.0	.34	1.6		60	46	7.5	254	50		156	
10	27	363.1	.35	1.7		62	46	7.5	254	50		154	
11	30	365.3	.34	1.6		64	48	7.5	254	60		134	
12	33	367.5	.34	1.6		66	50	7.5	254	60		134	
end	36	369.495				X	X						
		25.495											

Missing Data

Point	Clock time (min)	Dry gas meter CF	Pitot in H_2O Δp	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry gas temp. °F Inlet	Dry gas temp. °F Outlet	Pump vacuum in. Hg gauge	Box temp. °F	Impinger temp. °F	Stack press. in. Hg	Stack temp. °F	Fyrite %CO
1	0	370.100	.37	1.7		—	—	7.5	250	46	.33	154	
2	3	372.2	.32	1.5		64	54	8.0	252	46		154	
3	6	374.4	.30	1.9		66	54	10.0	260	48		148	
4	9	376.6	.40	1.9		70	54	10.5	265	46		140	
5	12	378.9	.36	1.7		72	56	10.5	244	44		154	
6	15	381.1	.38	1.8		74	56	10.5	246	46		156	
7	18	383.4	.32	1.5		76	56	10.5	250	46		134	
8	21	385.5	.32	1.5		76	58	10.5	250	46		156	
9	24	387.6	.38	1.8		78	58	10.5	250	46		156	
10	27	389.8	.34	1.6		78	60	10.5	250	46		150	
11	30	391.9	.32	1.5		78	60	10.5	250	66		148	
12	33	394.0	.30	1.4		80	62	10.5	250	66		148	
end	36	396.050				80	62						
		25.950											
	72 min	51.445	.599	1.70		56°F	516°R					149°F	609°R

Comments: Rate .105 #/hr Sandbar 1/2 Cinna 300 Clayton
water 250
average 144

Test observers:

LOCATION: 300 Calcine

TEST: METHOD 3 INTIGRATED SAMPLE

DATE: 1/14/90

TECH: JO

BAROMETRIC PRESS: 25

Run III

25.48 in.

SAMPLE LOCATION IN STACK PITOT TUBE

Leak Check of equipment OK

TIME	INDICATED FLOW RATE	TEMP °F. STACK	ΔP PITOT TUBE
1015	.02	149	.70
1140	.02	149	.70

ORSAT ANALYSIS	RUN I	RUN II	RUN III	RUN IV	RUN V
% CO_2	9.4	9.4	9.4		
% O_2	10.6 20	10.6 20	10.6 20		
% CO	0	0	0		
% N by difference	80	80	80		

Md (dry molecular weight) lb/lb mole = 0.44 (% CO_2) + 0.32 (% O_2) + 0.23 (% N + % CO)

Md =

Md =

Md =

APPENDIX 3 - LABORATORY REPORT

APPENDIX 3 - LABORATORY REPORT:

Is Chain of Custody applicable? Yes < > No <x> If Yes, Chain of Custody is attached. If No, explain: Samples are handled and analyzed only by members of the test team.

SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant 300 Calciner Sample date 1/13/90 0800

Sample location Pocatello 300 Cal Stack before fan Run number 1

Sample recovery person Jno Recovery date 1/13/89

Filter(s) number .6239

MOISTURE

Impingers		Silica gel		
Final volume (wt)	650 ml (g)	Final wt	434.2 g	421.3 g
Initial volume (wt)	200 ml (g)	Initial wt	400 g	400 g
Net volume (wt)	450 ml (g)	Net wt	34.2 g	21.3 g

Total moisture 505.5 g 9/10 used 2 55.5

Color of silica gel blue / 3/4 used

Description of impinger water Clear

RECOVERED SAMPLE

Blank filter container number R-1 1/13/90 .6239 Sealed yes

Filter container number R-1 1/13/90 Sealed yes

Description of particulate on filter

Acetone rinse container number squeezy bottle Liquid level marked? measured yes ~~[illegible]~~

Acetone blank container number blank Liquid level marked? measured

Samples stored and locked N A

Remarks

Date of laboratory custody 1/13/89 11:08

Laboratory personnel taking custody Jno

Remarks

SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant 300 Calciner Sample date 1/13/90
Sample location 300 Cal stack before fan Run number 2
Sample recovery person John Oborn Recovery date 1/13/90
Filter(s) number

