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Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

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Air

Ammonium Sulfate

Emission Test Report Occidental Chemical Company Houston, Texas

SOURCE EMISSIONS TEST REPORT

OCCIDENTAL CHEMICAL COMPANY
Houston, Texas

AMMONIUM SULFATE DRYER BAGHOUSE EXHAUST STACK

Barry L. Jackson
Supervisor
Air Testing

Peter J. Marks
Department Manager
Laboratory Services

for: ROY F. WESTON

RFW W.O. #0300-81-04
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Prepared by:

ROY F. WESTON
ENVIRONMENTAL CONSULTANTS-DESIGNERS
Weston Way
West Chester, Pennsylvania 19380
(215) 692-3030

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SUMMARY

The Emission Measurement Branch of the U. S. Environmental Protection Agency contracted Roy F. Weston, Inc. to conduct a source testing and analysis program at Occidental Chemical Company's Houston, Texas Ammonium Sulfate Plant.

The primary objective of the testing program was to quantify the particulate emissions to the atmosphere from the Ammonium Sulfate Dryer Baghouse Stack. This objective was achieved by performing a series of three particulate tests utilizing EPA Method 5[(1)] procedures at the baghouse exhaust stack location. In addition, visual determinations of plume opacities were made simultaneously with each particulate test at the source discharge point according to EPA Method 9[(2)] protocol. Also, EPA Method 5[(3)] particulate tests were executed at the baghouse inlet site simultaneously with the exhaust stack tests to measure the potential uncontrolled emissions and to calculate particulate removal efficiencies. A singular Anderson[R] cascade impactor test was conducted at the baghouse inlet location to determine the particle size distribution of the entering particulate matter.

The particulate matter emission results are summarized below:

Ammonium Sulfate Dryer Baghouse

Test No.	Date	Test Location	Particulate Concentration Grains/DSCF	Particulate Concentration Pounds/Hour	Particulate Removal Efficiency Percent
1	9/12/78	Inlet Duct	1.01	8.36	97.2
	9/12/78	Exhaust Stack	0.028	0.24	
2	9/12/78	Inlet Duct	0.96	7.84	91.1
	9/12/78	Exhaust Stack	0.085	0.70	
3	9/13/78	Inlet Duct	3.83	31.2	97.6
	9/13/78	Exhaust Stack	0.093	0.74	

(1) Code of Federal Regulations, Title 40, Part 60, Appendix A, "Standards of Performance for New Stationary Sources," August 18, 1977.

(2) Federal Register, Vol. 39, No. 219, November 12, 1974.

(3) Op. Cit.

No visible emissions were observed emanating from the baghouse exhaust stack during the test program by the certified observer.

Figure 6 illustrates the particle size distribution of the particulate matter at the baghouse inlet location.

Detailed summaries of test data and test results are presented in Tables 1 through 4 of this report.

INTRODUCTION

The Emission Measurement Branch of the U. S. Environmental Protection Agency contracted Roy F. Weston, Inc. to conduct a source testing and analysis program at Occidental Chemical Company's Houston, Texas Ammonium Sulfate Plant. The objective of the testing program was to measure various emission parameters from Oxychem's Ammonium Sulfate Dryer.

The location tested, plus the number and types of tests performed at each site are listed below:

1. Ammonium Sulfate Dryer Baghouse Inlet Duct.
    a. Three particulate tests by EPA Method 5.
    b. One particle size distribution test by cascade impaction (Anderson^R).
2. Ammonium Sulfate Dryer Baghouse Exhaust Stack.
    a. Three particulate tests by EPA Method 5. Each particulate test was performed simultaneously with one of the inlet duct tests.
    b. Three opacity tests by EPA Method 9. Visual determinations of plume opacities determined concurrently with the particulate tests.

All tests were conducted during the period 12-13 September 1978 by Weston personnel and were observed by Mr. Dennis P. Holzschuh, EPA Technical Manager.

Test data and test results are presented in Tables 1 through 4 of this report. Particle size distribution results are shown in Figure 6. Also incorporated herein is a description of the test locations, test equipment, test procedures, sample recovery, and analytical methods used during the test program. Raw test data, laboratory reports, sample calculations, equipment calibration data, baghouse details, and a list of project participants are provided in Appendices A through F, respectively.

III. PROCESS DESCRIPTION AND OPERATION

The Occidental Chemical plant produces ammonium sulfate (AS) from ammonia and sulfuric acid. All of the AS produced is sold for use as a fertilizer. The plant did not operate continuously during 1978 due to problems with sulfuric acid supply and cyclical market conditions for AS.

A. Process Description

Sulfuric acid and ammonia are combined in a crystallizer or saturator. The reaction in the saturator to form the AS occurs with much evolution of heat. The reaction takes place in a medium of "mother liquor" which is a dilute solution of AS. As the reaction proceeds and the concentration of AS in the mother liquor increases, the solution becomes supersaturated, and the AS begins to precipitate in the form of crystals. The crystals grow to about 1/8" diameter maximum and leave the saturator through bottom feed lines to centrifuges. A slight vacuum (11.0 psia) is maintained on the saturator to aid evaporation.

At the centrifuges, the crystals are separated from the mother liquor and are discharged as wet crystals onto a conveyor belt leading to the dryer. The mother liquor goes back to storage. The wet crystals contain about 2 to 3 percent moisture at this point.

The dryer installed at this plant is a natural gas, direct-fired rotary drum unit. The water content of the AS is reduced to a range of about 0.3 percent to 0.5 percent. Some drying of AS also occurs on the lengthy conveyor belt feeding the dryer. From the dryer the AS passes to a screening operation where "granular" and "coarse" products are separated.

The baghouse is a Carter Day unit Model No. 24RV60 containing 320 square feet of dacron felt cloth. It employs a periodic reverse jet of filtered air to clean the bags. The AS collected drops into a conical bottom in the housing and is pumped back to the mother liquor tank after reslurrying. The bags in the baghouse had been replaced during the week of September 4, prior to the test.

A schematic diagram of the dryer and baghouse is presented in Figure 1.

B. Process Operation

The purpose of the test program was to measure emission levels from the Occidental Chemical baghouse controlling the dryer. Process conditions were carefully observed and testing was performed only during periods when the plant was operating normally. During the tests, pertinent operating conditions were monitored and recorded on process data sheets. This data is summarized in Tables I-IV of Appendix B.

The plant was operating over 90 percent of its design capacity during each of the three emission tests which were conducted. No calibrated weigh belts were used at this plant. The production rate was determined most accurately by a digital sulfuric acid flow meter which registered the total acid withdrawn from storage for a 24-hour period. The plant reported to be operating with 94 - 95 percent H_2SO_4.

The temperature of the exit gases from the dryer were read off a strip chart in the control room. Temperatures of this strip chart were slightly lower than those measured by the test team at the baghouse inlet. The temperature and the centrifuge motor drive amperage were monitored during the emission tests to establish the steady state operation of the dryer throughput rate. Other process parameters monitored are included in Appendix B. Tables I-IV.

The following parameters were monitored during the tests to verify that the dryer was operating normally.

1. Acid flow rate and totalizer amount.
2. Ammonia flow rate.
3. Dryer outlet gas temperature.
4. Centrifuge amperes.
5. Temperature of the vapor leaving the saturator.
6. Liquid level in the saturator (inverse reading).
7. Liquid level in the mother liquor tank.
8. Neutral point titration (ml of 0.1N NaOH).
9. Percent solids in the magma.

The raw data sheets for these parameters are included in [illegible] Tables I - IV.

Process monitoring for test No. 1 began at 9:50 a.m. on September 12, 1978, and continued until 12:35 p.m. The centrifuges were shut down for 20 minutes for water flushing of the centrifuge inlet lines. The AS production ceased during this period but the acid and ammonia feed to the saturator continued. Since the production rate obviously affected emissions, the test team was advised immediately when the production stopped. Emission sampling was stopped for the 20 minute period and resumed after a short period to allow buildup of AS in the dryer.

Monitoring for test No. 2 began at 1:40 p.m. on September 12, 1978, and concluded at 4:20 p.m. Test No. 3 process monitoring began at 9:15 a.m. on September 13, 1978, and concluded at 1:00 p.m. As with the first test, the emission sampling was suspended during centrifuge servicing.

OCCIDENTAL CHEMICAL COMPANY

Houston, Texas

FIGURE 1

AMMONIUM SULFATE DRYER AND BAGHOUSE

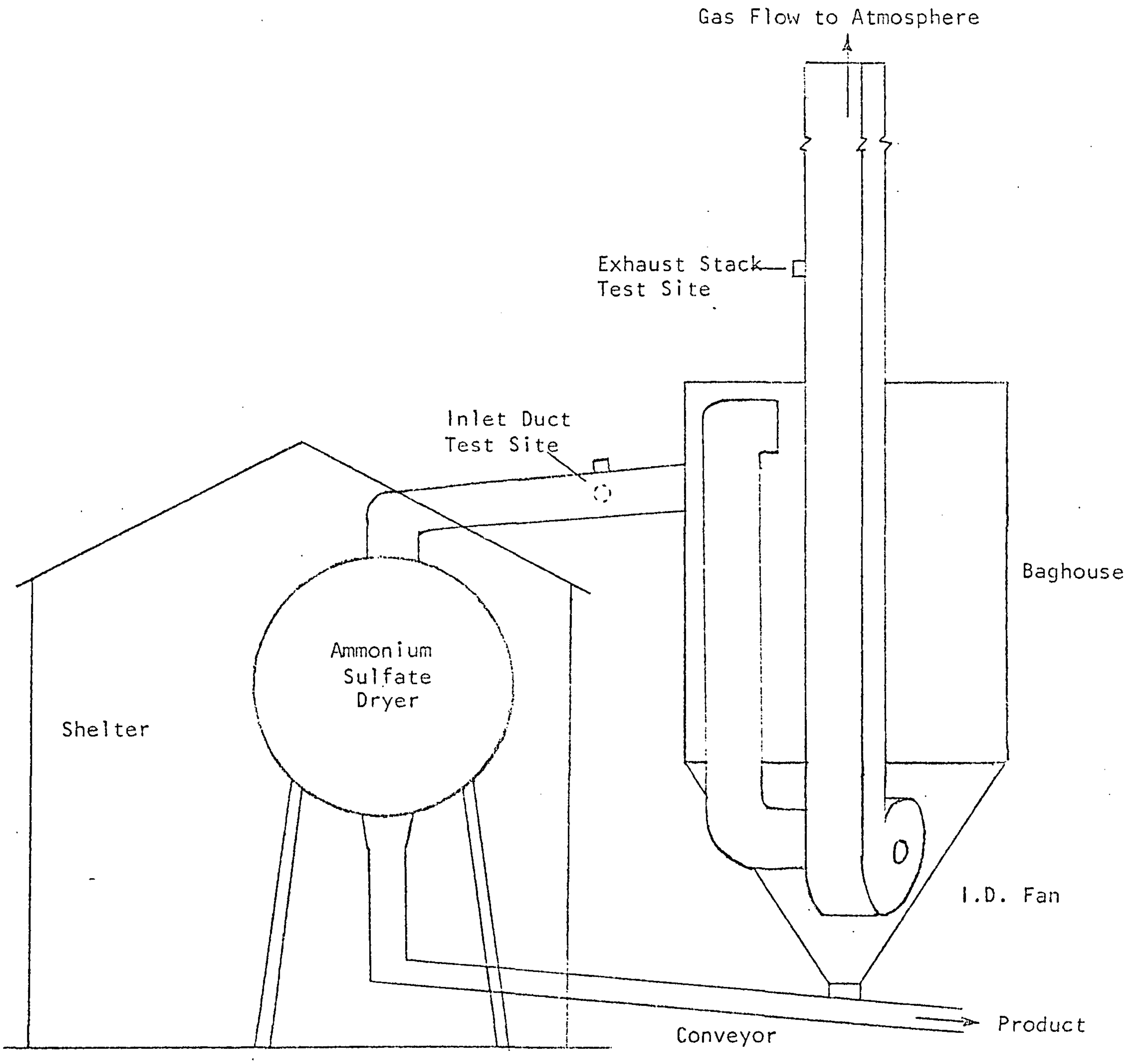

TABLE I

SUMMARY OF AS PRODUCTION RATE DATA

Test No. 1	1	2	3
Average indicated acid rate, gpm	31.67	31.8	34.
Standard Deviation, gpm	.38	Small	Small
Equivalent AS production rate, Tons/hr, based on indicated acid rate	19.1	17.6	19.4
Acid rate from totalizer, gpm	28.8	29.0	34.1
Equivalent AS production rate, Tons/hr, based on acid totalizer rate	17.4	16.4	20.6
Ammonia Rate, lb/hr (average readout, temperature corrected)	8400	8402	8438
Standard Deviation, lbs/hr	141	Small	Small
Equivalent AS production rate, Tons/hr, based on ammonia rate	16.3	16.3	16.4
AS product conveyor sample rate, $\frac{\text{lbs}}{\text{lin. ft.}}$	4.32	3.90	3.81
Equivalent AS production rate, Tons/hr, based on AS product conveyor rate	18.7	16.9	16.6

TABLE II

ADDITIONAL PROCESS PARAMETERS MONITORED DURING TEST NO. 1

Elapsed Time, min.	0	30	60	90	120	140
Saturator Vapor Temp, ^{o}F	182	182	182	182	181	182
Dryer Exit Air Temp, ^{o}F	135	--	135	–	135	135
Percent Solids in the magma	70		70		74	72
Neutral Point Titration, ml 0.1N NaOH	8.0		6.0		8.2	12.0
Centrifuge Current, Amperes						
Unit #2	20		18		18	18
Unit #3	18		23		25	25

TABLE III

ADDITIONAL PROCESS PARAMETERS MONITORED DURING TEST NO. 2

Elapsed Time, min.	0	30	60	90	120	150
Saturator Vapor Temp, °F	182	183	183	183	183	183
Dryer Exit Air Temp, °F	136	--	136	--	138	136
Percent Solids in magma	71	71	70	72	71	71
Neutral Point Titration, ml 0.1N NaOH	7.8	7.8	7.8	7.8	7.8	7.8
Centrifuge Current, Amperes						
Unit #2	20	20	20	18	18	18
Unit #3	23	23	23	22	22	23

TABLE IV

ADDITIONAL PROCESS PARAMETERS MONITORED DURING TEST NO. 3

Elapsed Time, min.	0	30	60	90	120	150
Saturator Vapor Temp, ^{o}F	182	182	182	182	182	183
Dryer Exit Air Temp, ^{o}F	136	–	135	–	136	138
Percent Solids in magma	71	71	70	70	71	71
Neutral Point Titration, ml 0.1N NaOH	7.8	10.0	–	4.8	6.8	7.8
Centrifuge Current, Amperes						
Unit #2	20	21	23	0*	0	18
Unit #3	22	25	25	25	25	0*

*Shutdown – Unit No. 1 operating but ammeter was defective

[redacted] TOTAL ... TONS [redacted]

	Flow %					Temp.			Misc.			Levels		Control Analysis					Tyler Screen Analysis							
	Min. Oper. Last Hr.	Hrs. Cent.	NH_3 PPH	H_2SO_4 GPM	Mother Liquid %	Liquid NH_3 PSI	Saturator	Dryer	Mother Liquid	Vapor Line Temp.	NH_3 Line Temp.	Steam Line Temp.	Saturator	Mother Liquid	Saturator SP. GR.	Mother Liq. SP. GR.	Saturator % H_2SO_4	Mother Liq. % H_2SO_4	Crystal % Saturator	%8	%10	%12	%14	%16	%18	%20	%28
am	60	60	7.8	22.30	Ditto	40	[illegible]	135	138	114	58	174	6'1"	38	1272	1132	.400	.210	71	[illegible]	3	11	31	13	—	9	17
am	60.	40	7.8	22.30	"	40	212	[illegible]	140	114	57	[illegible]	5'10"	40	1272	1134	[illegible]	[illegible]	71								
am	60	60	7.8	22.30	"	40	214	[illegible]	[illegible]	114	57	182	6'3"	45	1272	1132	.680	[illegible]	70	1	4	20	22	9	—	12	2[illegible]
am	60	60	7.8	22.30	"	40	[illegible]	[illegible]	[illegible]	114	58	184	[illegible]	40	1272	1128	[illegible]	[illegible]	70								
am	60	60	7.8	22.30	"	40	[illegible]	[illegible]	136	115	58	182	6'1"	42	1272	1128	.450	—	69	2	7	[illegible]	12	9	—	18	[illegible]
N	[illegible]	30	7.8		"	40	214	135	[illegible]	115	[illegible]	[illegible]	[illegible]	42	1272	[illegible]	.375	←	70								
pm	60	60	7.8		"	40	[illegible]	136	15[illegible]	116	[illegible]	184	[illegible]	46	[illegible]	1130	.300	[illegible]	[illegible]	1	14	15	13	14	—	18	12
pm	60	60	7.8	22.30	"	40	214	135	152	116	69	184	6'3"	48	1270	1144	.310	.050	70								
pm	60	60	7.8	22.30	"	40	[illegible]	136	152	116	69	185	6'6"	50	1270	1142	.375	.075	70	1	15	11	15	15	—	17	14
pm	60	40	[illegible]	22.30	"	40	215	138	150	116	62	185	6'4"	52	1270	1140	.375	.100	70								
pm	60	60	[illegible]	[illegible]	"	40	216	136	148	116	64	181	6'[illegible]	[illegible]	[illegible]	[illegible]	.400	.115	71	1	15	13	16	14	—	16	13
pm	60	60	[illegible]	[illegible]	"	40	215	[illegible]	148	[illegible]	[illegible]	185	6'9"	[illegible]	[illegible]	[illegible]	.550	[illegible]	75								
pm	60	60	7.8	[illegible]	"	40	219	136	152	116	[illegible]	185	6'8"	5[illegible]	1270	1142	[illegible]	.100	70	1	13	15	18	11	—	14	13
pm	60	40	7.8	[illegible]	"	40	[illegible]	135	150	116	66	185	6'6"	40	1272	1140	.350	[illegible]	71								
pm	60	45	7.8	[illegible]	"	40	216	135	148	[illegible]	56	184	60"	40	[illegible]	1140	[illegible]	.110	75	1	12	10	16	11.	—	10	1[illegible]
am	60	60	[illegible]	[illegible]	"	40	218	139	152	116	56	[illegible]	[illegible]	40	1272	[illegible]	[illegible]	.125	74								
pm	60	40	[illegible]	[illegible]	"	40	[illegible]	[illegible]	150	[illegible]	[illegible]	[illegible]	60"	40	[illegible]	[illegible]	[illegible]	.115	74	1	12	15	15	11	—	15	17
MN	60	60	7.8	[illegible]	"	40	[illegible]	135	146	116	[illegible]	186	[illegible]	40	[illegible]	1146	.345	[illegible]	72								
am	60	0	7.8	22.30	"	[illegible]	[illegible]	[illegible]	122	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	12	12	14	12	—	17	2[illegible]
am	[illegible]	[illegible]	7.8	[illegible]	"	40	214	[illegible]	139	116	59	[illegible]	[illegible]	[illegible]	1272	1132	[illegible]	.100	[illegible]								
am	[illegible]	[illegible]	[illegible]	[illegible]	"	[illegible]	[illegible]	[illegible]	[illegible]	116	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.410	[illegible]	72	2	12	12	13	13	—	20	14
am	60	60	7.8	[illegible]	"	40	[illegible]	135	136	116	58	186	[illegible]	40	1272	1128	.420	.120	72								
am	[illegible]	60	[illegible]	[illegible]	"	[illegible]	[illegible]	[illegible]	[illegible]	116	59	[illegible]	[illegible]	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	12	12	13	16	—	17	1[illegible]
am	[illegible]	60	[illegible]	[illegible]		40	[illegible]	[illegible]	15[illegible]	116	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.100	72								
am																											