MOISTURE

Impingers			Silica gel		
Final volume (wt)	625 ml (g)		Final wt	412.5 g	438.5 g
Initial volume (wt)	200 ml (g)		Initial wt	400 g	400 g
Net volume (wt)	425 ml (g)		Net wt	12.5 g	38.5 g

Total moisture g

Color of silica gel 1st blue 1/4 used / 2nd 8/10 used 51 total

Description of impinger water Clear

RECOVERED SAMPLE

Blank filter container number R-2 .6217 Sealed yes
Filter container number same as above Sealed yes
Description of particulate on filter light brown

Acetone rinse container number squeez bottle Liquid level marked? measured
Acetone blank container number blank Liquid level marked? measured
Samples stored and locked N/A
Remarks with one test at a time its not necessary to store, lock or have numbers on acetone rinses.
Date of laboratory custody 1/13/90
Laboratory personnel taking custody JMO
Remarks

SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant 300 Calciner Sample date 1/14/90

Sample location #3 Cal stack cyclet before fan Run number 3

Sample recovery person John Olson Recovery date 1/14/90

Filter(s) number -6261

MOISTURE

Impingers			Silica gel		
Final volume (wt)	592 ml (g)		Final wt	419.3 g	411 g
Initial volume (wt)	200 ml (g)		Initial wt	400 g	400 g
Net volume (wt)	392 ml (g)		Net wt	19.3 g	11 g
Total moisture	g			30.3	

Color of silica gel 1st 1/2 used / 2nd 1/4 used

Description of impinger water Clear

RECOVERED SAMPLE

Blank filter container number R-3 . 6261 Sealed yes

Filter container number same as above Sealed yes

Description of particulate on filter light brown

Acetone rinse container number squeeze bottle Liquid level marked? measured

Acetone blank container number blank Liquid level marked? measured

Samples stored and locked N/A

Remarks

Date of laboratory custody 1/14/90

Laboratory personnel taking custody JRO

Remarks

55.5

APPENDIX 4 - RAW PRODUCTION DATA

APPENDIX 4 - RAW PRODUCTION DATA:

I have reviewed the attached log sheets, and I verify that these are the plant operating data, as entered by the operator, during the time of the test.

Name (print): Kevin D. Armstrong

Signature: [signature] Date: 5-4-90

Title:

APPENDIX 5 - TEST LOG

APPENDIX 5 - TEST IOG:

There is no additional information for this section.

APPENDIX 6 - CALIBRATION AND QUALITY ASSURANCE PROCEDURES/RESULTS

Table 2.1. ACTIVITY MATRIX FOR CALIBRATION OF EQUIPMENT

Apparatus	Acceptance limits	Frequency and method of measurement	Action if requirements are not met
Wet test meter	Capacity $\geq 3.4\ m^3/h$ ($120\ ft^3/h$); accuracy within ±1.0%	Calibrate initially, and then yearly by liquid displacement	Adjust until specifications are met, or return to manufacturer
Dry gas meter	$Y_i = Y \pm 0.02\ Y$	Calibrate vs wet test meter initially, and when posttest check exceeds $Y \pm 0.05\ Y$	Repair, or replace and then recalibrate
Thermometers	Impinger thermometer ±1°C (2°F); dry gas meter thermometer ±3°C (5.4°F) over range; stack temperature sensor ±1.5% of absolute temperature	Calibrate each initially as a separate component against a mercury-in-glass thermometer; then before each field trip compare each as part of the train with the mercury-in-glass thermometer	Adjust; determine a constant correction factor; or reject
Probe heating system	Capable of maintaining 120° ±14°C (248° ± 25°F) at a flow rate of 20ℓ/min ($0.71\ ft^3$/min)	Calibrate component initially by APTD-0576; if constructed by APTD-0581, or use published calibration curves	Repair, or replace and then reverify the calibration
Barometer	±2.5 mm (0.1 in.) Hg of mercury-in-glass barometer	Calibrate initially vs mercury-in-glass barometer; check before and after each field test	Adjust to agree with a certified barometer
Probe nozzle	Average of three ID measurements of nozzle; difference between high and low ≤0.1 mm (0.004 in.)	Use a micrometer to measure to nearest 0.025 mm (0.001 in.)	Recalibrate, reshape, and sharpen when nozzle becomes nicked, dented, or corroded

(continued)

PROCEDURE FOR WEIGHING FILTERS
BEFORE AND AFTER SAMPLING
(Method 5, Figure 5.5)

Status

_____ 1. Label the filter and/or the petri dish--both with the same label number; label the filter on top and bottom; check each filter visually against the light for irregularities, flaws, and pinhole leaks

_____ 2. Check the desiccator; be sure the lid is sealed tightly and the anhydrous calcium sulfate is dry; if not dry, heat the desiccant in the oven for 2 h at 180°-200°C (350° - 400°F), and let cool in the balance room before putting it back into the desiccator

_____ 3. Take off the lid of the filter container and desiccate the filter for 24 h; during desiccation, be sure that filters are widely spread, and not overlapping

_____ 4. Adjust the analytical balance to zero, and check the accuracy with a 0.500-g Class-S weights (within ±0.5 mg); use tweezers to carefully place the filter on the pan of the balance, and weigh it to the nearest 0.1 mg. The time of weighing should not be >2 min, and the relative humidity should be <50%

Very important: Desiccator should be tightly covered immediately after removing the filter to be weighed; never leave the desiccator open while weighing a sample because samples in the desiccator will be exposed to moisture in the room, which will cause gains in their weights

_____ 5. Put the filter back into the petri dish without the lid, desiccate for ≥6 h and reweigh the filter; the two recorded weights should agree to ±0.5 mg; if not, desiccate for another 6 h and reweigh until weight is constant within ±0.5 mg; keep the tare weight of the filter in file for future use

_____ 6. Be sure the filters that arrived from the field are handled and analyzed whenever possible by the same person who started the project--the person who tared the filters before sampling; use the same balance

(continued)

PROCEDURE FOR ANALYSIS OF ACETONE RINSE SAMPLES
(Method 5, Figure 5.6)

Status

I. Preparing Containers for Shipment

_____ 1. Select the appropriate size and number of bottles to be shipped to the field; include extra bottles

_____ 2. Clean the bottles and caps thoroughly with soap detergent, rinse with tap water, and then rinse at least twice with deionized distilled water

_____ 3. Rinse the clean bottles with acetone to get rid of most of the water; remember that one batch of acetone could be used for more than one container

_____ 4. Check the containers and the caps individually after they are dry to be sure no detergent or other contaminant is present; tightly cap all containers

II. Handling and Analysis of Acetone Rinse Samples

Important: Blanks and samples should have identical analytical treatments; never handle with bare hands any analysis glassware once tared; always use tongs or disposable gloves

_____ 1. Log the samples received from the field, and check each container for leakage; if the sample volume level is marked on the container, check to see if the sample still matches the level, if not, write a note of that

_____ 2. Use a dry, clean glass funnel to transfer the acetone rinse into the dry, clean 250-ml graduated cylinder

_____ 3. Record the volume of the sample to the nearest 1.0 ml, and transfer it into a dry, clean, tared (to the nearest 0.1 mg) 250- or 300-ml beaker, depending on the volume of the sample; add 50 ml to the recorded sample volume to account for the acetone rinse of all containers

(continued)

(continued)

Status

d. Be sure that both sides of the balance are closed when weighing

e. Turn all balance knobs to zero after the weighings

_____ 12. Record the weights of the samples, blanks, and empty beaker; record the date and time, each time a sample is weighed

_____ 13. Desiccate the samples, blanks, and empty beaker for $\geq$6 h; data on the first and second weighings should agree within ±0.5 mg; if not, desiccate again for 6 h and reweigh until consistent data are obtained; after the third trial, consult the supervisor

_____ 14. If there is >2 mg change in the weight of the empty beaker, note it on the analytical data form

_____ 15. Calculate the data recorded on the data forms (Figures 5.3 and 5.4) provided for this analysis

Ammo Sulfate

ANALYTICAL BALANCE CALIBRATION FORM

Balance name Sartorius Number 1

Classification of standard weights Mass S

Date	0.500 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	Analyst
2/6/90	.5000g	1.0000g	10.0000g	50.0000g	100.0000g	JMO
2/8/90	.5000g	1.0000g	10.0000g	49.99999	100.0001	[illegible]
2/12/90	.5000g	1.0000g	10.0000g	49.99999	100.0000	JMO
2/13/90	.5000g	1.0000g	10.0000g	49.99999	100.0000	JMO
2/14/90	"	"	"	"	"	JMO