1st. SHIFT - Tons 137.9

Operator

Gaston

[illegible]-Garza

2nd. SHIFT - Tons 140.6

Operator

1. Garza

2. H. Wallace

3rd. SHIFT - Tons

Operator

1. [illegible] Gaston

2. D. [illegible]

Spent Acid Tank Lev[el]

East	Time

APPENDIX A

Dryer	Mother Liquid	Vapor Line Temp.	NH_3 Line Temp.	Steam Line Temp.	Saturator	Mother Liquid	Saturator SP. GR.	Mother Liq. SP. GR.	Saturator % H_2SO_4	Mother Liq. % H_2SO_4	Crystal % Saturator	% 8-	% 10-	% 12-	% 14-	% 16-	% 18-	% 20-	% 28	% Fine	NH_3 Liq. Line Pres %	Acid Tank Level	REMARKS
[illegible]	[illegible]	114	[illegible]	174	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	71	[illegible]	3	11	31	13	[illegible]	9	17	14	134	86	[illegible] Clean Screen
[illegible]	[illegible]	[illegible]	57	[illegible]	5'10"	40	[illegible]	1124	.110	[illegible]	71										137	[illegible]	Noon M
[illegible]	[illegible]	114	[illegible]	184	5'7"	[illegible]	[illegible]	[illegible]	.680	...	76	1	4	20	22	9	–	12	21	12	136	80	
[illegible]	[illegible]	[illegible]	[illegible]	184	[illegible]	40	[illegible]	1124	[illegible]	...	[illegible]						[illegible]				134	[illegible]	11:25
[illegible]	136	[illegible]	[illegible]	[illegible]	[illegible]	42	1272	[illegible]	[illegible]	—	69	[illegible]	7	[illegible]	12	8	—	18	[illegible]	11	138	79	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1272	[illegible]	[illegible]	—	70						[illegible]				171	[illegible]	3:00 A.M.
[illegible]	35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1130	[illegible]	[illegible]	73	1	14	15	13	14	—	18	12	8	146	[illegible]	[illegible]
135	152	116	62	147	6'2"	48	1270	1142	.320	.050	70						[illegible]				144	74	[illegible]
[illegible]	[illegible]	116	[illegible]	[illegible]	6'6"	50	1370	1142	.315	.075	70	1	15	11	15	15	—	17	14	11	138	72	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6'4"	[illegible]	[illegible]	1146	.31	.100	70						[illegible]				[illegible]	[illegible]	[illegible]
[illegible]	146	[illegible]	[illegible]	135	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.115	71	1	15	13	16	14	—	16	13	11	143	[illegible]	
[illegible]	170	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.550	[illegible]	73						[illegible]				150	88	
156	152	[illegible]	[illegible]	145	6'6"	[illegible]	1272	1142	[illegible]	.100	70	1	13	15	18	11	—	14	15	12	133	93	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	1272	1142	.330	[illegible]	71						[illegible]				140	93	
[illegible]	[illegible]		[illegible]	[illegible]	6'0"	[illegible]	[illegible]	1142	[illegible]	.110	75	1	12	14	16	11	—	14	17	14	145	70	
[illegible]	[illegible]	116	[illegible]	[illegible]		40	[illegible]	[illegible]	[illegible]	.125	[illegible]										[illegible]	[illegible]	
[illegible]	150	[illegible]	[illegible]	[illegible]	6'8"	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	12	15	15	11	—	15	19	12	[illegible]	[illegible]	
135	[illegible]	116	[illegible]	[illegible]	[illegible]	40	[illegible]	1142	.395	[illegible]	72										130	[illegible]	
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		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	72	[illegible]	12	12	13	13	—	20	16	12	[illegible]	72	
[illegible]	[illegible]	116	[illegible]	[illegible]	[illegible]	40	[illegible]	[illegible]	[illegible]	[illegible]	70										[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12	13	16	—	14	[illegible]	12	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.100	[illegible]										142	73	

. SHIFT - Tons 149.6

[illegible]tor

1. [illegible]

2. [illegible]

3rd. SHIFT - Tons

Operator

1. [illegible]

2. [illegible]

Spent Acid Tank Levels

East	Time	West

Inventories & Transfers

H_2SO_4 7 am ______ Begin

H_2SO_4 7 am ______ End

Transferred

Start-Time ______ ______

F.T. ______ ______

Finish-Time ______ ______

F.T. ______ ______

NH_3 Totalizer

Begin ______

End ______

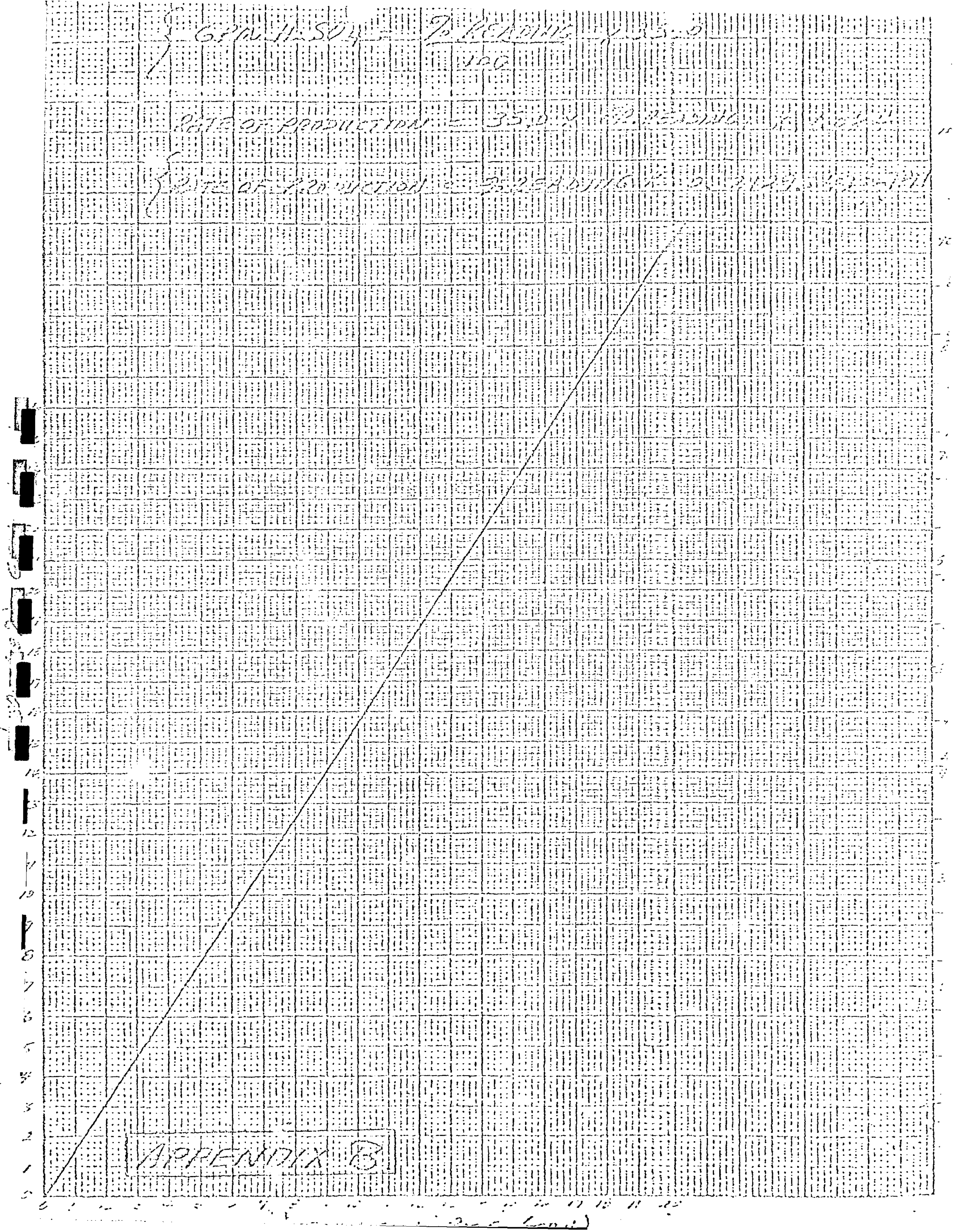
H_2SO_4 Totalizer

Begin ______ gal

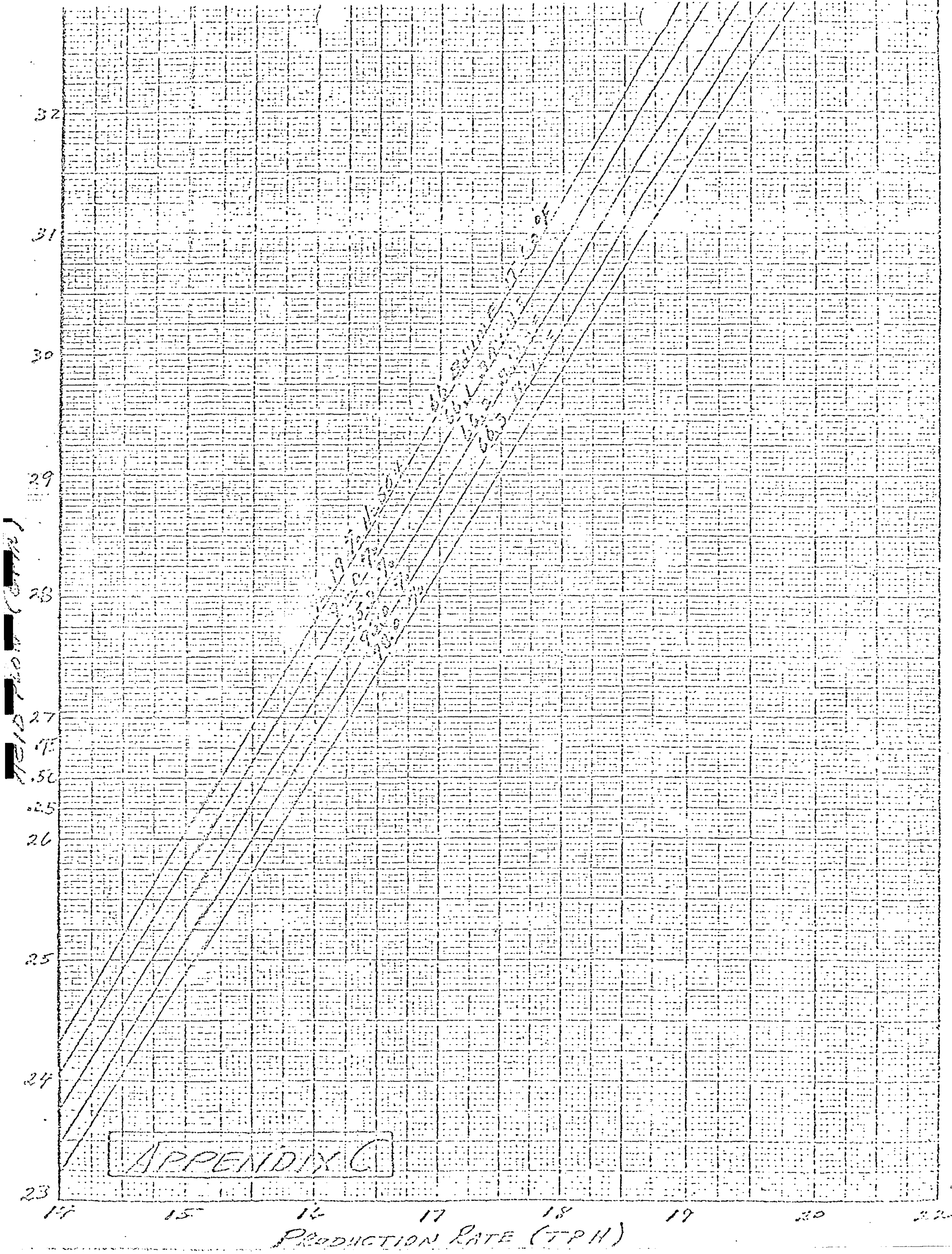
End ______ gal

TOTAL ______ gal

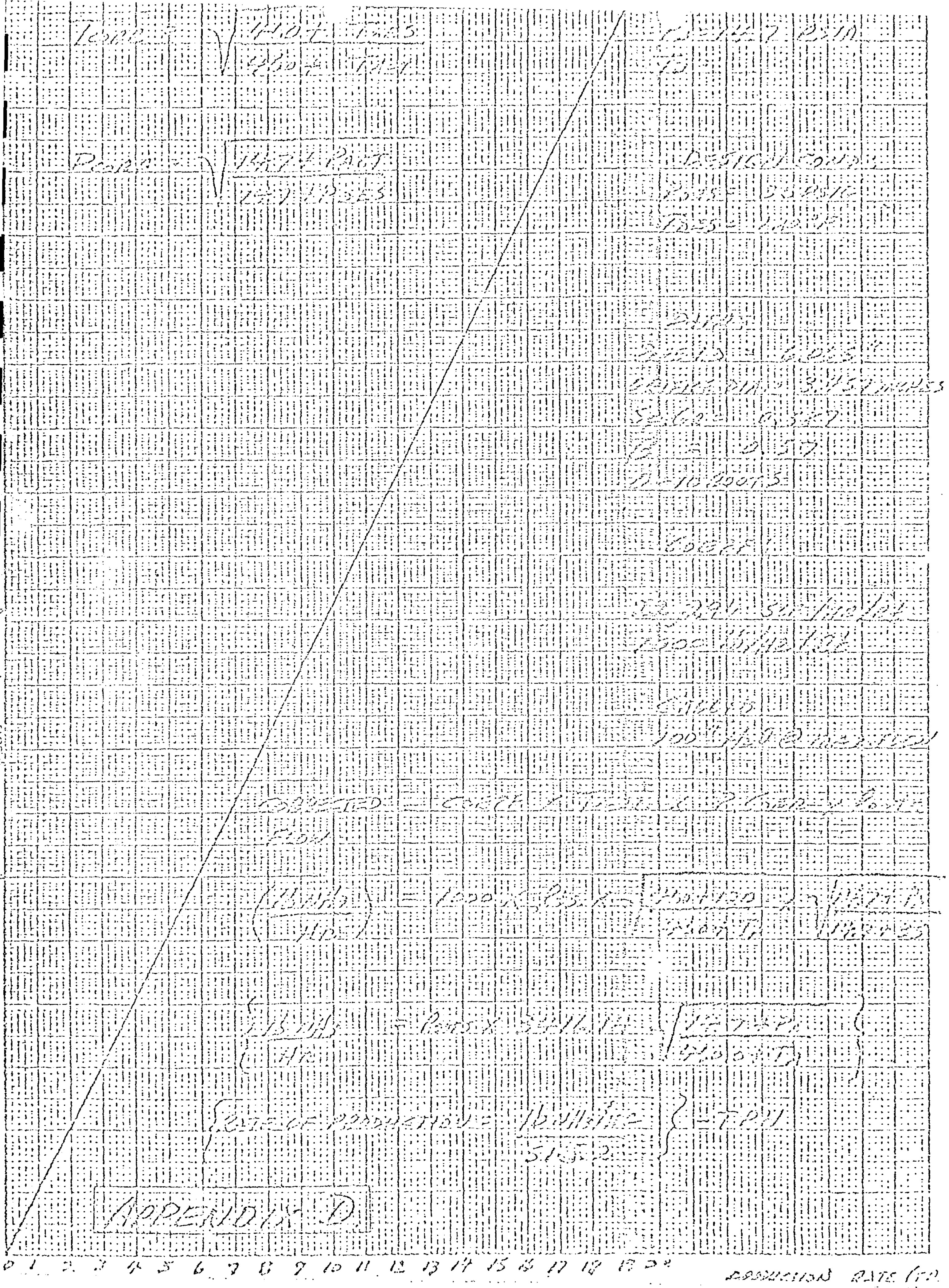
APPENDIX A CONT'D


% READING
RATE OF PRODUCTION
RATE OF PRODUCTION
APPENDIX B

APPENDIX C



32
31
30
29
28
27
.75
.50
.25
26
25
24
23
14
15
16
17
18
19
20
PRODUCTION RATE (TPH)


APPENDIX D
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Time	[redacted]							1100	1110	1115	1135	1145	1155	1205
Elap Time	0	10	20	30	40	50	60	70	80	Centrifuge	90	[illegible]	100	110
ACID RATE	.915	.905	.89	.895	.89	.9	.89	.90	.90	off	.925	.91	.93	.91
am. *	.79	.80	.79	.79	.79	.79	.795	.795	.80		.79	.78	.79	.785
TOTALIZER	3148	3483	3729	4002	4325	4586	4866	5130	5400			6527		7021
AMMONIA RATE	.8	.81	.80	.80	.80	.8	.80	.80	.8	Stopped Cent	.76	.79	.80	.81
Bottom P1	26	26	33	29	26	32	25	31.5	31.0		31.	33	28.5	29.0
Top P2	27	27	34.5	30	27	33	26.2	32.5	32.0		32.	33	29.5	30.0
Conc. in Sat / % Solids Tot	64 / 965		640/1000	700/1000	740/1100	740/1050	700/1000	740/1000	—		—	32/430		720/1000
"Steam" °F Temp	182°	182	182	182	182	182	182	181	181		182	182	181	182
Titration ml Range 8-10 Eqpt	11.2		8.0	8.2	8.0	6.0	5.0 Bumped acid	6.3	—		8.2	10.0	8.5	8.2
Level in Sat (inverse)	5.8	6.0	6.0	6.2	6.6	6.0	6.4	6.3	6.2		5.8	5.4	5.5	5.4
Level in M.L Tank	.40	.40	.4	.44	.44	.44	.45	.44	.44		.44	.44	.45	.44
Centrifuge amps 2	20	20	20	18	19	18	18	18	18	0	23	15	18	21
3	20	20	18	16	23	23	23	23	25	0	26	22	22	25

* Duplication of Ammonia Rate for recording

APPENDIX E

[redacted]

	1215	1225	1235	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Time	120	130	140	0	12	20	30	40	50	60	70	80	
Elap. Time	290												
Acid Sat	.90	.91	.90	.88	.90	.91	.91	.91	.90	.90	.91	.91	
Am Sat	.79	.79	.785	.78	.795	.79	.80	.79	.79	.79	.78	.79	
Acid Tot gallons	7370	7600	7892	9724	10070	10289	10568	10895	11165	11455	11741	12029	
Ammoniate	~~.795~~	.78	.78	.80	.80	.80	.80	.785	.80	.80	.79	.8	
Pulse OPPSI Po Sat							34	34	30	30.5	30.5	30.0	
Pulse OPPSI A Sp							35	35	31	31.5	31.5	31.0	
Conc in Sat % Solids	73	72	72	71	70	72	71	72	70	70	70		
Steam °F Temp	182	182	182	182	182	182	182	182	182	182	182	183	
Titration	6.8	12.0	12.0	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8		
Level in	5.8	5.8	5.8	6.1	6.3	6.3	6.2	6.2	6.2	6.8	6.7	6.8	
Acid Sat (Conc)													
Level in ML Tank	.44	.43	.43	.435	.44	.45	.49	.44	.44	.44	.45	.46	
Centrifuge 2	16	20	18	20	20	20	20	20	20	20	20	20	0
[illegible]	26	25	25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

Centrifugally [illegible] for [illegible]

[redacted]

Elapsed Time	100	110	120	130	140	150
Acid Rate	.925	.92	.92	.92	.915	.90
Am. Rate	.8	.795	.8	.77	.8	.8
Acid Tot gallons	12918	13200	13502	13795 + 2ass	00283	0564
Ammon Rate	.8	.8	.79	.80	.8	.8
ΔP P_0	34	34	34	32	30	31.0
P_1	35	35	35	33	31	32.0
Conc inlet % Solids	72	73	71	70	73	71
Steam °F Temp	183	182	182	183	182	182
Dilution	7.8	7.8	7.8	7.8	7.8	78
Level in Sat (inches)	6.1	6.2	6.1	6.0	6.2	6.0
Level ML Tank	.46	.46	.465	.46	.47	.46
Centrifuge						
2	19	18	18	18	18	18
3	23	22	23	22	22	23