Mill #2 Testing
1/15/90

ANALYTICAL BALANCE CALIBRATION FORM

Balance name Sartorius Number 1

Classification of standard weights Class S

Date	0.500 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	Analyst
12:20 PM 1/15/90	.500 g	1.0000 g	10.0000 g	49.9999 g	100.0000 g	JMO
0700 1/16/90	~~.4999~~ .5000	1.0000 g	10.0000 g	49.9998 g	100.0000 g	JMO
10:20 1/29/90	.5000	1.0000 g	10.0001	49.9999	100.0000	JMO
06:50 1/30/90	.5000 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	JMO
0940 1/31/90	.5000 g	1.0000 g	10.0000 g	49.9999 g	100.0000	JMO
0807 2/3/90	.5000 g	1.0000 g	10.0000 g	49.9998 g	100.0000	JMO

Mill #2 Testing
All 3 Runs

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 1/8/90 Ref 003 (Cal book) Thermocouple number #1

Ambient temperature 72 ~~°C~~ °F Barometric pressure 25.54 in. Hg

Calibrator JMO Reference: mercury-in-glass Astm #1 & 3

other

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
32 °F	Ice	32	32.7	-.14
200 °F	Boiling Water	202	201.3	.106
	Ice			
	Boiling Water			

[a]Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$

Quality Assurance Handbook M5-2.5

300 Cal 0041
& mill 2

Post Calibration of RAC Dry Gas Meter Sn. 1835 Mod 2343

1/15/90
Pb 25.45
temp Lab 72

Calibrated by Wet test meter #12AE-5

Leak ✓ unbilical cord at 15" Hg = OK
All three Runs at a Vacuum of 6" Hg

Run - 1

ft³	in	at	ΔH	time	ft³	Temp
414.300	84	74	1.7	0	0	67
422.205	92	78	1.7	10		67
7.905	82	76	1.7	10 mins	7.674	67

$$\Delta H_a = \frac{.05389}{25.45 \times 536}\left[\frac{527 \times 10}{7.674}\right]^2 = 1.863$$

$$Y = \frac{7.674 \times 25.45 \times 542}{7.905 \times 25.57 \times 527} = .994$$

R-2

ft³	in	at	ΔH	time	ft³	Temp
422.205	84	76	1.7	0	0	67
430.173	92	80	1.7	10		67
7.968	83	78	1.7	10	7.708	67

$$\Delta H_a = \frac{.05389}{25.45 \times 538}\left[\frac{527 \times 10}{7.708}\right]^2 = 1.84$$

$$Y = \frac{7.708 \times 25.45 \times 543}{7.968 \times 25.57 \times 527} = .992$$

R-3

430.173	84	78	1.7	0	0	67
438.088	92	82	1.7	10		67
7.915	84	80	1.7	10	7.604	67

$$\Delta H_a = \frac{.05389}{25.45 \times 540}\left[\frac{527 \times 10}{7.604}\right]^2 = 1.88$$

$$Y = \frac{7.604 \times 25.45 \times 544}{7.915 \times 25.57 \times 527} = .987$$

avg
$\Delta H_a = 1.861$
$Y = .991$

Calibration of the RAC Console (1 mill 2 Begin Ammo Salt)

Serial 1835 Mod. 2343 2/6/90

Calibrated by Wet test Meter #12AF-5

Pb 25.35
Lab temp 72°F

Leak ✓ of system at 15" Hg and all these Runs were at at Vacuum of 5" Hg

R-1

RAC ft³	Ti	Ot	ΔH	tm	WTM ft³	t
716.300	76	62	1.8	0	0	64
724.549	90	70	1.8	10	8.221	64
8.249		66-526		10 min		

$$\Delta H_a = \frac{.05706}{25.35 \times 526}\left[\frac{524 \times 10}{8.221}\right]^2 = 1.738$$

$$Y = \frac{8.221 \times 25.35 \times 534}{8.249 \times 25.48 \times 526} = 1.006$$