APPENDIX E CONT'D

Time	915	925	935	945	955	1005	1015	1025	1030	1055	1105	1115	1125	1135	1145	1157	1206	1215
Elapse	0	10	21	30	40	50	60	70	75	75	85	95	105	115	125	137	146	155
Taminin																		
Acid rate	.92	.92	.91	.91	.90	.90	.90	.90		.91	.92	.925	.925	.925	.925	.925	.925	.93
NH_3 rate	.79	.8	.8	.79	.79	.79	.80	.80		.79	.79	.8	.8	.8	.79	.79	.79	.79
Acid Total ~~[illegible]~~ gallons	2211	2518	2849	3125	3400	3673	3953	4245		5128	5440	5701	6012	6320	6621	6980	7236	7514
Ammonia	8	8	8	8	8	8	8	8		8	8	8	8	8	8	8.0	8.0	8.0
Ratio P_1	26.5																	
Ratio P_0	27.5																	
Sat level	5.8	6.0	6.0	6.0	6.2	6.2	6.7	6.8		6.1	6.0	5.9	5.9	6.2	6.3	6.2	6.3	6.2
ML Tank level	.43	.43	.43	.43	.43	.43	.43	.43		.43	.43	.43	.43	.43	.43	.43	.43	.43
Steam Temp	182	183	183	183	183	183	183	183		183	183	183	183	183	183	183	183	183
Centrif amp 2	20	20	23	23	20	21	23	23		#1-15	?*	?	?	?	#2 18	#2 18	#2-22	#2 [illegible]
Centrif amp 3	22	23	23	25	25	24	25	25		#1-25	25	25	25	25	25	23	0	0
Dryer temp °F			135	132	132	133				142	140	140	138	138 138	138	136	137	13[illegible]
Crude solids %	72		72	73	72	72	—	72		72	72	72	73	73	72		71	72
Titration	7.8		12.5	10.0	10.8	8.8	—	5.0		4.8	5.8	5.8	6.3	7.2	6.8		7.8	8.[illegible]

System down for centrifugal oiling 27 min

Dry temp 130-135°F

[redacted]

Time	1235	1255	100 PM
Elap. Time	175	185	
Acid Rate	.925	.915	.915
NH_3 Rate	.79	.78	.79
Acid Total gallons	8121	8712	8859
Ammonia	7.9	7.9	8.0
Rate P_1	33	32	31
P_0	34	33	32
Salt level	6.5	6.7	6.6
~~T. Isolation~~ ML Tank level	.42	.42	.42
Steam temp	183	183	183
Centrifug Amps			
1	2	2	2
2	21	19	20
3	0	0	0
Dryer Temp	135	134	134
Conc Sol 7.2			
T Isolation 7.2			

APPENDIX E CONT'D

[redacted]

Flows | Temp. | Misc. | Levels | Control Analysis | Screen Analysis

Time	Min. Oper. Last Hr.	Hrs. Cont.	NH_3 PPH	H_2SO_4 GPM	Mother Liquid %	Liquid NH_3 PSI	Saturator	Dryer	Mother Liquid	Vapor Line Temp.	NH_3 Line Temp.	Steam Line Temp.	Saturator	Mother Liquid	Saturator Sp. GR.	Mother Liq. Sp. GR.	Saturator % H_2SO_4	Mother Liq. % H_2SO_4	Crystal % Saturator	% 8	% 10	% 12	% 14	% 16	% 18	% 20	% 28
7am	60	66	75	27.3	[illegible]	40	212	135	140	116	58	186	6'4	46	1272	1132	.415	.07	73	3	12	12	19	15	–	14	13
8am	60	60	75	27.4	"		212	135	146	116	58	186	5'6	45	1272	113.	.52	.08	72								
9am	60	60	75	27.4	"		216	135	146	118	60	184	5'2	43	1276	1135	.46	–	72	3	14	15	19	10	–	18	15
10am	66	66	75	27.3	"		218	132	145	118	65	183	6'4	46	1276	1137	.60	.4	74								
11am	66	46	75	27.3	"		216	135	146	115	65	186	6'0	46	1276	1140	.30	.115	73	4	14	17	17	10	–	13	16
12N	60	60	75	27.3	"	40	211	135	147	116	65	185	6'5	46	1276	1135	.34	–	72								
1pm	60	60	75	27.3	"	40	216	135	142	118	65	186	6'5	46	1276	1135	.34	–	73								
2pm																											
3pm																											
4pm																											
5pm																											
6pm																											
7pm																											
8pm																											
9pm																											
10pm																											
11pm																											
12M																											
1am																											
2am																											
3am																											
4am																											
5am																											
6am																											
7am																											

1st. SHIFT - Tons ________

Operator

1. ________

2. ________

2nd. SHIFT - Tons ________

Operator

1. ________

2. ________

3rd. SHIFT - Tons ________

Operator

1. ________

2. ________

Spent Acid Tank Lev[el]	
East	Time

OXY 323-1

APPENDIX F

[redacted]

Dryer	Mother Liquid	Vapor Line Temp.	NH_3 Line Temp.	Steam Line Temp.	Saturator	Mother Liquid	Saturator SP. GR.	Mother Liq. SP. GR.	Saturator % H_2SO_4	Mother Liq. % H_2SO_4	Crystal % Saturator	% 8-	% 10-	% 12-	% 14-	% 16-	% 18-	% 20-	% 28	% Fine	NH_3 Liq. Line Pres %	Acid Tank Level	REMARKS
135	140	116	55	186	6'4	46	1272	1132	.45	.07	73	3	12	12	19	15	—	14	13	12	150	71	7AM
135	140	116	55	186	5'6	46	1292	113.	.52	.08	72										148	69	[illegible] 103
135	140	118	60	184	5'8	42	1270	1135	.46	—	72	3	14	15	19	10	—	14	15	10	145	61	
135	145	[illegible]	[illegible]	183	6'6	46	1271	1132	.62	.4	74										163	66	
135	140	[illegible]	65	186	6'0	42	1272	1140	.3	.115	73	4	14	17	17	10	—	13	16	9	160	65	
135	143	118	65	186	6'5	46	1270	1135	.34	—	72										165	63	
135	143	118	65	186	6'5	46	1270	1135	.34	—	73												

Inventories & Transfers

H_2SO_4 7 am ________ Beg

H_2SO_4 7 am ________ E

Transferred

Start-Time ________ ________

F.T. ________ ________

Finish-Time ________ ________

F.T. ________ ________

NH_3 Totalizer

Begin ________

End ________

H_2SO_4 Totalizer

Begin ________ g

End ________ g

TOTAL ________ g

SHIFT - Tons ________

tor

3rd. SHIFT - Tons ________

Operator

1. ________

2. ________

Spent Acid Tank Levels

East	Time	West

APPENDIX F CONT'D

Ammonium Sulfate Dryer Baghouse Inlet Duct

Two 3" I.D. test ports approximately 90° apart were installed on a straight section of the 11" I.D. stack at a location which was 5.0 stack diameters downstream and 2.3 diameters upstream from the nearest gas stream flow disturbances. EPA Method 1[3] criteria for this test location required a minimum of 20 traverse points but due to a heavy build-up of particulate matter covering ~68% of the inside area of the duct the particulate tests were run at a single point of average velocity during each of the three test runs. See Figure 2 for port and sampling point locations.

Ammonium Sulfate Dryer Baghouse Exhaust Stack

Two 3" I.D. test ports were placed on one side of the 7-1/2" x 8-5/8" rectangular exhaust stack serving the baghouse. The ports were located 15 diameters downstream and 10 diameters upstream from the nearest flow disturbances. Since the eight and two diameter criterion were met, a minimum of eight traverse points were required by EPA Method 1 regulations. Figure 3 illustrates duct geometry plus port and sampling point locations.

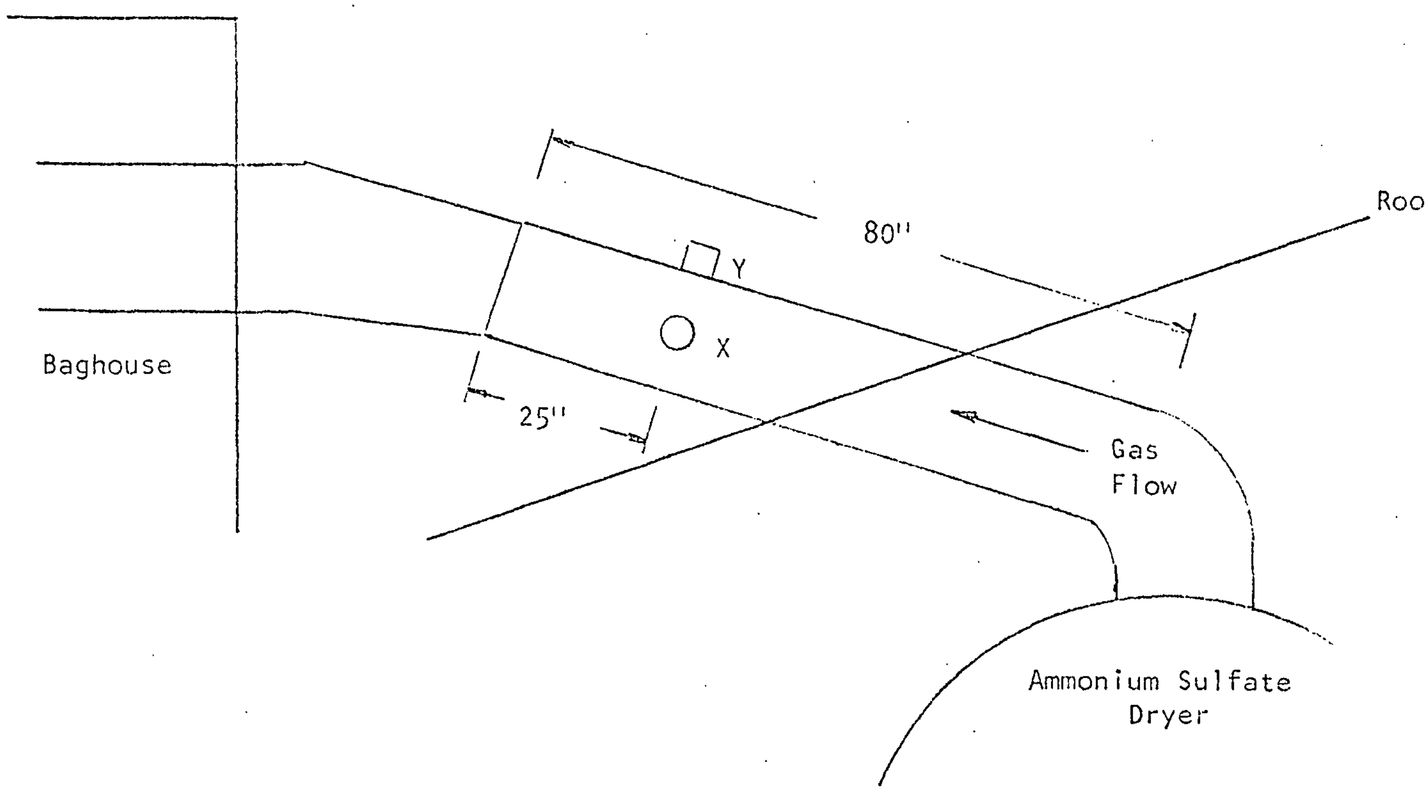
(3) Code of Federal Regulations, Title 40, Part 60, Appendix A, "Standards of Performance for New Stationary Sources," August 18, 1977.

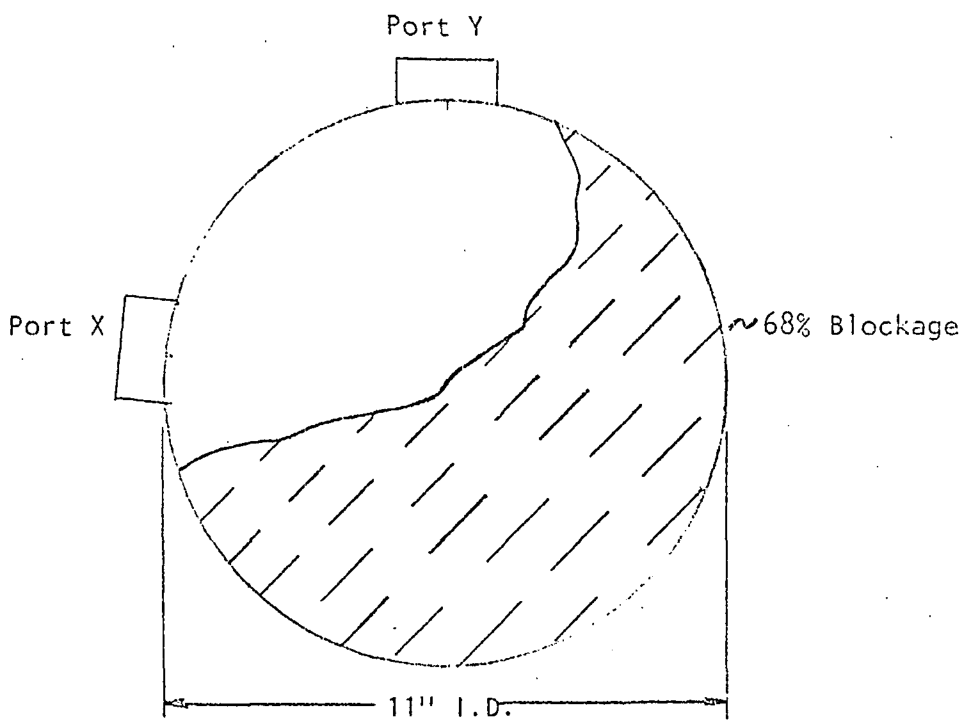
FIGURE 2

OCCIDENTAL CHEMICAL COMPANY

Houston, Texas

AMMONIUM SULFATE DRYER BAGHOUSE INLET DUCT
PORT AND SAMPLING POINT LOCATIONS





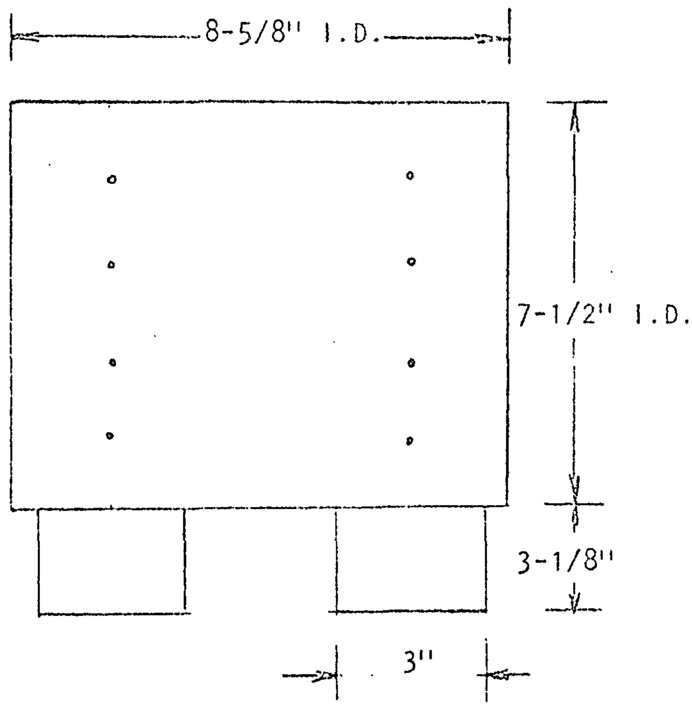
Duct Cross-Sectional View

OCCIDENTAL CHEMICAL COMPANY

Houston, Texas

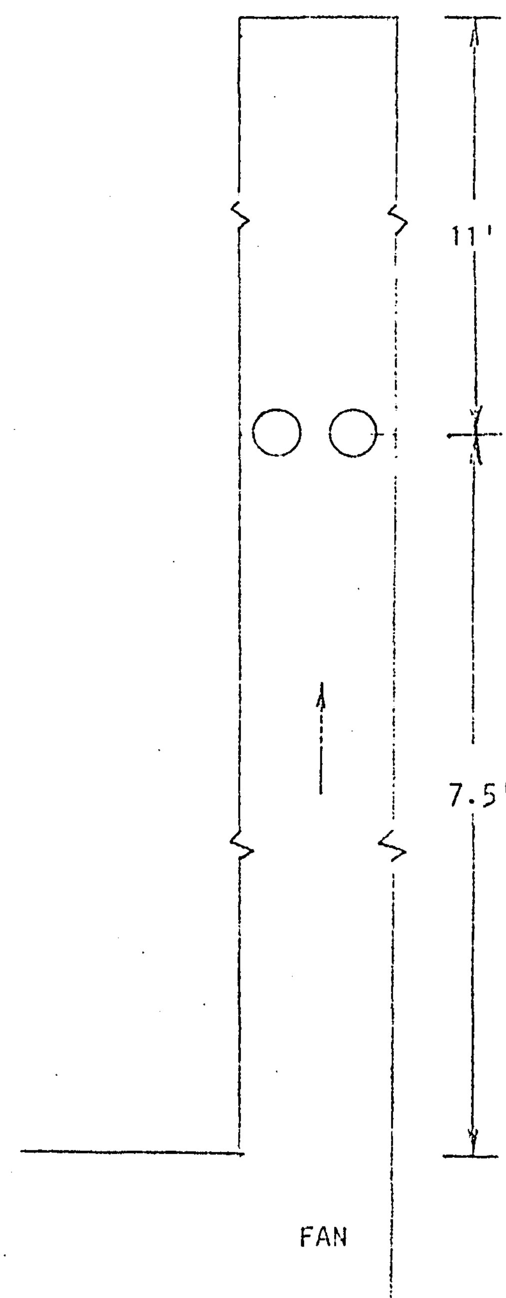
FIGURE 3

AMMONIUM SULFATE DRYER BAGHOUSE EXHAUST STACK



Duct Cross-Sectional View

Traverse Point Number	Distance From Inside Near Wall, Inches
1	1
2	2-3/4
3	4-5/8
4	6-1/2



METAL STACK

Particulate Sampling Trains

The test train utilized for particulate sampling at the baghouse inlet duct location was the standard EPA Method Five Train (see Figure 4).

A stainless steel nozzle was attached to a heated ($\sim 250^{o}F$) 3' borosilicate glass probe which was connected directly to a borosilicate filter holder containing a 4" Reeve Angel 900 AF glass fiber filter. The filter holder was maintained at approximately $250^{o}F$ in a heated chamber, and was connected by Tygon^{R} vacuum tubing to the first of four Greenburg-Smith impingers which were included in the train to condense the moisture in the gas stream. Each of the first two impingers contained 100 ml of distilled water, the third was dry and the final impinger contained 200 grams of dry pre-weighed silica gel. The first, third, and fourth impingers were modified Greenburg-Smith type; the second was a standard Greenburg-Smith impinger. All impingers were maintained in a crushed ice bath. A RAC control console with vacuum pump, dry gas meter, a calibrated orifice, and inclined manometers completed the sampling train.

Flue gas temperature was measured by means of a Type K thermocouple which was connected to a direct readout pyrometer. The thermocouple sensor was positioned adjacent to the sampling nozzle.

Gas velocity was measured using a calibrated "S" type pitot tube provided with extensions and fastened alongside the sampling probe. Gas stream composition (carbon dioxide, oxygen, and carbon monoxide content) was determined utilizing Orsat apparatus to analyze stack gas samples. Gas stream composition proved to be ambient air since no combustion products were found in any of the stack gas effluent samples.

The test train used for particulate sampling at the baghouse exhaust stack location was identical to the train described above except for a rigid borosilicate connection in place of flexible tubing between the filter between the filter holder and the first impinger. See Figure 5 for train schematic.