R-2

724.549	80	72	1.8	0	0	64
732.745	96	76	1.8	10	7.996	64
8.196	541	74-534				

$$\Delta H_a = \frac{.05706}{25.35 \times 534}\left[\frac{524 \times 10}{7.996}\right]^2 = 1.81$$

$$Y = \frac{7.996 \times 25.35 \times 541}{8.196 \times 25.48 \times 524} = 1.002$$

R-3

732.745	86	70	1.8	0	0	64
740.973	100	82	1.8	10	7.955	64
8.228	544.5	76-536				

$$\Delta H_a = \frac{.05706}{25.35 \times 536}\left[\frac{524 \times 10}{7.955}\right]^2 = 1.82$$

$$Y = \frac{7.955 \times 25.35 \times 544.5}{8.228 \times 25.48 \times 524} = .999$$

avg $\Delta H_a = 1.789$
$Y = 1.002$

Dennis

Calibration of RAC 41" Effective mill 2
Length SS Sampling Probe heating System 1/17/90

the Calibrated #7 thermocouple was placed at the Exit end of the Probe. Air Flow of .75 CFM was drawn through the Probe.

Results

Reostate Setting	Temp
44	260.6°F

Dennis

mill 2

Calibration of the Lab Barometer

1/17/90

The Barometer is Calibrated by calling the U.S. Weather Service Located 1 mile from the Lab. the Elevation at the Weather Service is 4,454 ft above Sea Level & the Lab is at the same, 4,454 ft.

Dennis

mit 2

Calibration of Tedlar Bags

1/17/80

the Bag are filled 3/4 full of air and a weight placed in each, and left overnight.

the Bags used are # 0013
0011
70

Results

All three bags hell there volume

Dennis

Calibration of RAC Dry Gas Meter inlet & outlet thermometers

1/17/90

thermometer are calibrated against an ASTM Glass thermometer.

Boiling water 202°F	ASTM 202°F
Ice Bath 32°F	ASTM 32°F

Dennis

0054

Calibration of Last Impinger thermometer

1/17/90

Calibrated by an ASTM Glass Thermometer

Boiling Water 202°F	ASTM 202°F
Ice Bath 32°F	ASTM 32°F

0055

Calibration of Differential Press Gage

mil 7

1/17/90

the Calibration of the RAC Differential Gages is not necessary because the RAC Equipment uses a Dryer Oil Gage Manometer

Dennis

Calibration of the Rotameter

mtl 2

1/17/90

Porter Inc Co.
B-250-2

Meter Setting	Flow Rate	ft³/hr
2	.015	.9
3	.22	1.32

Dennis

Calibration of the RAC mk2

Impinger Case Filter heating Compartment 1/18/90

Cal. by using thermocouple #1

setting	thermocouple temp
280	
276	225
276	225
276	223
274	223

[illegible]

(M.1/2)

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? ✓ yes _____ no

Pitot tube openings damaged? _____ yes (explain below) ✓ no

α_1 = 1 ° (<10°), α_2 = 1 ° (<10°), β_1 = 1 ° (<5°),

β_2 = 0 ° (<5°)

γ = 0 °, θ = 0 °, A = 2.82 cm (in.)

z = A sin γ = 0 cm (in.); <0.32 cm (<1/8 in.),

w = A sin θ = 0 cm (in.); <.08 cm (<1/32 in.)

P_A 1.42 cm (in.) P_b 1.42 cm (in.)

D_t = .95 cm (in.)

Comments: .84 Averaged

Calibration required? _____ yes ✓ no

Dave

APPENDIX 7 - PROJECT PARTICIPANTS AND TITLES

APPENDIX 7 - PROJECT PARTICIPANTS AND TITLES:

1. Dennis C. Bowman, Environmental Monitoring Technician.

2. John N. Oborn, Environmental Monitoring Technician.

3. Nadeen B. Myers, Environmetnal Analyst.

4. Norman F. Self, Environmental Control Supervisor.

APPENDIX 8

I. SAMPLE POINT DESCRIPTION

II. SAMPLE TRAIN DIAGRAM

III. PROCESS DIAGRAM

APPENDIX 8 - I. SAMPLING POINT DESCRIPTION:

Traverse Point	Inches Into Stack
1	.65
2	2.08
3	3.65
4	5.49
5	7.74
6	11.0
7	19.96
8	23.25
9	25.50
10	27.34
11	28.92
12	30.34

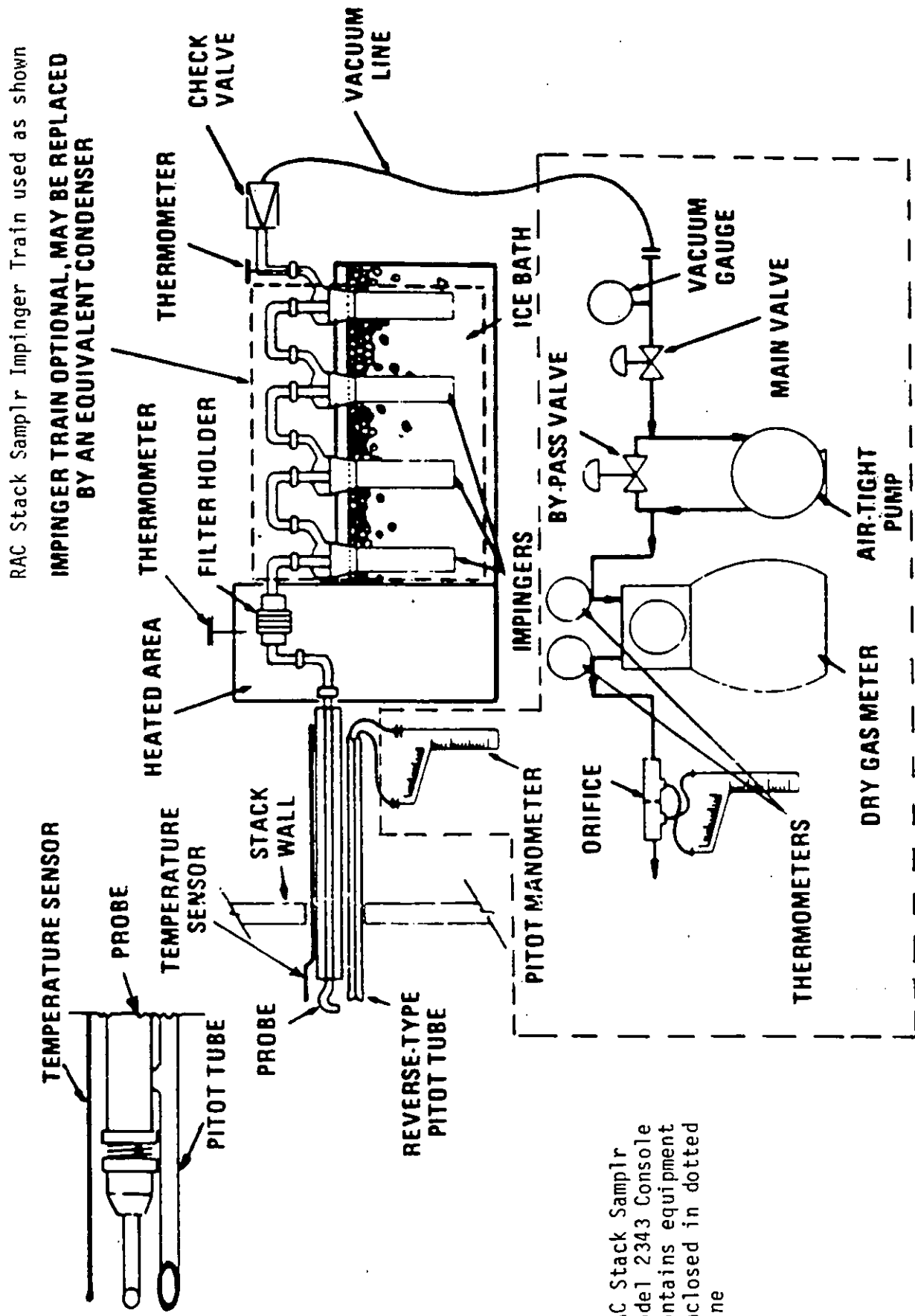

Figure 5-1. Particulate-sampling train.