Particle Size Distribution Sampling Apparatus

A stainless steel nozzle was connected directly to an 8-stage Anderson[R] cascade impaction device which separated the particles according to their effective aerodynamic particle diameters. A glass fiber filter was used to capture any particles that passed through the impactor substrates to permit the measurement of total particulate. The filter holder was maintained at stack temperature and was connected by Tygon[R] vacuum tubing to the first of four Greenburg-Smith impingers which were included in the train to condense the moisture in the gas stream. All impingers were maintained in a crushed ice bath. A RAC control console with vacuum pump, dry gas meter, a calibrated orifice, and inclined manometers completed the sampling train.

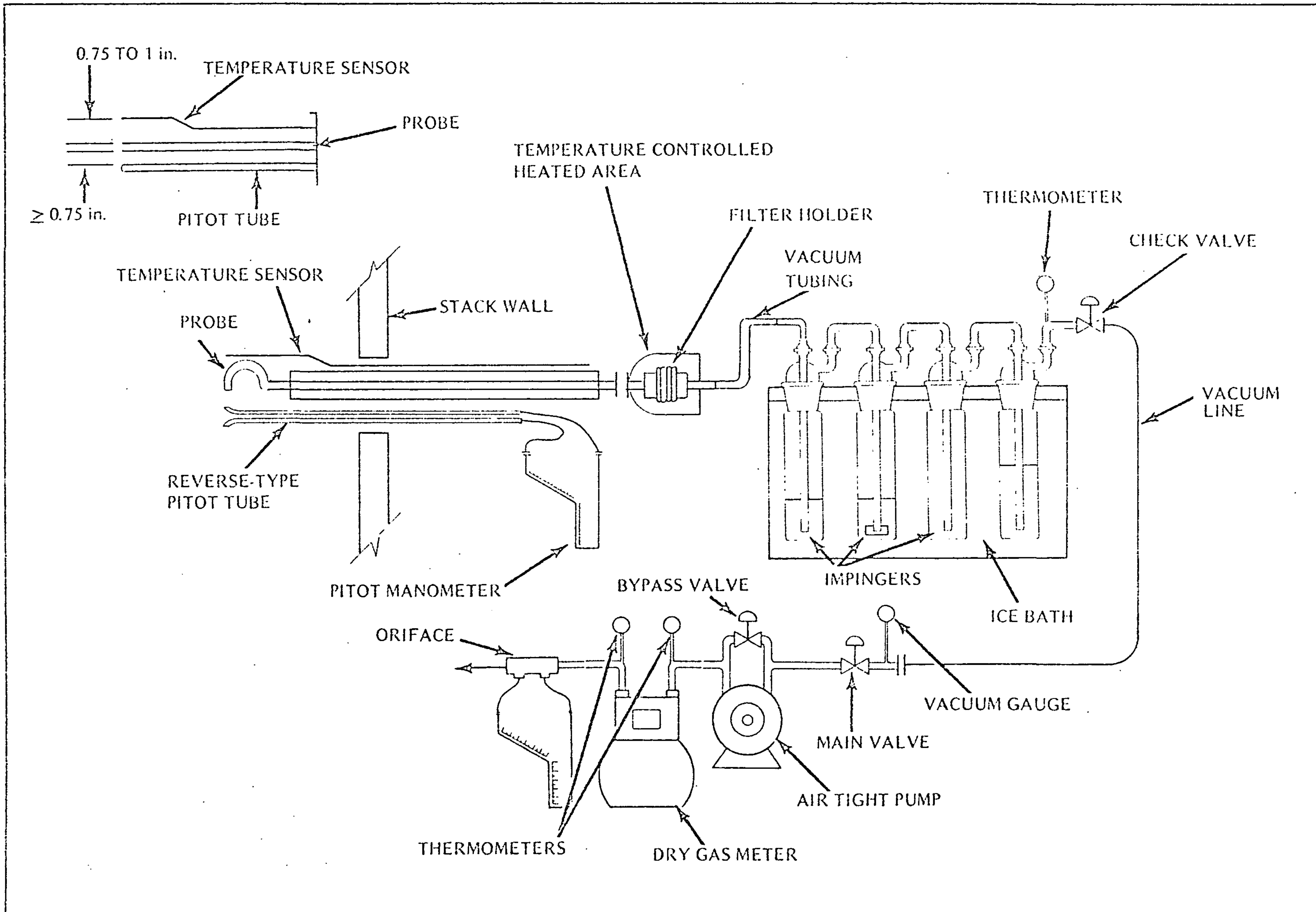


FIGURE 4 PARTICULATE SAMPLING TRAIN
EPA METHOD 5
BAGHOUSE INLET DUCT

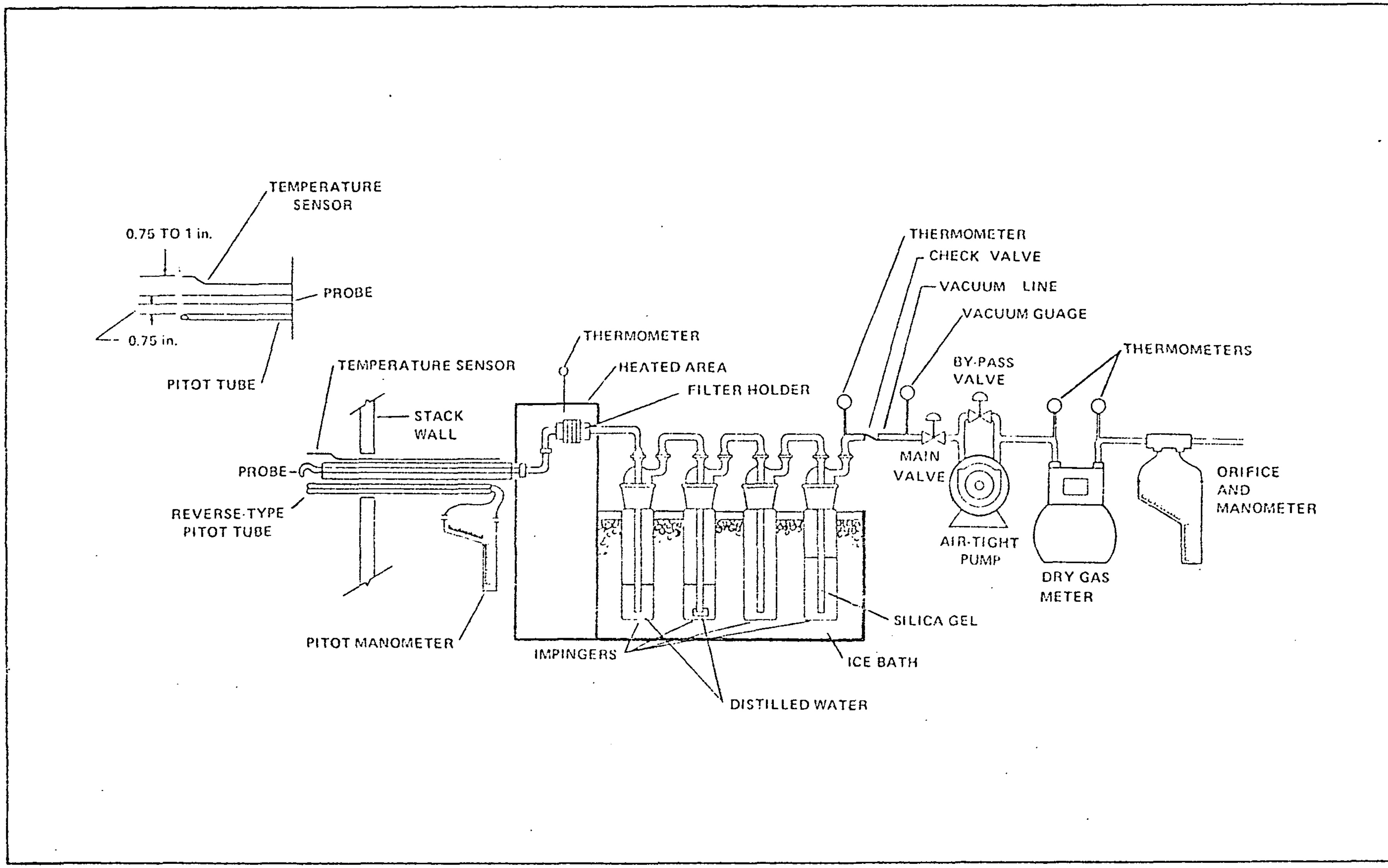


FIGURE 5 PARTICULATE SAMPLING TRAIN–EPA METHOD 5

EPA METHOD 5

BAGHOUSE EXHAUST STACK

TEST PROCEDURES

Preliminary Tests

Preliminary test data was obtained at each sampling location. Stack geometry measurements were recorded and sampling point distances calculated. A preliminary velocity traverse was performed at each test location utilizing a calibrated "S" type pitot tube and a Dwyer inclined manometer to determine velocity profiles. Stack gas temperatures were observed with a direct read-out pyrometer equipped with a chromel-alumel thermocouple. Gas stream composition and moisture content values were estimated from information supplied by Oxychem.

Preliminary test data was used for nozzle sizing and nomagraph set-up for isokinetic sampling procedures.

Calibration of the probe nozzles, pitot tubes, metering systems, probe heaters, temperature gauges and barometer were performed as specified in Section 5 of EPA Method 5 test procedures (see Appendix E for calibration data).

Ammonium Sulfate Dryer Baghouse Inlet Duct

A series of three tests were conducted at the inlet to the Ammonium Sulfate Dryer Baghouse simultaneous with particulate test runs at the exhaust stack. The sampling was performed at one point of average velocity for a total test time of 120 minutes. This point was chosen before each test by running a rough velocity traverse across the open area of the duct. Test data was recorded every five minutes during all test periods.

Table 1 presents a summary of test data for each of the three runs. Test result summarization appears on Table 3.

One particle size distribution test was performed following the completion of test run 3.

One sampling point located at a site of average velocity was selected from velocity traverse data for particle size distribution testing. The gas stream was sampled isokinetically at that point for 4 minutes which permitted collection of sufficient sample for analysis without overloading the filter substrates. Sample volume, temperature, and pressure data was recorded before and after the test. See Figure 6 for a distribution plot.

Ammonium Sulfate Dryer Baghouse Exhaust Stack

A series of three EPA Method 5 tests were performed at the Ammonium Sulfate Dryer Baghouse exhaust stack simultaneous with the inlet test runs. Eight points were traversed, 4 per port axis, for 15 minutes each yielding a test period 120 minutes in length.

During particulate sampling, gas stream velocities were measured by inserting a calibrated "S" type pitot tube into the stream adjacent to the sampling nozzle. The velocity pressure differential was observed immediately after positioning the nozzle at each point, and sampling rates were adjusted to maintain isokinetic sampling. Stack gas temperatures were also monitored at each point with the pyrometer and thermocouple. Additional temperature measurements were made at the final impinger and at the inlet and outlet of the dry gas meter.

Test data was recorded every five minutes during all test periods. Table 2 presents a summary of test data for each of the three runs. Test result summarization appears on Table 4.

Visible emissions observations were recorded concurrently with each particulate test repetition by a certified observer according to EPA Method 9 procedures. See Table 4 for result summary.

Particulate Sample Recovery

At the conclusion of each test, the sampling trains were dismantled, openings sealed, and the components transported to the field laboratory. Sample integrity was assured by maintaining chain of custody records which will be supplied upon request.

A consistent procedure was employed for sample recovery:

- The glass fiber filter(s) was removed from its holder with tweezers and placed in its original container (petri dish), along with any loose particulate and filter fragments (Sample 1).
- The probe and nozzle were separated and the internal particulate rinsed with acetone or distilled water into a borosilicate container while brushing a minimum of three times until no visible particles remained. Particulate adhering to the brush was rinsed with acetone or water into the same container. The front half of the filter holder was rinsed with acetone or water while brushing a minimum of three times. The rinses were combined (Sample 2) and the container sealed with a Teflon lined closure.
- The total liquid in impingers one, two and three was measured, the value recorded, and the liquid discarded.
- The silica gel was removed from the last impinger and immediately weighed.
- Acetone and distilled water samples were retained for blank analysis.

Particulate Analyses

The filters (Sample 1) and any loose fragments were desiccated for 24 hours and weighed to the nearest 0.1 milligram to a constant weight.

The acetone and distilled water wash samples (Sample 2) were evaporated (acetone at ambient temperature and pressure; water at 105°C and ambient pressure) in tared beakers, and desiccated to constant weight. All sample residue weights were adjusted by the acetone or water blank values.

The weight of the material collected on the glass fiber filter(s) plus the weight of the residue of the nozzle/probe/front-half filter holder washes represents the "total" EPA Method 5 catch. Complete laboratory results are presented in Appendix B of this report.

Particle Size Sample Recovery and Analyses

The cascade impactor substrates and any loose fragments were carefully removed from their support plates with tweezers and placed in individual containers (petri dishes) for shipment to Weston Laboratory.

Each cascade impactor filter was fired at 525°C and pre-weighed to the nearest 0.1 milligram to constant weight at Weston's Laboratory prior to on-site application. Subsequent to emissions exposure, the cascade impactor substrates, back-up filters and any loose fragments (Sample 4) were desiccated for 24 hours in the Laboratory, and weighed to the nearest 0.1 milligram to constant weight.

DISCUSSION OF TEST RESULTS

Particulate test data and test result summaries are presented in Tables 1 through 4 of this report. Figure 6 illustrates the particle size distribution of the particulate matter at the baghouse inlet location.

No unusual process operating conditions were encountered during any of the test periods.

A heavy build up of particulate matter covered approximately 68% of the inside area of the baghouse inlet duct at the test port location and therefore precluded particulate/velocity traversing of the duct cross-sectional area as specified in EPA testing methodology (see Figure 2). Sampling at a single point of average velocity proved to be the most feasible testing alternative (the blockage could not be easily removed) and was the procedure followed for all three inlet tests. Therefore, since no particulate/velocity traversing could be performed as required to insure representative sampling, the inlet test results should only be viewed as a rough guide when evaluating the performance efficiency of the bag collector.

The amount of particulate matter discharged to the atmosphere from the baghouse was $\leq$ 0.093 grains/dscf and $\leq$ 0.74 pounds/hour. The certified observer recorded no visible emissions emanating from the stack during the test program. However, water droplets containing dissolved particulate matter were frequently observed dripping from the stack during the test periods. This phenomenon was due to water vapor condensation on the inside walls of the stack due to cooling the gas stream below the saturation temperature.

The particulate removal efficiency of the baghouse was mediocre averaging roughly 95.3%.

Results of the Anderson[R] cascade impaction particle size distribution test conducted at the baghouse inlet site showed a perponderance of relatively large particles entering the collector (90% of the particles, by weight, were $\geq$ 2.2 μ in diameter). Visual inspection of a sample collected from the baghouse indicated the presence of many large product granules.

It is suspected that the high grain loading measured at the outlet location was due to a malfunction in the baghouse. Consequently, the plant was contacted, the baghouse corrections were made, and three additional tests were run at the baghouse outlet location at a later date. The inlet duct was not tested during this period since most of the internal area of the duct was filled with an irregular buildup of product solids at the test site which prevented representative sampling. Since the entire unit would have been required to shut down to enable the inlet duct to be cleaned a decision was made to test the outlet location only.

OCCIDENTAL CHEMICAL COMPANY
Houston, Texas

TABLE 1

AMMONIUM SULFATE DRYER BAGHOUSE INLET DUCT

Summary of Test Data

Test Data			
Test Number	1	2	3
Test Date	9/12/78	9/12/78	9/13/78
Test Period	0940-1230	1350-1620	0915-1225
Sampling Data			
Sampling Duration, minutes	120.0	120.0	106.0
Nozzle Diameter, inches	0.125	0.125	0.125
Barometric Pressure, inches mercury	29.77	29.77	29.79
Average Orifice Pressure Differential, inches water	0.55	0.55	0.55
Average Dry Gas Temperature at Meter, °F	86.	89.	89.
Sample Volume at Meter Conditions, cubic feet	50.33	48.37	42.40
Sample Volume at Standard Conditions,[1] cubic feet	49.37	47.27	41.39
Gas Stream Moisture Content			
Total Water Collected by Train, ml	156.	141.5	131.
Standard Volume of Water Collected, cubic feet	7.34	6.66	6.17
Moisture in Gas Stream, percent by volume	12.9	12.4	13.0
Mole Fraction of Dry Gas	0.871	0.876	0.870
Gas Stream Composition			
CO_2, percent by volume	0.0	0.0	0.0
O_2, percent by volume	20.9	20.9	20.9
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	79.1	79.1	79.1
Molecular Weight of Wet Gas	27.55	27.62	27.55
Molecular Weight of Dry Gas	28.97	28.97	28.97
Gas Stream Velocity			
Static Pressure, inches water	- 2.4	- 2.8	- 2.4
Absolute Pressure, inches mercury	29.59	29.56	29.61
Average Temperature, °F	153.	176.	170.
Pitot Tube Calibration Coefficient	0.831	0.831	0.831
Total Number of Sampling Points	1.0	1.0	1.0
Velocity at Actual Conditions, feet/second	103.	105.	104.
Gas Stream Volumetric Flow[2]			
Stack Cross-Sectional Area, square feet	0.21	0.21	0.21
Volumetric Flow at Actual Conditions, cubic feet/minute	1,300.	1,320.	1,320.
Volumetric Flow at Standard Conditions, cubic feet/minute	960.	950.	950.
Percent Isokinetic	105.2	102.1	101.3
Process Operations Data			
Ammonium Sulfate Production Rate, tons/hour	17.	17.	17.
Average Pressure Drop across Baghouse, inches water	1.5	1.6	1.8

[1]Standard Conditions = 68°F, 29.92 inches mercury, dry basis.

[2]Reported values are approximate and are calculated based on estimated dryer baghouse inlet duct clear area of 32% = 0.21 ft^2.

OCCIDENTAL CHEMICAL COMPANY
Houston, Texas

TABLE 2

AMMONIUM SULFATE DRYER BAGHOUSE EXHAUST STACK

Summary of Test Data

Test Data			
Test Number	1	2	3
Test Date	9/12/78	9/12/78	9/13/78
Test Period	0940-1230	1350-1620	0915-1225
Sampling Data			
Sampling Duration, minutes	120.0	120.0	120.0
Nozzle Diameter, inches	0.189	0.189	0.189
Barometric Pressure, inches mercury	29.77	29.77	29.79
Average Orifice Pressure Differential, inches water	0.69	0.60	0.55
Average Dry Gas Temperature at Meter, °F	85.	89.	87.
Sample Volume at Meter Conditions, cubic feet	56.60	52.08	51.27
Sample Volume at Standard Conditions,[1] cubic feet	54.94	51.08	49.60
Gas Stream Moisture Content			
Total Water Collected by Train, ml	186.	145.	147.5
Standard Volume of Water Collected, cubic feet	8.76	6.83	6.94
Moisture in Gas Stream, percent by volume	13.7	11.8	12.3
Mole Fraction of Dry Gas	0.863	0.882	0.877
Gas Stream Composition			
CO_2, percent by volume	0.0	0.0	0.0
O_2, percent by volume	20.9	20.9	20.9
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	79.1	79.1	79.1
Molecular Weight of Wet Gas	27.46	27.68	27.62
Molecular Weight of Dry Gas	28.97	28.97	28.97
Gas Stream Velocity			
Static Pressure, inches water	4.4	4.4	4.3
Absolute Pressure, inches mercury	30.09	30.09	30.11
Average Temperature, °F	131.	139.	138.
Pitot Tube Calibration Coefficient	0.843	0.843	0.843
Total Number of Sampling Points	8.0	8.0	8.0
Velocity at Actual Conditions, feet/second	46.9	45.2	44.1
Gas Stream Volumetric Flow			
Stack Cross-Sectional Area, square feet	0.45	0.45	0.45
Volumetric Flow at Actual Conditions, cubic feet/minute	1,260.	1,220.	1,190.
Volumetric Flow at Standard Conditions, cubic feet/minute	980.	950.	930.
Percent Isokinetic	107.8	103.0	102.9
Process Operations Data			
Ammonium Sulfate Production Rate, tons/hour	17.	17.	17.
Average Pressure Drop across Baghouse, inches water	1.5	1.6	1.8

[1] Standard Conditions = 68°F, 29.92 inches mercury, dry basis.

OCCIDENTAL CHEMICAL COMPANY
Houston, Texas

TABLE 3

AMMONIUM SULFATE BAGHOUSE INLET DUCT

Summary of Test Results

Test Data			
Test Number	1	2	3
Test Date	9/12/78	9/12/78	9/13/78
Test Time	0940-1230	1350-1620	0915-1225
Gas Flow			
Standard Cubic Feet/minute, dry	960.	950.	950.
Actual Cubic Feet/minute, wet	1,300.	1,320.	1,320.
Particulates			
Nozzle, Probe and Front Half Filter Holder Catch Fraction, g	2.7212	2.5637	7.2971
Filter Catch Fraction, g	0.5204	0.3817	2.9921
Total Particulates, g	3.2416	2.9454	10.2892
Particulate Emissions[1]			
Grains/dry standard cubic foot[2]	1.01	0.96	3.83
Pounds/hour	8.36	7.84	31.2
Baghouse Particulate Removal Efficiency, percent	97.2	91.1	97.6
Product Moisture Content			
Moisture content of Dryer Inlet Sample, percent	0.46	0.50	0.54
Moisture content of Dryer Outlet Sample, percent	0.14	0.19	0.03

[1]Based on Total Particulates captured by train.

[2]Standard Conditions = 68°F and 29.92 inches mercury.

OCCIDENTAL CHEMICAL COMPANY
Houston, Texas

TABLE 4

AMMONIUM SULFATE DRYER BAGHOUSE EXHAUST STACK

Summary of Test Results

Test Data			
Test Number	1	2	3
Test Date	9/12/78	9/12/78	9/13/78
Test Time	0940-1230	1350-1620	0915-1225
Gas Flow			
Standard Cubic Feet/minute, dry	980.	950.	930.
Actual Cubic Feet/minute, wet	1,260.	1,220.	1,190.
Particulates			
Nozzle, Probe and Front Half Filter Holder Catch Fraction, g	0.0594	0.1423	0.2344
Filter Catch Fraction, g	0.0405	0.1405	0.0647
Total Particulates, g	0.0999	0.2828	0.2991
Particulate Emissions[1]			
Grains/dry standard cubic foot[2]	0.028	0.085	0.093
Pounds/hour	0.24	0.70	0.74
Baghouse Particulate Removal Efficiency, percent	97.2	91.1	97.6
Visible Emissions			
$\geq$ 5 percent opacity, minutes observed	0.	0.	0.
0 percent opacity, minutes observed	0.	0.	0.
No visible emission, minutes observed	120.	120.	120.
Product Moisture Content			
Moisture content of Dryer Inlet Sample, percent	0.46	0.50	0.54
Moisture content of Dryer Outlet Sample, percent	0.14	0.19	0.03

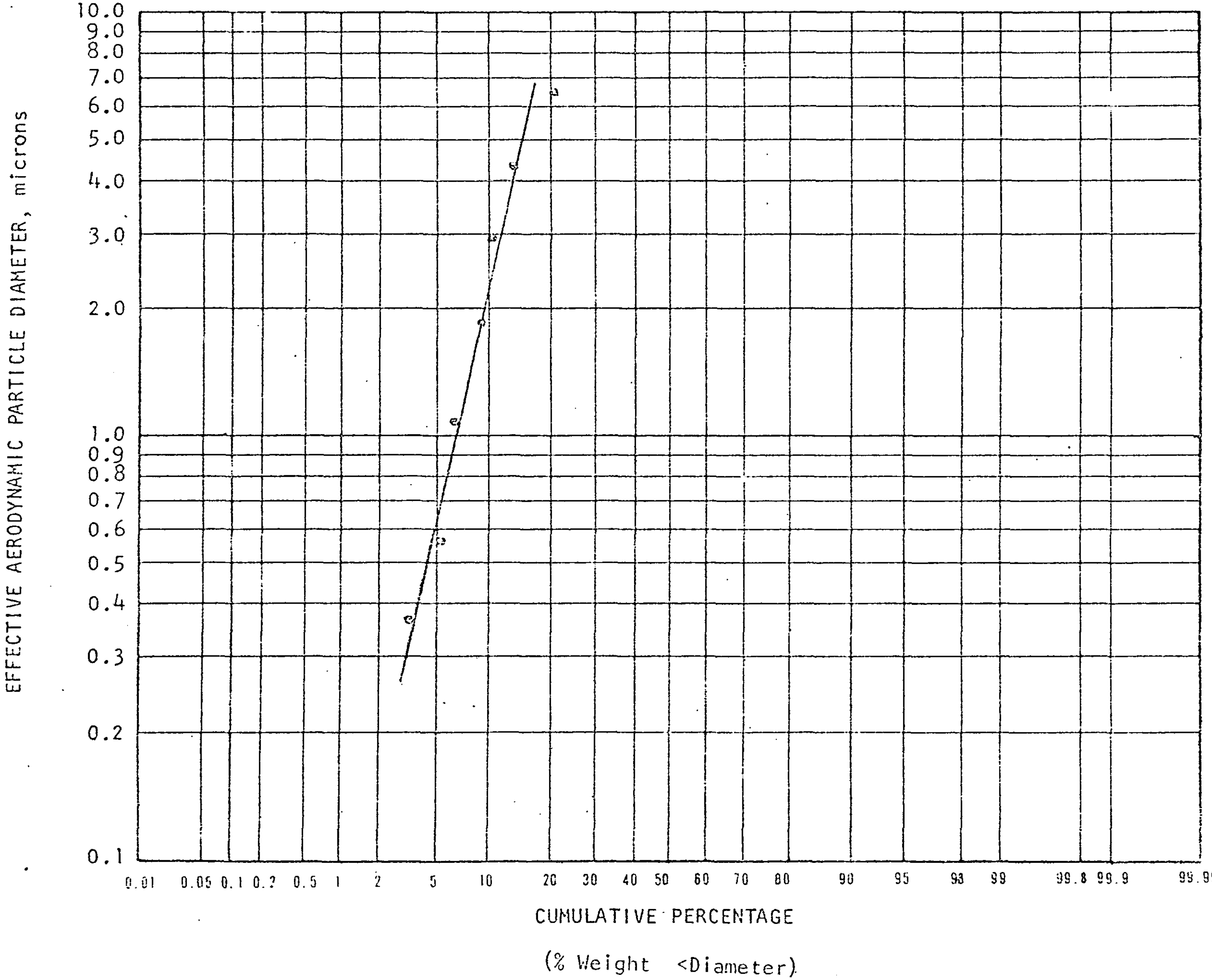
[1] Based on Total Particulates captured by train.

[2] Standard Conditions = 68°F and 29.92 inches mercury.

AMMONIUM SULFATE DRYER BAGHOUSE INLET

Particle Size Distribution

FIGURE 6



APPENDIX A

RAW TEST DATA

PRELIMINARY VELOCITY TRAVERSE

PLANT Oxychem
DATE 9-11-78
LOCATION Inlet to Dryer
STACK I.D. —
BAROMETRIC PRESSURE, in. Hg [illegible]
STACK GAUGE PRESSURE, in. H_2O -2.4
OPERATORS O'Neill / Maloney

SCHEMATIC OF TRAVERSE POINT LAYOUT

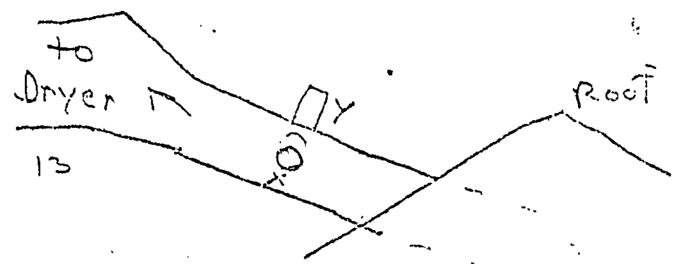
TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
X 1.3	3.6	171
1.35	2.9	175
1.4	2.0	170
1.25	3.6	171
	11.1	
	2.8	
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
X 3.4	2.9	172
3.7	3.2	175
3.8	2.7	169
3.5	2.7	168
	11.5	
	[illegible]	2.9
AVERAGE		

E. B. Robison
Miter Corp
x427

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Oxychem
DATE 9-11-78
SAMPLING LOCATION Inlet
INSIDE OF FAR WALL TO OUTSIDE OF PORT. (DISTANCE A) 10½ to 11¼
INSIDE OF NEAR WALL TO OUTSIDE OF PORT. (DISTANCE B) X=6'
STACK I.D., (DISTANCE A - DISTANCE B) app 11
NEAREST UPSTREAM DISTURBANCE 24"+
NEAREST DOWNSTREAM DISTURBANCE 36"
CALCULATOR O'Neill



SCHEMATIC OF SAMPLING LOCATION

Note: ≈65→70% duct covered w/ product. Say 68%.

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1 8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF PORT (SUM OF COLUMNS 4 & 5)
XY 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

NOMOGRAPH DATA

PLANT Oxydental Houston Tex

DATE 9-11-78

SAMPLING LOCATION Inlet To Dryer

CONTROL BOX NO. 1225

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_{@}$	1.96
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m\,avg.}$	90°
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	9-10
BAROMETRIC PRESSURE AT METER, in Hg	P_m	29.9
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	-2.9
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s / P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	175
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	2.5
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	4.0
C FACTOR	1.00	
CALCULATED NOZZLE DIAMETER, in.	0.125	
ACTUAL NOZZLE DIAMETER, in.	0.121	
REFERENCE Δp, in. H_2O	8.5	

PRELIMINARY VELOCITY TRAVERSE

PLANT Oxychem
DATE 9/11/79
LOCATION OUTLET
STACK I.D. [illegible]
BAROMETRIC PRESSURE, in. Hg [illegible]
STACK GAUGE PRESSURE, in. H_2O [illegible]
OPERATORS [illegible]

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
X-1	.60	115
2	.79	115
3	.84	116
4	.81	114
AVERAGE	.76	

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
Y-1	.66	132
2	.77	132
3	.75	135
4	.71	133
AVERAGE		

125 .74

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT [illegible]
DATE 9-14-78
SAMPLING LOCATION [illegible]
INSIDE OF FAR WALL TO
OUTSIDE OF PORT. (DISTANCE A) 10 5/8
INSIDE OF NEAR WALL TO
OUTSIDE OF PORT. (DISTANCE B) 3 1/8"
STACK I.D.. (DISTANCE A - DISTANCE B) 7 1/2" × 3 7/8"
NEAREST UPSTREAM DISTURBANCE 7.5' (10 dia)
NEAREST DOWNSTREAM DISTURBANCE 11' (15.1 dia.)
CALCULATOR Jackson

[illegible]

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF PORT (SUM OF COLUMNS 4 & 5)
[illegible]	—	7 1/2"	1"	3 1/8"	4 1/8"
2	—		2 3/4		5 7/8
3	—		4 5/8		7 3/4
4	—		6 1/2		9 5/8

NOMOGRAPH DATA

PLANT [illegible]

DATE [illegible]

SAMPLING LOCATION [illegible]

CONTROL BOX NO. 1204

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.80
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m\,avg.}$	105
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	10%
BAROMETRIC PRESSURE AT METER, in Hg	P_m	29.7
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	+4.4 P_s	30.1
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s\,avg.}$	125
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.74
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.84
C FACTOR	.95	
CALCULATED NOZZLE DIAMETER, in.	3/16	
ACTUAL NOZZLE DIAMETER, in.	3/16	
REFERENCE Δp, in. H_2O	1.6	

FIELD DATA

PLANT Oxy dental
DATE 9-12-78
SAMPLING LOCATION Inlet Dryer
SAMPLE TYPE Particulate
RUN NUMBER One
OPERATOR O'Neill
AMBIENT TEMPERATURE 80°F
BAROMETRIC PRESSURE 29.77
STATIC PRESSURE, (P_s) -2.4
FILTER NUMBER (s) [illegible]

PROBE LENGTH AND TYPE 3'
NOZZLE I.D. .125
ASSUMED MOISTURE, % 7.10 %
SAMPLE BOX NUMBER 1
METER BOX NUMBER [illegible]
METER $\Delta H_@$ 1.76
C FACTOR 1.0
PITOT TUBE FACTOR [illegible]
REFERENCE Δp 0.5
NOTE [illegible]

$V_s = 1.019$

11.798
10.805
5.106
27.616

READ AND RECORD ALL DATA EVERY 5.0 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F
	0	0940	566.722						
X 1	5		568.9	0.8	.55		134	80	80
	10		570.80		.55		134	80	82
	20		572.900		.55		140	80	83
	25		575.100		.55		141	81	84
	30		577.3	[illegible]	[illegible]		142	86	85
stop	35	1015	578.720	.865	.55		143	86	[illegible]
	40		[illegible]		.55		[illegible]	[illegible]	[illegible]
	45		583.0		.55		130	[illegible]	[illegible]
	50		584.9		.55		131	[illegible]	[illegible]
stop	55		590.213 / 510.211		.55		136	82	81
	60		592.150	590.11	.55		142	88	85
	65		594.800	595.251	.55		142	87	85
start 11:35	70		594.930		.55		151	85	84
	75		598.800		.55		158	87	85
	80		601.180		.55		161	91	85
	85		603.000		.55		168	91	86
	90		605.300		.55		170	92	87
	95		607.150		.55		171	93	87
	100		609.150		.55		175	92	86
	105		611.300		.55		176	93	86
	110		613.[illegible]		.55		177	94	86
	115		[illegible]		.55		179	94	86
stop	120		614.5116		.55		176	94	[illegible]
			50.328	1.073	.55		152		

change filter leak
change filter leak
clean nozzle leak

Houston Dryer Inlet

1.673	ΓΔP
0.55	ΔH
152.565	TS
86.457	TM
50.328	VMA
29.77	PBAR
142.	VWC
14.	WSG
156.	TH2O
28.97	MWD
0.21	AS
120.	TT
-2.4	STAT
0.125	DN
1.019	Y
0.831	CP
49.3704575	VMS
7.94404	VWS
12.94414056	%M
.8 [illegible]85944	MD
27.[illegible]47028	MWS
29.[illegible]52941	PS
103.0227865	VS
[illegible].08711	QACT
[illegible]9426	QSTD
[illegible]001	%I

$.32(.\ldots)=.21$

FIELD DATA

PLANT [illegible]
DATE 9/11/7[illegible]
SAMPLING LOCATION OUTLET [illegible]
SAMPLE TYPE [illegible]
RUN NUMBER 1
OPERATOR [illegible]
AMBIENT TEMPERATURE [illegible]
BAROMETRIC PRESSURE [illegible]
STATIC PRESSURE, (P_s) [illegible]
FILTER NUMBER (s) [illegible]

PROBE LENGTH AND TYPE [illegible]
NOZZLE I.D. [illegible]
ASSUMED MOISTURE, % [illegible]
SAMPLE BOX NUMBER
METER BOX NUMBER [illegible]
METER $\Delta H_@$ 1.70
C FACTOR [illegible]
PITOT TUBE FACTOR
REFERENCE Δp
NOTE

READ AND RECORD ALL DATA EVERY [illegible] MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	[illegible]	[illegible]									
X							77	[illegible]			
		[illegible]									
			.65	.76		152					
			[illegible]								
		[illegible]									
		[illegible]									
		632.445									
	1135										

STOP 1050
START 1100

1.5
1.5

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
	[illegible]	[illegible]									
Y-1		[illegible]	[illegible]	[illegible]							
[illegible]		636.5	.45	[illegible]		135					
[illegible]		[illegible]	.46	[illegible]		135			[illegible]		
[illegible]		[illegible]	.58	.77		[illegible]					[illegible]
[illegible]		[illegible]	[illegible]	[illegible]		[illegible]					[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]			[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]			[illegible]		[illegible]		[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]			[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			[illegible]
		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			[illegible]
[illegible]	[illegible]	[illegible]	[illegible]			139			[illegible]		[illegible]
		[illegible]	.7694								
				0.6117		131.2	85.319				
		56.596									

1.5

1.5

1.5

FIELD DATA

PLANT Oxy chem
DATE 8/12/78
SAMPLING LOCATION Inlet
SAMPLE TYPE Part + Moisture
RUN NUMBER 2
OPERATOR [illegible]
AMBIENT TEMPERATURE 81°
BAROMETRIC PRESSURE 29.77
STATIC PRESSURE, (P_s) -2.8
FILTER NUMBER (s) 24295

PROBE LENGTH AND TYPE 3' [illegible]
NOZZLE I.D. .125
ASSUMED MOISTURE, % 10
SAMPLE BOX NUMBER 1
METER BOX NUMBER 1225
METER $\Delta H_@$ [illegible]
C FACTOR [illegible]
PITOT TUBE FACTOR [illegible]
REFERENCE Δp [illegible]
NOTE

Oxychem, Houston
Run 2 Dryer Inlet
8-12-78

.254
27.171
16.025
3.921

L.C.s = .01
L.C.p = .0

READ AND RECORD ALL DATA EVERY 5.0 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg		
	0 / 1350	617.895/618.149	stop								
X-1	5	start 618.349 / 620.100	[illegible]	.55		173	87	85	2		
	10	622.100		.55		178	89	87	2		
	15	624.400		.55		177	92	88	2		
	20	626.500		.55		178	92	88	2		
	25	628.600		.55		178	92	88	2.5		
	30	630.400		.55		177	92	88	3		
	35	632.500		.55		177	91	88	3		
	40	634.500		.55		176	90	88	3		
	45	636.600		.55		178	90	88	3.5		
	50	638.750		.55		177	90	87	4		
	55	640.900		.55		176	90	87	3.5		
	60	642.950	stop	.55		177	91	87	3.5		
stop 1505 start 1525	65	645.020/645.500		.55		175	91	88	4		
	70	start 645.525 / 647.000		.55		173	86	85	3.5		
	75	649.200		.55		179	88	85	4.0		
	80	651.150		.55		171	84	86	4		
	85	653.050		.55		175	90	86	4		
	90	655.100		.55		174	90	86	4.5		
	95	657.200		.55		174	91	86	5		
	100	659.300		.55		175	90	87	[illegible]	220	[illegible]
	105	661.350/	stop start	.55		176	91	87	5	225	67
	110	663.550/664.600		.55		177	92	88	10.5	220	67
	115	665.700		.55		174	90	87	[illegible]	225	70
1620	120	667.527		.55		173	90	87	3	22[illegible]	70

Clean nozzle
clean nozzle
clean nozzle

[illegible] .55

1.673
0.55
175.54
88.5
48.371 VM
29.77 PB
129. VL
12.5 WS
141.5 TH
28.97 MW
0.21 F
120. T
-2.8 STR
0.125 D
1.019
0.831 C
47.27395169 VM
6.661405 VW
12.35072021 %
.8764927979 M
27.61512599 MW
29.56411765 P
104.8643215 V
1321.290451 QAC
950.6914018 QST
100.1104234 %I

PLANT Oxy Chem
DATE 9/12/78
SAMPLING LOCATION outlet
SAMPLE TYPE Part. + Moisture
RUN NUMBER 2
OPERATOR [illegible]
AMBIENT TEMPERATURE 81°
BAROMETRIC PRESSURE [illegible]
STATIC PRESSURE, (P_s) +4.4
FILTER NUMBER (s) [illegible]