II-1

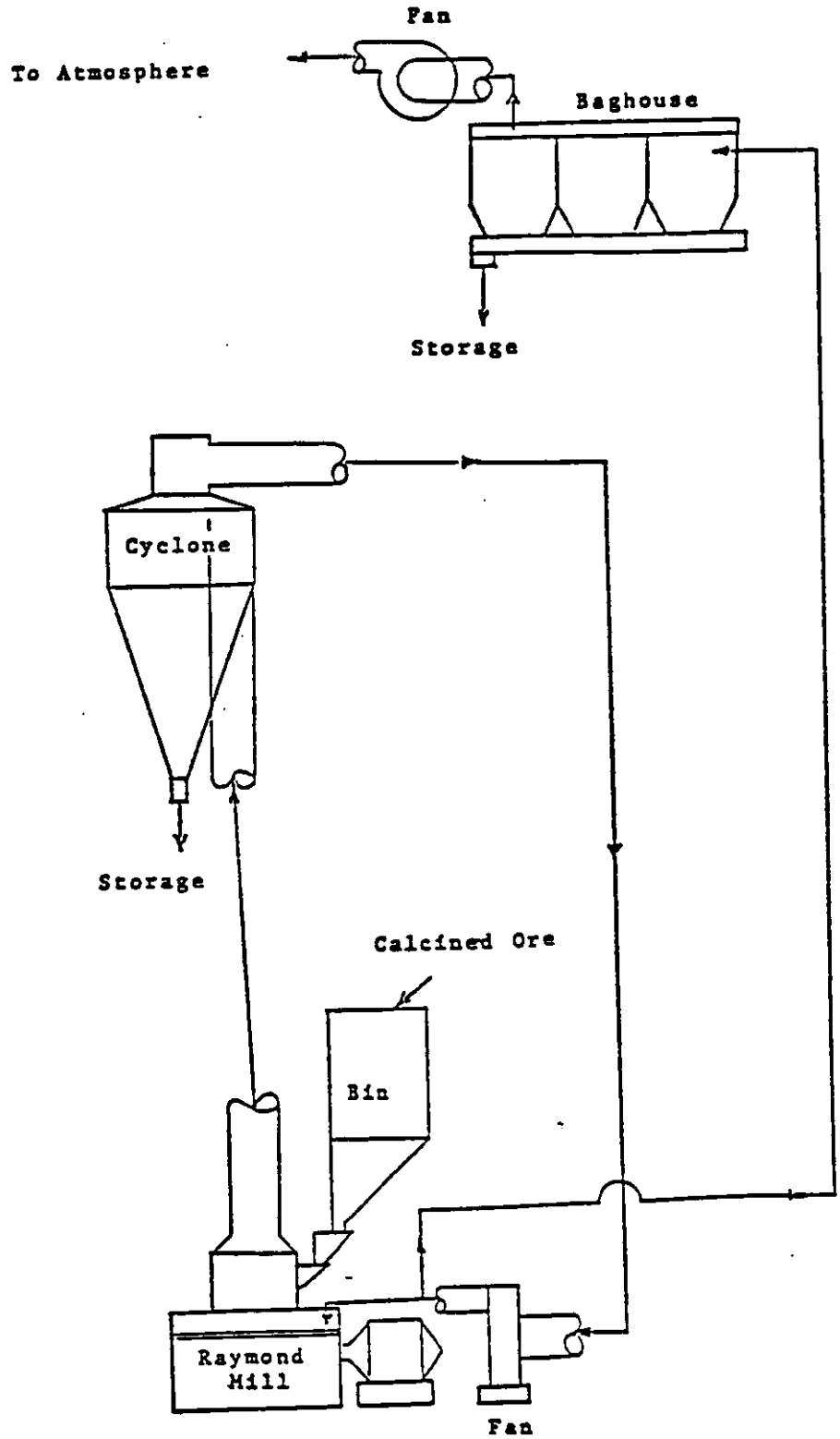

Figure 5. Phosphate ore grinding operation.