PROBE LENGTH AND TYPE 3' [illegible]
NOZZLE I.D. .189
ASSUMED MOISTURE, % 10
SAMPLE BOX NUMBER
METER BOX NUMBER 1204
METER $\Delta H_@$
C FACTOR [illegible]
PITOT TUBE FACTOR [illegible] .845
REFERENCE Δp [illegible]
NOTE [illegible]

READ AND RECORD ALL DATA EVERY [illegible] MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	Sqrt. Δp, in. H_2O
	1350	[illegible]										
2-1		662.5	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	1		[illegible]	1.[illegible]
2		[illegible]	.38	.64		[illegible]	86	[illegible]			65	
3		[illegible]	.38	.64		[illegible]	87	[illegible]			[illegible]	
4		668.6	[illegible]	.62		[illegible]	[illegible]	[illegible]			[illegible]	
5		670.8	[illegible]	[illegible]		[illegible]	91	[illegible]			[illegible]	1.[illegible]
[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	93	[illegible]			[illegible]	
[illegible]		[illegible]	.60	.66		[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]		677.7	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]		[illegible]	[illegible]	.65		[illegible]	[illegible]	[illegible]			[illegible]	1.[illegible]
[illegible]		[illegible]	.37	[illegible]		[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			[illegible]	1.[illegible]
[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]				
	[illegible]	[illegible]										

[illegible] Wab 3
Dryer [redacted] [redacted] [redacted] outlet
9-12-78

STOP
1505
1525

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O		STACK TEMPERATURE (T_s) °F	DRY GAS METER TEMPERATURE		PUMP VACUUM in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F	
				DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F				[illegible]
	1600	[illegible]										
X-1		657.7	.48	.68		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	63	1.7
2		659.6	.47	.69		14[illegible]	53	86	[illegible]	[illegible]	63	
3		661.6	.46	.67		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	63	
4		664.0	.45	[illegible]		140	[illegible]	[illegible]	[illegible]	[illegible]	63	
5		666.2	.53	.66		141	[illegible]	87	[illegible]	[illegible]	63	1.6
6		668.7	.58	.66		14[illegible]	[illegible]	[illegible]				
7		671.2	.67	.70		14[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	63	
8		673.6	.66	.69		1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	63	
9		675.9	.67	.70		140	87	90	[illegible]	[illegible]	63	1.6
10		678.[illegible]	.75	.79		[illegible]	[illegible]	[illegible]		[illegible]	63	
11		681.0	.77	.82		139	89	91	[illegible]	[illegible]	63	
12		683.54	.78	.81		138	89	91	[illegible]	[illegible]	63	1.6
	1630	27.89										
		(52.977)	(.740)	.597		139.2[illegible]	[illegible]5.	76				

FIELD DATA

PLANT Oxylon
DATE [illegible]
SAMPLING LOCATION [illegible]
SAMPLE TYPE [illegible]
RUN NUMBER [illegible]
OPERATOR [illegible]
AMBIENT TEMPERATURE 85°F
BAROMETRIC PRESSURE 29.79
STATIC PRESSURE, (P_s) -2.4
FILTER NUMBER (s) 24511, 42

PROBE LENGTH AND TYPE
NOZZLE I.D. [illegible]
ASSUMED MOISTURE, %
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$
C FACTOR
PITOT TUBE FACTOR
REFERENCE Δp
NOTE

READ AND RECORD ALL DATA EVERY ______ MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM in.
0925		0915	667.720 / 667.914							
1 P-L			668.234 / 667.700		.55		172	86	84	
			669.904		.55		170	86		
			674.300		.55		169	91	87	
			[illegible]		.55		[illegible]	92		
			678.630		.55		174		87	
			680.700		.55		176	93	88	
			682.500		.55		174	93	88	
		stop	684.600 / 684.930		.55		176			
START 685.220		1030	684.770	685.100	.55		170	91	87	
stop 686.44			689.150		.55		168	93	89	
START 686.650			692.200		.55		171	90	88	2
stop 686.274			693.900		.55		170	91	89	2.
START 688.348			695.500		.55		171	92	87	
stop 689.365			697.800	2.5	.55		170	92	89	3
START 689.611		Change filt.	699.750		.55		171	92	88	3.
stop 690.158			701.700		.55		172	92	88	
START 690.850			703.800		.55		170	92	89	
			705.900		.55		170	92	87	3.
			708.100		.55		169	91	88	3
			710.100		.55		164	92	89	3
stop 705.970			712.056		.35		163	91	88	
start 706.173	46		(712.537)							
		1325								
			1.673		.55		170.14	89.476		

1.673	TAP
0.55	ΔH
170.14	TS
89.476	TM
42.397	VMA
29.79	PBAR
119.	VWC
12.	WSG
131.	TH2O
28.97	MWD
0.21	AS
106.	TT
-2.4	STAT
0.125	DN
1.019	Y
0.831	CP
41.38959198	VMS
6.16713	VWS
12.96794595	%M
.8703205405	MD
27.54741633	MWS
29.61352941	PS
104.4588606	VS
1016.181644	QACT
940.9900812	QSTD
101.2026815	%I

FIELD DATA

PLANT [illegible]
DATE [illegible]
SAMPLING LOCATION [illegible] to Dryer
SAMPLE TYPE [illegible]
RUN NUMBER [illegible]
OPERATOR [illegible]
AMBIENT TEMPERATURE 85°F
BAROMETRIC PRESSURE 29.79
STATIC PRESSURE, (P_s) [illegible]
FILTER NUMBER (s) 24276

PROBE LENGTH AND TYPE
NOZZLE I.D. [illegible]
ASSUMED MOISTURE, % [illegible]
SAMPLE BOX NUMBER [illegible]
METER BOX NUMBER [illegible]
METER $\Delta H_@$ [illegible]
C FACTOR [illegible]
PITOT TUBE FACTOR [illegible]
REFERENCE Δp [illegible]
NOTE

READ AND RECORD ALL DATA EVERY 5.0 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	0	[illegible]									
X 1	5	716.1	[illegible]								
1	10	[illegible]	.38								
1	[illegible]										
2	[illegible]	[illegible]	.7	.9							
2	[illegible]	[illegible]	[illegible]	[illegible]							
2	[illegible]	[illegible]	[illegible]								
2	35	[illegible]		.7							
3	[illegible]	[illegible]		.57							
3	[illegible]	[illegible]	[illegible]	[illegible]							
4	[illegible]	[illegible]	.57	[illegible]							
4	[illegible]	[illegible]		[illegible]							
4		727.[illegible]	[illegible]	.41							
	1105										

Baghouse ΔP, in. H
1.8
1.7
1.7
1.8

STOP 1025
START 1050

[redacted]
7-13-78 Dryer [illegible]

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s) in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s) °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
	0	[illegible]	739.1[illegible]									
X 1	5		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			[illegible]
1	10		[illegible]	.36	.3[illegible]		[illegible]	[illegible]	[illegible]			[illegible]
1	15		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			[illegible]
2	20		[illegible]	[illegible]	[illegible]			[illegible]	[illegible]			
[illegible]	25		[illegible]	.57	[illegible]		[illegible]		[illegible]			
[illegible]	30		[illegible]	[illegible]	.61		[illegible]	[illegible]				[illegible]
[illegible]	[illegible]		[illegible]		.71		[illegible]	[illegible]	[illegible]			[illegible]
[illegible]	[illegible]		[illegible]	.66	[illegible]		[illegible]		[illegible]			[illegible]
[illegible]	[illegible]		[illegible]	.66	[illegible]		[illegible]	[illegible]	[illegible]			[illegible]
[illegible]	[illegible]		[illegible]	.8	66		[illegible]	[illegible]	[illegible]			[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	.24		[illegible]	[illegible]	[illegible]			[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			[illegible]				[illegible]
	[illegible]05			$\sqrt{\Delta p}$								
			51.273	.72124	.55[illegible]		[illegible]	84.396				

1.7

1.9

1.9

1.8

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant [illegible] -$(NH_4)_2SO_4$ Date 9-12-78 & 9-13-78

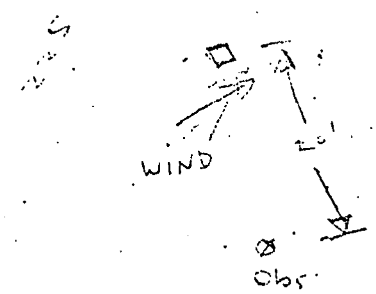
Company Name [illegible] Hours of Observation as noted

Plant Address Houston, Tx. Observer B. L. Jackson

Type of Discharge STACK OTHER ____

Discharge Location $(NH_4)_2SO_4$ Dryer

Height of Point of Discharge 45' above grade



Observer's Location:

Distance to Discharge Point 25'

Height of Observation Point 25'

Direction from Discharge Point ____

Background Description solid lt gray of building

Weather: Clear Overcast Partly Cloudy Other ____ Sky Color lt./med gray

Wind Direction ____ Wind Velocity 10-25 mi/hr

Plume Description:

Detached: Yes No Not visible

Color: Black White Other ____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other ____

Estimated Distance Plume Visible —

RECORD OF VISIBLE EMISSIONS

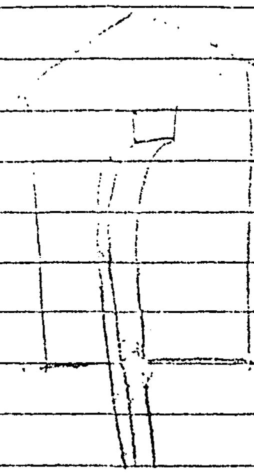
Company Name Oxychem   Date 9-12-78

Plant Address Houston, Tx   Observer [illegible]

Stack Location [illegible]   Observer's Location 25' [illegible] 20' [illegible]

Weather Conditions [illegible]

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					Wind [illegible]
09	45	N	N	N	N	mild rain
	46	N	N	N	N	⊗
	47	N	N	N	N	obs.
	48	N	N	N	N	
	49	N	N	N	N	
	50	N	N	N	N	
	51	N	N	N	N	
	52	N	N	N	N	
	53	N	N	N	N	
	54	N	N	N	N	
	55	N	N	N	N	
	56	N	N	N	N	
	57	N	N	N	N	
	58	N	N	N	N	
	59	N	N	N	N	



RECORD OF VISIBLE EMISSIONS

Company Name: OxyChem

Date: 3-12-78

Plant Address: Houston, Tx

Observer: B. L. Jackson

Stack Location: $(NH_4)_2SO_4$ Dryer.

Observer's Location: [illegible] from base [illegible]

Weather Conditions: [illegible], T=85

HR	MIN	00	15	30	45	COMMENTS
[illegible]	00	N	N	N	N	[illegible]
	01	N	N	N	N	
	02	N	N	N	N	
	03	N	N	N	N	
	04	N	N	N	N	
	05	N	N	N	N	
	06	N	N	N	N	
	07	N	N	N	N	
	08	N	N	N	N	
	09	N	N	N	N	
	10	N	N	N	N	
	11	N	N	N	N	
	12	N	N	N	N	
	13	N	N	N	N	
	14	N	N	N	N	Stop test change filter
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name [illegible] Date 7-12-79

Plant Address [illegible] Observer B. L. Jackson

Stack Location [illegible] Observer's Location [illegible] from base

Weather Conditions [illegible]

TIME						COMMENTS
HR	MIN	SECONDS				
		00	15	30	45	
[illegible]	30	[illegible]		[illegible]	[illegible]	[illegible]
	31	N	N	N	N	[illegible]
	32	N	N	N	N	
	33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	34	[illegible]	[illegible]	[illegible]	N	
	35	[illegible]	[illegible]	[illegible]	N	
	36	N	N	[illegible]	N	
	37	[illegible]	[illegible]	[illegible]	[illegible]	
	38	[illegible]	[illegible]	[illegible]	[illegible]	
	39	[illegible]	[illegible]	[illegible]	[illegible]	
	40	N	N	N	N	
	41	N	N	N	N	
	42	N	N	[illegible]	N	
	43	N	N	N	N	
	44	[illegible]	N	[illegible]	N	
	45	N	N	N	N	
	46	N	N	N	N	
	47	N	N	N	N	
	48	N	N	N	N	
	49	N	N	N	N	
	50	N	N	N	N	
	51	N	N	N	N	
	52	N	N	N	N	
	53	N	N	N	N	
	54	N	N	N	N	
	55	N	N	N	N	Stop reading
	56					
	57					
	58					
	59					

RECORD OF VISIBLE EMISSIONS

Company Name OxyChem　　Date 9-17-78

Plant Address Houston, Tx　　Observer B.L. Jackson

Stack Location [illegible] Dryer　　Observer's Location [illegible]

Weather Conditions [illegible] windy [illegible] T=85°[illegible]　　[illegible]

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
	00					
	01					
	02					
	03					
	04					
11	05	N	N	N	N	start
	06	N	N	N	N	
	07	N	N	N	N	
	08	N	N	N	N	
	09	N	N	N	N	
	10	N	N	N	N	
	11	N	N	N	N	
	12	N	N	N	N	
	13	N	N	N	N	
	14	N	N	N	N	
	15	N	N	N	N	stop unit down
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name Oxychem Date 9-12-78

Plant Address Houston, Tx. Observer [illegible]

Stack Location [illegible] Observer's Location [illegible]

Weather Conditions [illegible]

HR	MIN	00	15	30	45	COMMENTS
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
11	44	✓	✓	✓	✓	[illegible]
	45	✓	✓	✓	✓	
	46	✓	✓	✓	✓	
	47	✓	✓	✓	✓	
	48	✓	✓	✓	✓	
	49	✓	✓	✓	✓	
	50	✓	✓	✓	✓	
	51	✓	✓	✓	✓	
	52	✓	✓	✓	✓	
	53	✓	✓	✓	✓	
	54	✓	✓	✓	✓	
	55	✓	✓	✓	✓	
	56	✓	✓	✓	✓	
	57	✓	✓	✓	✓	
	58	✓	✓	✓	✓	
	59	✓	✓	✓	✓	

RECORD OF VISIBLE EMISSIONS

Company Name: Oxychem
Date: 9-12-78
Plant Address: Houston, Tx.
Observer: B.L. Jackson
Stack Location: $(NH_4)_2SO_4$ Dryer
Observer's Location: 20' from stack, 20' below [illegible]
Weather Conditions: [illegible], windy, [illegible] °F

TIME						COMMENTS
HR	MIN	SECONDS				
		00	15	30	45	
14	30	N	N	N	N	[illegible]
	31	N	N	N	N	
	32	N	N	N	N	
	33	N	N	N	N	
	34	N	N	N	N	
	35	N	N	N	N	
	36	N	N	N	N	
	37	N	N	N	N	
	38	N	N	N	N	
	39	N	N	N	N	
	40	N	N	N	N	
	41	N	N	N	N	
	42	N	N	N	N	
	43	N	N	N	N	
	44	N	N	N	N	
	45	N	N	N	N	
	46	N	N	N	N	
	47	N	N	N	N	
	48	N	N	N	N	
	49	N	N	N	N	
	50	N	N	N	N	
	51	N	N	N	N	
	52	N	N	N	N	
	53	N	N	N	N	
	54	N	N	N	N	
	55	N	N	N	N	
	56	N	N	N	N	
	57	N	N	N	N	
	58	N	N	N	N	
	59	N	N	N	N	

RECORD OF VISIBLE EMISSIONS

Company Name Oxychem

Plant Address Houston, Tx

Stack Location $(NH_3)_2SO_4$ Dryer

Weather Conditions [illegible]

Date 9-12-73

Observer

Observer's Location

HR	MIN	00	15	30	45	COMMENTS
15	00	N	N	N	N	
	01	N	N	N	N	
	02	N	N	N	N	
	03	N	N			Unit Down - stop test
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26			N	N	resume test - unit up
	27	N	N	N	N	
	28	N	N	N	N	
	29	N	N	N	N	

RECORD OF VISIBLE EMISSIONS

Company Name Oxychem Date 9-12-78

Plant Address Houston Tx. Observer B. L. Jackson

Stack Location $(NH_3)_2SO_4$ Dryer Observer's Location 20' from stack, 20' below lip

Weather Conditions [illegible] T=87°F

TIME						COMMENTS
HR	MIN	SECONDS				
		00	15	30	45	
15	30	N	N	N	N	w/ Run 2
	31	N	N	N	N	
	32	N	N	N	N	
	33	N	N	N	N	
	34	N	N	N	N	
	35	N	N	N	N	
	36	N	N	N	N	
	37	N	N	N	N	
	38	N	N	N	N	
	39	N	N	N	N	
	40	N	N	N	N	
	41	N	N	N	N	
	42	N	N	N	N	
	43	N	N	N	N	
	44	N	N	N	N	
	45	N	N	N	N	
	46	N	N	N	N	
	47	N	N	N	N	
	48	N	N	N	N	
	49	N	N	N	N	
	50	N	N	N	N	
	51	N	N	N	N	
	52	N	N	N	N	
	53	N	N	N	N	
	54	N	N	N	N	Sun visible
	55	N	N	N	N	
	56	N	N	N	N	
	57	N	N	N	N	
	58	N	N	N	N	
	59	N	N	N	N	

RECORD OF VISIBLE EMISSIONS

Company Name Oxychem

Date 9-12-78

Plant Address Houston, Tx

Observer B. L. Jackson

Stack Location (NH4) Soy Dryer

Observer's Location 20' from stack 20' below

Weather Conditions cl windy [illegible]

HR	MIN	00	15	30	45	COMMENTS
16	00	N	N	N	N	w/ Test 2
	01	N	N	N	N	
	02	N	N	N	N	
	03	N	N	N	N	
	04	N	N	N	N	
	05	N	N	N	N	
	06	N	N	N	N	
	07	N	N	N	N	
	08	N	N	N	N	
	09	N	N	N	N	
	10	N	N	N	N	
	11	N	N	N	N	
	12	N	N	N	N	
	13	N	N	N	N	
	14	N	N	N	N	
	15	N	N	N	N	
	16	N	N	N	N	
	17	N	N	N	N	
	18	N	N	N	N	
	19	N	N	N	N	
	20	N	N	N	N	
	21	N	N	N	N	End of Test
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name [illegible]

Date [illegible]

Plant Address [illegible]

Observer [illegible]

Stack Location [illegible]

Observer's Location [illegible]

Weather Conditions [illegible]

[redacted]-test 3

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					
	50					
	51					
09	52	N	N	N	N	Start opacity test [illegible]
	53	N	N	N	N	
	54	N	N	N	[illegible]	
	55	N	N	N	N	
	56	[illegible]	[illegible]	N	N	
	57	[illegible]	N	N	N	
	58	N	N	N	N	
	59	N	N	N	N	

RECORD OF VISIBLE EMISSIONS

Company Name Oxychem

Date [illegible]-13-[illegible]

Plant Address [illegible]

Observer B. L. Jackson

Stack Location [illegible]

Observer's Location [illegible]

Weather Conditions [illegible]

HR	MIN	SECONDS 00	15	30	45	COMMENTS
1[illegible]	00	[illegible]	[illegible]	[illegible]	[illegible]	
	01	N	N	N	N	
	02	N	N	N	N	[illegible] plume? ~2' from exit
	03	N	N	N	N	
	04	N	N	N	N	
	05	N	N	N	N	
	06	N	N	N	N	
	07	N	N	N	N	
	08	N	N	N	N	
	09	N	N	N	N	
	10	N	N	N	N	
	11	N	N	N	N	
	12	N	N	N	N	
	13	N	N	N	N	
	14	N	N	N	N	
	15	N	N	N	N	
	16	N	N	N	N	
	17	N	N	N	N	
	18	N	N	N	N	
	19	N	N	N	N	
	20	N	N	N	N	
	21	N	N	N	N	
	22	N	N	N	N	
	23	N	N	N	N	
	24	N	N	N	N	
	25	N	N	N	N	
	26	N	N	N	N	
	27	N	N	N	N	Stop test - clean centrifuge
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name [illegible]　　Date 3-13-78

Plant Address Houston Tx　　Observer R. L. Jacks[illegible]

Stack Location [illegible]　　Observer's Location [illegible]

Weather Conditions [illegible]

HR	MIN	00	15	30	45	COMMENTS
[illegible]	00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] test
	01	N	N	N	N	
	02	N	N	N	N	
	03	N	N	N	N	
	04	N	N	N	N	
	05	[illegible]	N	[illegible]	N	
	06	[illegible]	[illegible]		[illegible]	
	07	N	[illegible]	[illegible]	[illegible]	
	08	N	N	N	N	
	09	N	N	N	N	
	10	N	N	N	N	Stop test change filter
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name [illegible] Date [illegible]

Plant Address [illegible] Observer [illegible]

Stack Location [illegible] Observer's Location [illegible]

Weather Conditions [illegible]

TIME						COMMENTS
HR	MIN	SECONDS				
		00	15	30	45	
11	30	N	N	N	N	[illegible]
	31	N	N	N	N	
	32	N	N	N	N	
	33	N	N	N	N	
	34	N	N	N	N	
	35	N	N	N	N	
	36	N	N	N	N	
	37	N	N	N	N	
	38	N	N	N	N	
	39	N	N	N	N	
	40	N	N	N	N	
	41	N	N	N	N	
	42	N	N	N	N	
	43	N	N	N	N	
	44	N	N	N	N	
	45	N	N	N	N	
	46	N	N	N	N	
	47	N	N	N	N	
	48	N	N	N	N	
	49	N	N	N	N	
	50	N	N	N	N	
	51	N	N	N	N	
	52	N	N	N	N	
	53	N	N	N	N	
	54	N	N	N	N	
	55	N	N	N	N	
	56	N	N	N	N	
	57	N	N	N	N	
	58	N	N	N	N	
	59	N	N	N	N	

RECORD OF VISIBLE EMISSIONS

Company Name Chevron Date 9-13-78

Plant Address [illegible] Observer R. L. Jackson

Stack Location [illegible] Observer's Location [illegible]

Weather Conditions [illegible]

HR	MIN	00	15	30	45	COMMENTS
[illegible]	00	N	N	N	N	[illegible] v. lt. rain
	01	N	N	N	N	
	02	N	N	N	N	
	03			N	N	
	04	N	N	N	N	
	05	N	N	N	N	
	06	N	N	N	N	unplug nozzle
	07					
	08					
	09					
	10					
	11	N	N	N	N	restart test
	12	N	N	N	N	
	13	N	N	N	N	
	14	N	5	5	5	H_2O? H_2O droplets from [illegible]
	15	5	5	5	5	Anderson Particle Size Dist. Test
	16	5	5	0	0	at ΔH=3.1 in H_2O [illegible]
	17	0	0	0	0	766.190 87.90
	18	0	0	N	N	770.008 4 min
	19	N	N	N	N	3.818 92.96
	20	N	N	N	N	
	21	N	N	N	N	
	22	N	N	N	N	
	23	N	N	N	N	
	24	N	N	N	N	
	25	N	N	N	N	end test
	26					
	27					
	28					
	29					

APPENDIX B

LABORATORY REPORTS

ANALYTICAL DATA

PLANT Oxychem

DATE 9-12-78

SAMPLING LOCATION Inlet Dryer

SAMPLE TYPE Particulate EPA-5

RUN NUMBER One

SAMPLE BOX NUMBER 1

CLEAN UP MAN O'Neill / Maloney

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER OI-1P 2721.2 mg

FILTER NUMBER — CONTAINER OI-1F 520.4 mg

24290	134.7
24299	240.9
24292	144.8

FRONT HALF SUBTOTAL 3,241.6 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER ______ mg

ETHER-CHLOROFORM EXTRACTION ______ mg

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER ______ mg

BACK HALF SUBTOTAL ______ mg

TOTAL WEIGHT 3,241.6 mg

MOISTURE

IMPINGERS

FINAL VOLUME 342 ml

INITIAL VOLUME 200 ml

NET VOLUME 142 ml

SILICA GEL

FINAL WEIGHT 214 g ______ g

INITIAL WEIGHT 200 g ______ g

NET WEIGHT 14 g ______ g

SUBTOTAL ______ g

142
14
156

TOTAL MOISTURE 156 g

ANALYTICAL DATA

PLANT ____________________

DATE ____________________

SAMPLING LOCATION ____________________

SAMPLE TYPE ____________________

RUN NUMBER ____________________

SAMPLE BOX NUMBER ____________________

CLEAN UP MAN ____________________

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER 00-1P — 57.4 mg

FILTER NUMBER [illegible] — CONTAINER 00-1F — 40.5 mg

FRONT HALF SUBTOTAL 99.9 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER ______ — ______ mg

ETHER-CHLOROFORM EXTRACTION ______ mg

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER ______ — ______ mg

BACK HALF SUBTOTAL ______ mg

TOTAL WEIGHT 99.9 mg

MOISTURE

IMPINGERS

FINAL VOLUME	372	ml
INITIAL VOLUME	200	ml
NET VOLUME	172	ml

SILICA GEL

FINAL WEIGHT	[illegible]	g		g
INITIAL WEIGHT	[illegible]	g		g
NET WEIGHT	[illegible]	g		g

SUBTOTAL ______ g

172
14
186

TOTAL MOISTURE ______ g

ANALYTICAL DATA

PLANT Oxy chemical

DATE 9/12/75

SAMPLING LOCATION INLET

SAMPLE TYPE [illegible]

RUN NUMBER 2

SAMPLE BOX NUMBER 1

CLEAN-UP MAN [illegible]

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER OI-2P 2563.7 mg

FILTER NUMBER 24295 381.7 — CONTAINER OI-2F 381.7 mg

FRONT HALF SUBTOTAL 2,945.4 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER ____ — mg

ETHER-CHLOROFORM EXTRACTION — mg

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER ____ — mg

BACK HALF SUBTOTAL — mg

TOTAL WEIGHT	2,945.4 mg

MOISTURE

IMPINGERS

FINAL VOLUME 325 ml

INITIAL VOLUME 200 ml

NET VOLUME 125 ml

227
150
79
256
325

127
12.5
[illegible]

SILICA GEL

FINAL WEIGHT 212.5 g ____ g

INITIAL WEIGHT 200 g ____ g

NET WEIGHT 12.5 g ____ g

SUBTOTAL ____ g

TOTAL MOISTURE [illegible] g

ANALYTICAL DATA

PLANT Oxi Chem

DATE 9/12/78

SAMPLING LOCATION [illegible]

SAMPLE TYPE [illegible]

RUN NUMBER 2

SAMPLE BOX NUMBER 1

CLEAN-UP MAN [illegible]

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER

CONTAINER 00-2P 142.3 mg

FILTER NUMBER 24284

CONTAINER 00-2F 140.5 mg

FRONT HALF SUBTOTAL 282.8 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER

CONTAINER ______ — mg

ETHER-CHLOROFORM EXTRACTION — mg

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER

CONTAINER ______ — mg

BACK HALF SUBTOTAL — mg

TOTAL WEIGHT 282.8 mg

MOISTURE

IMPINGERS

FINAL VOLUME 330 ml

INITIAL VOLUME 200 ml

NET VOLUME 130 ml

130
+15
145

SILICA GEL

FINAL WEIGHT 215 g ______ g

INITIAL WEIGHT 200 g ______ g

NET WEIGHT 15 g ______ g

SUBTOTAL ______ g

TOTAL MOISTURE 145 g

ANALYTICAL DATA

PLANT [illegible]

DATE [illegible]

SAMPLING LOCATION [illegible]

SAMPLE TYPE

RUN NUMBER

SAMPLE BOX NUMBER

CLEAN UP MAN

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER

CONTAINER [illegible] 7,297.1 mg

FILTER NUMBER

[illegible]	2336.8
2093	655.3
	2992.1

CONTAINER [illegible] 2,992.1 mg

FRONT HALF SUBTOTAL 10,289.2 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER

CONTAINER ______ ______ mg

ETHER-CHLOROFORM EXTRACTION ______ mg

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER

CONTAINER ______ ______ mg

BACK HALF SUBTOTAL ______ mg

TOTAL WEIGHT ______ mg

MOISTURE

IMPINGERS

FINAL VOLUME 319 ml

INITIAL VOLUME [illegible] ml

NET VOLUME [illegible] ml

119
12
131

SILICA GEL

FINAL WEIGHT [illegible] g ______ g

INITIAL WEIGHT [illegible] g ______ g

NET WEIGHT 12 g ______ g

SUBTOTAL ______ g

TOTAL MOISTURE 131 g

ANALYTICAL DATA

PLANT ______

DATE ______

SAMPLING LOCATION ______

SAMPLE TYPE ______

RUN NUMBER ______

SAMPLE BOX NUMBER ______

CLEAN UP MAN ______

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER	CONTAINER ______	234.4 mg
FILTER NUMBER 3V295	CONTAINER ______	64.7 mg
	FRONT HALF SUBTOTAL	299.1 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER ______	______ mg
	ETHER-CHLOROFORM EXTRACTION	______ mg
ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER ______	______ mg
	BACK HALF SUBTOTAL	______ mg
	TOTAL WEIGHT	299.1 mg

MOISTURE

IMPINGERS

FINAL VOLUME ______ ml

INITIAL VOLUME ______ ml

NET VOLUME ______ ml

SILICA GEL

FINAL WEIGHT ______ g ______ g

INITIAL WEIGHT ______ g ______ g

NET WEIGHT ______ g ______ g

SUBTOTAL ______ g

TOTAL MOISTURE ______ g

TITLE Oxy Chem — Houston Texas

Project No.

Book No.

From Page No. O

SAMPLE #	BEAKER #	TSU ML	FINAL(1) GMS	FINAL(2) GMS	TARE 1 GMS	TARE 2 GMS	ΔWT GMS	-BLK CORR.	GMS
Acetone: OI-1P	A	Ace 730	117.8015	117.8017	115.0797	115.0792	2.7223	.0011	2.71[illegible]
OI-2P	B	" 860	106.5250	106.5251	103.9601	[illegible]	2.5650	.0013	2.563[illegible]
OO-2P	C	" 410	108.4020	108.4019	108.2590	108.2593	0.1929	.0006	0.1923
OO-1P	D	" 350	107.4865	107.4865	107.4266	[illegible]	0.0599	.0005	0.059[illegible]
H_2O wash: OI-3P	E	H_2O 340	120.0954	120.0956	112.7972	[illegible]	7.2983	.0012	7.297[illegible]
OO-3P	F	H_2O 200	108.6242	108.6241	108.3890	[illegible]	0.2351	.0007	0.234[illegible]

Blanks: Acetone = .0003g/200ml = .0000015 g/ml

H_2O = .0007g/200ml = .0000035 g/ml

% Moisture Product $(NH_3)SO_4$

			Final(1)	Final(2)	Tare(1)	Tare(2)	
RUN 1	INLET	K7			24.2596	24.2598	—
RUN 1	OUTLET	4F			23.7664	23.7[illegible]	
RUN 2	INLET	H			24.7897	24.7877	
RUN 2	OUTLET	B9			24.1496	24.1497	
RUN 3	INLET	7L			23.6182	23.6181	
RUN 3	OUTLET	N31			23.5724	23.5122	

%M:	dish #	Final 1	Final 2	Dish + Product	Tare 1	Tare 2	ΔWt.	Δ Loss	%
Run 1 Inlet	1	3.0600	3.0597	3.0679	1.2689	1.2690	1.7990	.0082	0.46
" outlet	2	3.3896	3.3849	3.3874	1.2690	1.2689	2.1185	.0030	0.1[illegible]
Run 2 Inlet	3	3.2588	3.2587	3.2687	1.2670	1.2670	2.0017	.0100	0.50
" Outlet	4	3.1932	3.1931	3.1966	1.2659	1.2658	1.8808	.0035	0.19
Run 3 Inlet	5	3.1051	3.1097	3.1143	1.2669	1.2669	1.8474	.0099	0.54
" Outlet	6	3.5577	3.5575	3.5583	1.2655	1.2657	2.2928	.0008	0.03

To Page No.

Witnessed & Understood by me.	Date	Invented by	Date
BLJ	9-19,15-78	Recorded by	
	9-18,19-78		

11 4 filters 400 ... on 4/...

TITLE Project No. Book No.

From Page No. Client / Sample	Filter #	FINAL 1	FINAL 2	TARE 1	TARE 2	FINAL 3	Δ WT
	24279	1.5194	1.5198	.4123			1.1071
	24280	.4306	.4302	.4164			0.0138
41I	24281	1.3121	1.3118	.4103			0.9015
41O	24282	.4360	.4358	.4127			0.0231
42I	24283	1.6770	1.6875	.4124			1.2646
42O	24284	.4428	.4425	.4142			0.0283
43I	24285	1.4798	1.4802	.4121			1.0677
43O	24286	.4359	.4355	.4135			0.0203
	24287	1.1260	1.1256	.4152			0.7104
	24288			.4136			
Oxy Chem Houston, Texas	24289	.6547	.6545	.4136	.4138		0.2409
	24290	.5478	.5474	.4127	.4130		0.1347
	24291	.4578	.4577	.4172	.4172		0.0405
	24292	.5598	.5596	.4150	.4145		0.1448
	24293	1.0703	1.0701	.4148	.4148		0.6553
	24294	.5541	.5543	.4136	.4139		0.1405
	24295	.7936	.7934	.4120	.4117		0.3817
	24296	.4433	.4431	.3784	.3786		0.0647
	24297	.3928	.3920	.3785			0.0143
	24298	.9630	.9627	.3774			0.5853
	24299	1.3647	1.3641	.3795			0.9852
	24300	1.4334	1.4329	.3782			1.0547 ?
	24301	.4062	.4062	.3777			0.0280
	24302			.4147			
	24303			.4114			
MB-RC	24304	.4409	.4411	.4147			.0262
MB-55	24305	.5676	.5677	.4131			.1545
MB-30	24306	.4447	.4447	.4142			.0305
B8-1FP	24307	.9563	.9559	.4159			.5400
	24308		1.	.4178			
B8-2FP	24309	1.2108	1.2108	.3748			.8360
B8-3FP 2 of 2	24310	.8948	.8938	.3806			.5132 } .6255
B8-3FP 1 of 2	24311	.4916	.4908	.3785			.1123
	24312			.3753			
	24313			.3752			
	24314			.3769			

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	

11 4 [illegible] G.F. Filters [illegible]

TITLE

Project No.

Book No.

COPY

From Page No.

Client/Sample	Filter No.	Final 1	Final 2	Final 3	Tare 1	Tare 2	Δwt
	24315	0.			0.3763	.3761	
	24316	.			.3738	.3739	
	24317	.			.3741	.3741	
	24318	.			.3767	.3767	
	24319	.			.3746	.3749	
	24320	.			.3744	.3742	
	24321	.			.3740	.3741	
	24322	.			.3737	.3739	
	24323	.			.3770	.3771	
	24314	.			.3704	.3703	
	24325	.			.3769	.3770	
	24326	.			.3765	.3762	
	24327	.			.3754	.3751	
	24328	.			.3780	.3779	
	24329	.			.3768	.3769	
	24330	.			.3790	.3790	
	24331	.			.4158	.4160	
	24332	.			.4124	.4126	
	24333	.			.4127	.4131	
	24334	.			.4100	.4102	
	24335	.			.4134	.4133	
	24336	.			.4138	.4136	
	24337	.			.4163	.4164	
	24338	.			.4148	.4149	
	24339	.			.4131	.4131	
	24340	.			.4149	.4151	
oxy chem, Tex	24341	2.7106	2.7101		.3733	.3733	2.3368
	24342	.			.3722	.3720	
	24343	.			.3713	.3715	
	24344	.			.3739	.3738	
	24345	.			.3745	.3749	
	24346	.			.3741	.3743	
	24347	.			.3755	.3758	
	24348	.			.3746	.3745	
	24349	.			.3740	.3742	
	24350	.			.3695	.3698	

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	

[illegible] - II

TITLE Anderson Particle Size Filters   Project No. ______ Book No. ______   6

From Page No. ____ Client	Filter Number	Final 1	Final 2	Tare	Tare 1		ΔWT (g)
	5E-1	.1815	.1819	~~.1771~~	.1805		.0010
	5E-2	.1803	.1806	~~[illegible]~~	.1791		.0012
	5E-3	.1727	.1731	~~.1776~~	.1717		.0010
	5E-4	.1787	.1786	~~.1717~~	.1776		.0011
	5E-5	.1910	.1915	~~[illegible]~~	.1900		.0010
	5E-6	.1883	.1884	~~.1900~~	.1822		.0061
	5E-7	.2002	.2006	~~.1793~~	.1909		.0093
	5E-8	.1855	.1856	~~[illegible]~~	.1793		.0062
	5E-9 Bu	.2191	.2195		.2167		.0024
	6E-1	.1872	.1870	~~[illegible]~~	.1840		.0030
	6E-2	.1816	.1817	~~.1840~~	.1792		.0024
	6E-3	.1853	.1853	~~[illegible]~~	.1823		.0030
	6E-4	.1818	.1818	~~[illegible]~~	.1791		.0027
	6E-5	.1849	.1846	~~[illegible]~~	.1816		.0030
	6E-6	.1827	.1826	~~[illegible]~~	.1794		.0032
	6E-7	.1877	.1877	~~[illegible]~~	.1824		.0053
	6E-8	.1832	.1832	~~[illegible]~~	.1807		.0025
	6E-9 Bu	.2169	.2168	~~.2137~~	.2137		.0031
	7E-1	.2270	.2267	~~.1776~~	.1810		.0457
Oxy Chem	7E-2	.1813	.1813	~~[illegible]~~	.1776		.0037
Houston	7E-3	.1840	.1837	~~[illegible]~~	.1817		.0018
Tex.	7E-4	.1797	.1797	~~[illegible]~~	.1787		.0010
	7E-5	.1849	.1850	~~.1767~~	.1834		.0015
	7E-6	.1775	.1775	~~.1834~~	.1767		.0008
	7E-7	.1819	.1818	~~.1785~~	.1810		.0008
	7E-8	.1798	.1801	~~.1810~~	.1785		.0013
	7E-9 Bu	.2149	.2147	~~.2139~~	.2139		.0008
	8E-1	.1752	.1748	~~[illegible]~~	.1727		.0021
	8E-2	.1807	.1807	~~[illegible]~~	.1781		.0026
	8E-3	.1790	.1791	~~.1790~~	.1764		.0027
	8E-4	.1816	.1815	~~.1764~~	.1790		.0025
	8E-5	.1742	.1742	~~.1779~~	.1720		.0022
	8E-6	.1843	.1839	~~.1720~~	.1799		.0040
	8E-7	.1844	.1841	~~[illegible]~~	.1786		.0055
	8E-8	.1838	.1837	~~[illegible]~~	.1812		.0025
	8E-9 Bu	.2185	.2180	~~[illegible]~~	.2147		

To Page No. 0033

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	

APPENDIX C

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS

Test Run 1 - Ammonium Sulfate Dryer Baghouse Exhaust Stack

1. Volume of dry gas sampled at standard conditions (68^oF, 29.92 in. Hg), dscf.

$$V_{m(std)} = \frac{17.647 \times Y \times V_m \times \left(P_b + \frac{\Delta H}{13.6}\right)}{\left(T_m + 460\right)}$$

$$V_{m(std)} = \frac{17.647 \times 1.006 \times 56.60 \times \left(29.97 + \frac{0.69}{13.6}\right)}{\left(85.4 + 460\right)} = 54.94$$

Where:

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.

V_m = Volume of gas sample measured by the dry gas meter at meter conditions, dcf.

P_b = Barometric pressure, in. Hg.

ΔH = Average pressure drop across the orifice meter, in. H_2O.

T_m = Average dry gas meter temperature, ^oF.