Mill Report

Simplot

ATE 2-2-90

	OPERATOR	SHIFT SUPERVISOR
Shift I	E. Dopke	
Shift II	G.Z.	
Shift III	JE Hill	

TIME	2400	0200	0400	0600	0800	1000	1200	1400	1600	1800	2000	2200	REMARKS
													one scoop load shift I
MILL BINS													
#1													
#2	19	18	15	15	10	8	3	5	10	[illegible]	15	[illegible]	10 [illegible] mill 10 small.
#4													
#5	F	F	F	F	F	F	F	F	F	F	F	F	
SILOS													
#13	35	15	9	25	22	20	23	MT	MT	MT	30	30	
#14	F	10	30	20	15	15	15	F	10	20	22	MT	Shift 3 Dumped #14 Bin
TEMPERATURES													
#1 Mill													
#2 Mill	170	160	132	94	96	102	[illegible]	227	135	140	160	163	
#2 Mill Oil	145	145	[illegible]	140	120	110	110	115	110	120	120	120	
#4 Mill													
#5 Mill	217	219	[illegible]	233	206	237	266	267	277	250	266	252	
#5 Mill Oil	140	140	140	140	85	90	90	90	90	100	90	90	
PRESSURES													
Plant Air	75	74	[illegible]	74	72	72	73	74	75	[illegible]	[illegible]	75	
Baghouse Air	100	[illegible]	[illegible]	[illegible]	100	100	[illegible]	100	100	[illegible]	100	[illegible]	
#1 Mill													
#2 Mill	22.8	22.8	[illegible]	22.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22	
#4 Mill													
#5 Mill	1.1	1.2		1.2	1.1	1.1	1.1	1.1	1.0	[illegible]	1.1	1.1	
#1 & #4 Baghouse													
#2 Baghouse	7	7	7	7	[illegible]	[illegible]	[illegible]	7.5	7.5	7.5	7.5	7.5	
#5 Baghouse	8	[illegible]	7	8	9	[illegible]	7	7.5	9	9	9	9	
AMPS													
West Elevator	15	20	15	20	[illegible]	[illegible]	25	[illegible]	25	[illegible]	[illegible]	[illegible]	
West Screw	4.2	4.1	[illegible]	4.1	[illegible]	[illegible]	[illegible]	[illegible]	6	[illegible]	6	5.5	
East Elevator	21	24	[illegible]	16	[illegible]	[illegible]	[illegible]	15	17	12	12	12	
East Screw	3.7	3.6	[illegible]	3.6	[illegible]	[illegible]	[illegible]	[illegible]	3.[illegible]	[illegible]	[illegible]	[illegible]	
South Elevator	14	15	[illegible]	14	[illegible]	[illegible]	[illegible]	[illegible]	13	13	14	14	
South Screw	4	4	4	4	[illegible]	[illegible]	[illegible]	4.1	4.5	4	4	4	
15 HP Air Slide	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
7.5 HP Air Slide													
5 HP Air Slide													
Mill Cooler Fan													
#1 Drive													
#1 Large Fan													
#1 Small Fan													
#1 Whizzer													
#1 & #4 Baghouse Fan													
#1 & #4 Baghouse Rotary Valve													
#4 Drive													
#4 Fan													
#4 Whizzer													
#2 Drive	158	151	[illegible]	157	[illegible]	[illegible]	[illegible]		130	[illegible]	[illegible]	[illegible]	
#2 Fan	54	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
#2 Whizzer	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
#2 Baghouse Fan	31	[illegible]	31	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
#2 East Rotary Valve	1.6	[illegible]	1.6	1.6	[illegible]	[illegible]	[illegible]	[illegible]	1.6	1.6	1.6	[illegible]	
#2 West Roatary Valve	.7	.7	.7	.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
#5 Drive	510	510	510	[illegible]	[illegible]	[illegible]	[illegible]	540	510	[illegible]	[illegible]	520	
#5 Fan	295	295	295	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	260	[illegible]	[illegible]	290	
#5 Baghouse Fan	30	30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28	[illegible]	28	29	
#5 Baghouse Screw	1	1.4	[illegible]	1.4	[illegible]		1.2	[illegible]	[illegible]	1.3	1.3	1.3	
#5 Baghouse Rotary Valve	1.2	1.8	1.8	1.8	[illegible]		1.7	[illegible]	1.8	[illegible]	1.3	1.3	

MILL	HOURS OPERATED	REASON FOR DOWNTIME
1		