17.647 = Factor that includes ratio of standard temperature (528^oR) to standard pressure (29.92 in. Hg), ^oR/in. Hg.

Y = Dry gas meter calibration factor.

2. Volume of water vapor in the gas sample corrected to standard conditions, scf.

$$V_{w(std)} = (0.04707 \times V_{wc}) + 0.04715 \times W_{wsg}$$

$$V_{w(std)} = (0.04707 \times 172) + (0.04715 \times 14) = 8.76$$

Where:

$V_{w(std)}$ = Volume of water vapor in the gas sample corrected to standard conditions, scf.

V_{wc} = Volume of liquid condensed in impingers, ml.

W_{wsg} = Weight of water vapor collected in silica gel, g.

0.04707 = Factor which includes the density of water (0.002201 lb/ml), the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant [21.85 (in. Hg) (ft^3)/(lb-mole)(^oR)] ; absolute temperature at standard conditions (528^oR), absolute pressure at standard conditions (29.92 in. Hg), ft^3/ml.

0.04715 = Factor which includes the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant [21.85 (in. Hg)(ft^3)/(lb-mole)(^oR)]. absolute temperature at standard conditions (528^oR), absolute pressure at standard conditions (29.92 in. Hg), and 453.6 g/lb, ft^3/g.

3. Moisture content.

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

$$B_{ws} = \frac{8.76}{8.76 + 54.94} = 0.137$$

Where:

B_{ws} = Proportion of water vapor, by volume, in the gas stream, dimensionless.

4. Mole fraction of dry gas.

$$M_d = 1 - B_{ws}$$

$$M_d = 1 - 0.137 = 0.863$$

Where:

M_d = Mole fraction of dry gas, dimensionless

5. Dry molecular weight of gas stream, lb/lb-mole.

$$MW_d = 0.440(\%CO_2) + 0.320\ (\%O_2) + 0.280\ (\%N_2 + \%\ CO)$$

$$MW_d = (0.440 \times \quad) + (0.320 \times \quad) + [0.280 (\quad + \quad)]$$

$$= 28.97 \text{ (Air)}$$

Where:

MW_d = Dry molecular weight, lb/lb-mole.

$\%CO_2$ = Percent carbon dixoide by volume, dry basis.

$\%O_2$ = Percent oxygen by volume, dry basis.

$\%N_2$ = Percent nitrogen by volume, dry basis.

$\%CO$ = Percent carbon monoxide by volume, dry basis.

0.440 = Molecular weight of carbon dioxide, divided by 100.

0.320 = Molecular weight of oxygen, divided by 100.

0.280 = Molecular weight of nitrogen or carbon monoxide, divided by 100.

6. Actual molecular weight of gas stream (wet basis), lb/lb-mole.

$$MW_s = (MW_d \times M_d) + [18 (1 - M_d)]$$

$$MW_s = (28.97 \times 0.863) + [18 (1 - 0.863)]$$

$$= 27.46$$

Where:

MW_s = Molecular weight of wet gas, lb/lb-mole.

18 = Molecular weight of water, lb/lb-mole.

7. Average velocity of gas stream at actual conditions, ft/sec.

$$V_s = 85.49 \times C_p \times (\sqrt{\Delta p})_{avg.} \times \left[\frac{T_s \text{ (avg)}}{P_s \times MW_s} \right]^{\frac{1}{2}}$$

$$\bar{v}_s = 85.49 \times 0.843 \times 0.769 \times \left[\frac{591}{30.09 \times 27.46} \right]^{\frac{1}{2}}$$

$$= 46.9$$

Where:

$\bar{v}_s$ = Average gas stream velocity, ft/sec.

85.49 = Pitot tube constant, ft/sec x $\left[\frac{(lb/lb\text{-}mole)(in.Hg)}{(^oR)\ (in.\ H_2O)} \right]^{\frac{1}{2}}$.

C_p = Pitot tube coefficient, dimensionless.

Δp = Velocity head of stack gas, in H_2O.

T_s = Absolute gas stream temperature, ^oR.

P_s = Absolute gas stack pressure, in. Hg.

8. Average gas stream dry volumetric flow rates, dscf/min.

$$Q_{s(std)} = \frac{1058.8 \times v_s \times A_s \times M_d \times P_s}{T_s}$$

$$Q_{s(std)} = \frac{1058.8 \times 46.9 \times 0.449 \times 0.863 \times 30.09}{(131 + 460)}$$

$$= 980.$$

Where:

$Q_{s(std)}$ = Volumetric flow rate of dry stack gas, corrected to standard conditions, dscf/min.

A_s = Cross-sectional area of stack, ft^2.

1058.8 = Factor which includes standard temperature (528^oR), standard pressure (29.92 in. Hg), and 60 sec/min, $\frac{(^oR)\ (sec)}{(in.\ Hg)(min)}$.

9. Isokinetic variation calculated from intermediate values, percent.

$$I = \frac{17.316 \times T_s \times V_{m(std)}}{v_s \times \theta \times P_s \times M_d \times (D_n)^2}$$

$$I = \frac{17.316 \times 591 \times 54.94}{46.9 \times 120 \times 30.09 \times 0.863 \times (0.189)^2}$$

$$= 107.8$$

Where:

I = Percent of isokinetic sampling.

θ = Total sampling time, minutes.

D_n = Diameter of nozzle, inches.

17.316 = Factor which includes standard temperature ($528^{o}R$), standard pressure (29.92 in. Hg), the formula for calculating area of circle $\frac{\pi D^2}{4}$, conversion of square feet to square inches (144), conversion of seconds to minutes (60), and conversion to percent (100), $\frac{(in.\ Hg)\ (in^2)\ (min)}{(^{o}R)\ (ft^2)\ (sec)}$.

10. Particulate concentration, gr/dscf.

$$C_1 = 0.015432 \times \frac{M_t}{V_{m(std)}}$$

$$C_1 = 0.015432 \times \frac{99.9}{54.94} = 0.028$$

Where:

C_1 = Particulate concentration, gr/dscf.

M_t = Total weight of particulate caught by train, mg.

0.015432 = Conversion factor of gr/mg.

11. Particulate mass emission rate, lb/hr.

$$PMR_t = 0.0085714 \times C_1 \times Q_{s(std)}$$

$$= 0.0085714 \times 0.028 \times 980 = 0.24$$

Where:

PMR_t	=	Particulate mass emission rate, lb/hr.
0.0085714	=	Conversion factor relating minutes to hours (60), and grains to pounds (7,000), (lb) (min)/(gr) (hr).

APPENDIX D

EQUIPMENT CALIBRATION DATA

L.C.$_{15}$: .006 CFM
VAC$_{MAX}$ = 26

By GREG CELIANO

Date 9/7/78 Box No. 1204

Barometric pressure, P_b = 29.86 in. Hg Dry gas meter No. ORIGINAL

Orifice manometer setting, ΔH, in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average t_d, °F	Time θ, min	γ	$\Delta H_@$
0.5	5.000	5.041	75 74	71 84	74 78	76.75	12.216	.9948	1.686
1.0	~~8~~ 10.004	9.964	75 75	84 95	79 90	87.75	17.550	1.025	1.707
2.0	~~10~~ 9.995	10.314	75 75	94 106	90 97	96.75	13.166	1.004	1.893
1.5 ~~4.0~~	~~10~~ 4.997	5.192	75 75	102 107	96 99	101.0	7.450	1.006	1.805
1.5 ~~6.0~~	~~10~~ 4.998	5.246	75 76	103 108	99 102	103.0	7.450	.9989	1.759
8.0	10								
						Average		1.006	1.776

Calculations

ΔH	$\frac{\Delta H}{13.6}$	γ: $\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H_@$: $\frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737		
2.0	0.147		
1.5 ~~4.0~~	0.294		
1.5 ~~6.0~~	0.431		
8.0	0.583		

γ = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

$\Delta H_@$ = Orifice pressure differential that gives 0.75 cfm of air at 70° F and 29.92 inches of mercury, in. H_2O. Tolerance - ± 0.15

L.C.$_{15}$ = .002 cfM

UAC$_{MAX}$ = 24

Date 9/8/78　　　　　　　　Box No. 1225

Barometric pressure, P_b = 30.03 in. Hg　　　　Dry gas meter No. ORIGINAL

Orifice manometer setting, ΔH, in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Dry gas meter Outlet t_{do}, °F	Dry gas meter Average t_d, °F	Time θ, min	Y	$\Delta H_@$
0.5	5.000	4.883	74 74	72 88	70 78	77.0	12.65	1.028	1.799
1.0	~~5~~ 4.999	4.991	74 74	85 95	77 82	84.75	9.216	1.0134	1.878
2.0	10.001	10.160	74 73	93 102	81 88	91.0	13.416	1.0117	1.962
4.0	10.000	10.361	73 73	99 108	87 91	96.25	9.833	.9975	2.085
1.5 ~~6.0~~	~~10~~ 5.000	5.245	73 73	102 106	90 92	97.5	7.583	.9935	1.856
8.0	10								
						Average		1.009	1.915

Calculations

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H_@$: $\frac{0.0317 \Delta H}{P_b (t_d + 460)}\left[\frac{(t_w + 460)\theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737		
2.0	0.147		
4.0	0.294		
1.5 ~~6.0~~	0.431		
8.0	0.588		

Y = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

$\Delta H_@$ = Orifice pressure differential that gives 0.75 cfm of air at 70° F and 29.92 inches of mercury, in. H_2O. Tolerance - ± 0.15

Date 9-18-79 Box No. 1225

Barometric pressure, P_b = ___in. Hg Dry gas meter No. ________

Orifice manometer setting, ΔH, in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test meter, t_w, °F	Temperature: Dry gas meter, Inlet t_{di}, °F	Temperature: Dry gas meter, Outlet t_{do}, °F	Temperature: Dry gas meter, Average t_d, °F	Time θ, min	γ	$\Delta H_@$
0.5	5					ave	of	3	= 1.82
1.0	5.050 5	736.105 741.155	70 70	88 72	80 72	85.5	9.32	1.016	1.88
2.0	10.101	751.226	70 70	72 77	[illegible] 76	83	13.67	1.003	2.02
4.0	10	761.584	70	[illegible]	[illegible]	91	9.92	1.004	2.12
6.0	10								
8.0	10								
						Average			1.96

Calculations

ΔH	$\frac{\Delta H}{13.6}$	γ: $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H_@$: $\frac{0.0317 \Delta H}{P_b (t_d + 460)}\left[\frac{(t_w + 460)\theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737		
2.0	0.147		
4.0	0.294		
6.0	0.431		
8.0	0.588		

γ = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

$\Delta H_@$ = Orifice pressure differential that gives 0.75 cfm of air at 70° F and 29.92 inches of mercury, in. H_2O. Tolerance - ± 0.15

JDO
Inlet 0.5

Date 9-18-78 Box No. 1225

Barometric pressure, P_b = 30.12 in. Hg Dry gas meter No. 11

Orifice manometer setting, ΔH, in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average t_d, °F	Time θ, min	Y	$\Delta H@$
0.5	4.945 5	776.095 781.038	70 70	72 70	69 80	72.75	12.85	1.019	1.83
~~1.0~~ 0.5	4.952 5	" " 781.030	70 70	72 75	71 80	79.	12.83	1.019	1.81
~~2.0~~ 0.5	~~10~~ 5	" " 781.077	70 70	72 79	56 85	[illegible]	12.87	1.018	1.81
4.0	[illegible] 10								
6.0	10								
8.0	10								
						Average		1.0187	1.82

$\gamma = 1.019$

Calculations

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H@$: $\frac{0.0317\ \Delta H}{P_b\ (t_d + 460)}\left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737		
2.0	0.147		
4.0	0.294		
6.0	0.431		
8.0	0.588		

Y = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

$\Delta H@$ = Orifice pressure differential that gives 0.75 cfm of air at 70° F and 29.92 inches of mercury, in. H_2O. Tolerance - ± 0.15

JDO

Date 9-18-78 Box No. 1204

Barometric pressure, P_b = ___in. Hg Dry gas meter No. ______

Orifice manometer setting, ΔH, in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test: Meter t_w, °F	Temperature: Dry gas meter: Inlet t_{di}, °F	Temperature: Dry gas meter: Outlet t_{do}, °F	Temperature: Dry gas meter: Average t_d, °F	Time θ, min	γ	$\Delta H_@$
0.5	5	773.162 75.203	74 74	83 84	80 80	84	12,48	1.008	1.71
1.0	5	78.998 83.504	77 74	90 90	90 85	87	9.13	1.005	1.83
2.0	10	93.572	74 74	103	88 85	89	13.35	0.996	1.95
4.0	10								
6.0	10								
8.0	10								
						Average		1.004	1.83

Calculations

ΔH	$\frac{\Delta H}{13.6}$	γ: $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H_@$: $\frac{0.0317\ \Delta H}{P_b\ (t_d + 460)}\left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737		
2.0	0.147		
4.0	0.294		
6.0	0.431		
8.0	0.588		

γ = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

$\Delta H_@$ = Orifice pressure differential that gives 0.75 cfm of air at 70° F and 29.92 inches of mercury, in. H_2O. Tolerance - ± 0.15

JDO

Date 9-18-78 Box No. 1204

Barometric pressure, P_b = ___ in. Hg Dry gas meter No. ________

Orifice manometer setting, ΔH, in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average t_d, °F	Time θ, min	γ	$\Delta H_@$
0.7 ~~0.5~~	5	[illegible]	74 74	90 89	80 80	549	10.25	1.006	1.77
0.7 ~~1.0~~	5	[illegible]	74 74	9[illegible] "	80 "	"	10.50	1.006	1.77
2.0	10								
4.0	10								
6.0	10								
8.0	10								

Average γ = 1.006 1.78

Calculations

ΔH	$\frac{\Delta H}{13.6}$	$\gamma = \frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H_@ = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737		
2.0	0.147		
4.0	0.294		
6.0	0.431		
8.0	0.588		

γ = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

$\Delta H_@$ = Orifice pressure differential that gives 0.75 cfm of air at 70° F and 29.92 inches of mercury, in. H_2O. Tolerance - ± 0.15

BY BLJ DATE 6/2/77 **WESTON** SHEET ______ OF ______

CHKD BY ______ DATE ______ W.O. NO. ______

PROJECT ______

SUBJECT Pitot Tube Calibration Factors

Pitot ID #	"A" Side 0.90	0.46	0.192	0.024	Avg.	"B" Side 0.90	0.46	0.192	0.024	
E	.848	.832	.830	.844	.839	.848	.832	.839	.832	.8[illegible]
G	.821	.821	.813	.820	.819	.825	.825	.828	.820	8[illegible]
H	.839	.840	.848	.844	.843	.843	.830	.837	.844	.83[illegible]
I	.839	.841	.828	.832	.835	.830	.834	.828	.832	.83[illegible]
J	.830	.836	.820	.820	.827	.834	.829	.820	.820	.82[illegible]
	.65	.330	.125			.65	.330	.125		
W	.848	.852	.851		.850	.846	.850	.849		.84[illegible]
X	.856	.857	.861		.858	.858	.852	.854		.85[illegible]
Y	.841	.848	.837		.842	.841	.846	.849		.845
Z	.856	.855	.859		.857	.841	.850	.849		.847

Control Box S-2253

Orifice Man	ΔH_e	γ
0.5	1.71	0.99
1.0	1.85	1.00
2.0	1.85	1.00
4.0	1.92	1.01

APPENDIX E

DETAILED BAGHOUSE INFORMATION

Occidental Chemical Company

September 27, 1978

Mr. Berry Jackson
Ray F. Weston, Inc.
Weston Way
Westchester, Penn. 19380

Dear Sir:

There were 17 tons per hour produced on the 12 and 13th.

Enclosed are the production and spec sheets your requested.

Please return the spec sheets.

Thank you.

Sincerely yours,

OCCIDENTAL CHEMICAL COMPANY

Ray Kleissle

R.E. Kleissle
Production Manager

9802 Lawndale P. O. Box 5337 Houston, Texas 77012 (713) 477-8811

HOUSTON SULFATE

[redacted] [illegible]

[redacted]423 Tons

Start – 0
Finish – 10,225
Total – 10,225

SPARGER PRESS: High 32
Low 27

Flushing Every 5

[redacted]: Average: 17.7 T.P.H.

	AM	AM	PM	PM	8	10	12	14	16	18	20	23	F
Checked at:					3	16	14	13	13	—	17	11	11

[redacted] [illegible]

143.7 Tons

Start – 0
Finish – 10,275
Total – 10,275

SPARGER PRESS: High 31
Low 26

Flushing Every 5

RK[redacted]: Average: 17.97 T.P.H.

	AM	AM	PM	PM	8	10	12	14	16	18	20	28	F
[redacted]cked at:					4	13	13	13	10	—	17	20	10

[redacted] Daston

143.3 Tons

Start – 0
Finish – 10,[illegible]
Total – [illegible]

42,946 ÷ 102 = 421.

SPARGER PRESS: High 31
Low 26

Flushing Every 5

Average: 17.9 T.P.H.

	AM	AM	PM	PM	8	10	12	14	16	18	20	28	F
Checked at:					4	13	14	~~10~~	14	—	12	12	11

421

[redacted]TAL: ~~423~~ Tons

THIS MONTH: 9538 Tons

HOURLY AVERAGE 17.8 T.P.H.

Y.T.D. 49618 Tons

DATE: 9-12-78

HOUSTON SULFATE

HI[redacted] 1 Carney - Garza - Baston

Start - 0
Finish - 13,795
Total - 13,795

SPARGER PRESS: High 32 Low 27

Flushing Every 5

[redacted]: 137.9 Tons

[redacted]MARKS: Average: 17.2 T.P.H.

	8	10	12	14	16	18	20	28	F
O[redacted]checked at: AM AM PM PM	1	15	11	15	15	—	17	14	11

H[redacted] 2 GARZA

Start - 0
Finish - 14064
Total - 14,064
ES

SPARGER PRESS: High 31 Low 28

Flushing Every 5

R[redacted]: 140.6 Tons

[redacted]RKS: Average: 17.5 T.P.H.

	8	10	12	14	16	18	20	28	F
Oil checked at: AM AM PM PM	1	12	15	15	11	—	15	19	12

HIFT 3 Baston

Start - 0
Finish - 14,192
Total - 14,192
42,051

SPARGER PRESS: High 31 Low 27

Flushing Every 5

R[redacted]: 141.9 Tons

E[redacted]RKS: Average: 17.7 T.P.H.

	8	10	12	14	16	18	20	28	F
[redacted]l Checked at: AM AM PM PM	3	12	12	19	15	—	14	13	12

A[redacted]Y TOTAL: 420.4 Tons

THIS MONTH: 9117 Tons

A[redacted]Y HOURLY AVERAGE 17.5 T.P.H.

Y.T.D. 49197 Tons

APPENDIX F

PROJECT PARTICIPANTS

PROJECT PARTICIPANTS

The following Weston employees participated in this project:

Peter J. Marks Laboratory Manager	econENVIRONomics Division
Barry L. Jackson Supervisor, Air Testing	econENVIRONomics Division
Jeffrey D. O'Neill Project Scientist Assistant	econENVIRONomics Division
Gregory Celiano Assistant Project Scientist	econENVIRONomics Division
Richard J. Urban Laboratory Technician	econENVIRONomics Division
David D. Maloney Laboratory Technician	econENVIRONomics Division

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BARRY L. JACKSON

has completed

VISIBLE EMISSIONS EVALUATION SEMINAR

Recertified:	Date:
Robert J. Hemeon	2 March '77
Robert J. Hemeon	1 June '78

W. J. Moroz 3/5/75.
Certified Date:

Recertified:	Date:

W. J. Moroz
DIRECTOR, CENTER FOR AIR ENVIRONMENT STUDIES

Floyd B. Fischer
VICE PRESIDENT FOR CONTINUING EDUCATION