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

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

Report No. ~~73-CUS-7~~

AP-42
5th ed.
Section 12.3
#32

PRIMARY
COPPER SMELTING 12.3
AP-42 Section ~~7.3~~
Reference Number
32

AIR POLLUTION EMISSION TEST

ASARCO COPPER SMELTER

EL PASO, TEXAS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Emission Measurement Branch
Research Triangle Park, North Carolina

EMISSION TESTING OF ASARCO COPPER SMELTER

EL PASO, TEXAS

TO

ENVIRONMENTAL PROTECTION AGENCY

Contract #68-02-2812
Work Assignment #7

April 25, 1978

TRW
ENVIRONMENTAL ENGINEERING DIVISION
One Space Park, Redondo Beach, Ca. 90278

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SUPPLEMENT
TO
REFERENCE
30
AP-42 Section 7.3

NOV 9, 1983
AP-42 [illegible]

El Paso - Fugitive particulate emission tests for converters -

converter blowing time during sampling -

1/18/78 Test 1

Test time => 10.12 to 11.07 and 12.13 to 1.03

No. 1 converter was on from 10.45 to 11.07 and 12.13 to 1.03 ~~i.e.~~

i.e. 22' + 50' = 72 min

No. 2 converter was off

No. 3 converter was on from 10.12 to 10:30, & 10.35 to 11.07

i.e. 18' + 32' = 50'

∴ Total converter blowing time during sampling of #1 Test

= 72' + 50' = 122'

1/18/78 Test 2

Test time => 2.57 to 3.47 and 4.14 to 5.04

i.e. 50' + 50' = 100 min

No. 1 converter was on from 2.57 to 3.00, 3.05 to 3.47, & 4.15 to 5.05

i.e. 3' + 42' + 50 = 95'

No 2 converter was off

No 3 converter was on from 2.57 to 3.25, 3.30 to 3.47, 4.14 to 4.45 and 4.[illegible]

i.e. 28' + 17' + 31' + 14 = 90'

∴ Total converter blowing time during testing

= 95' + 90' = 185'

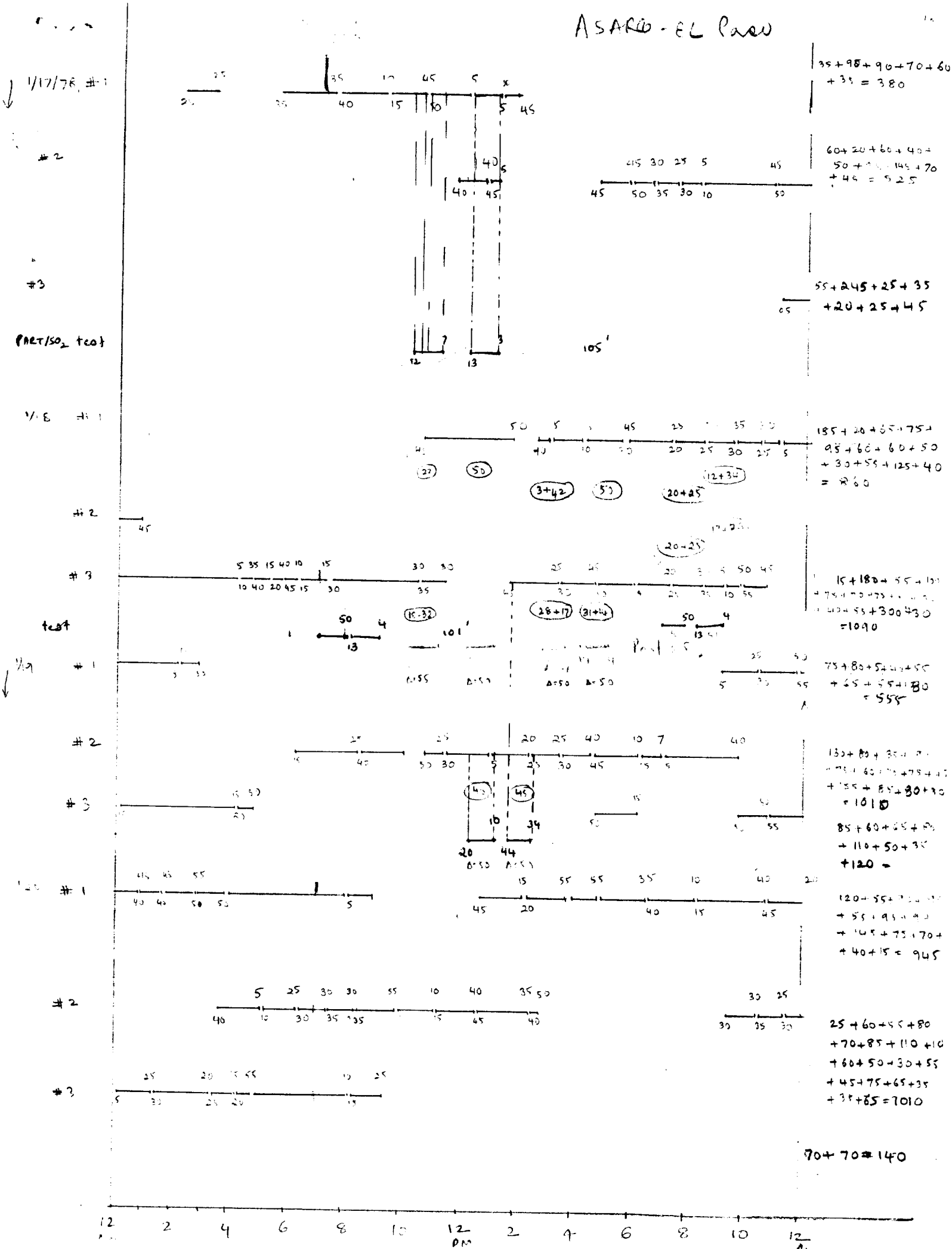
1/21/78 Test 3

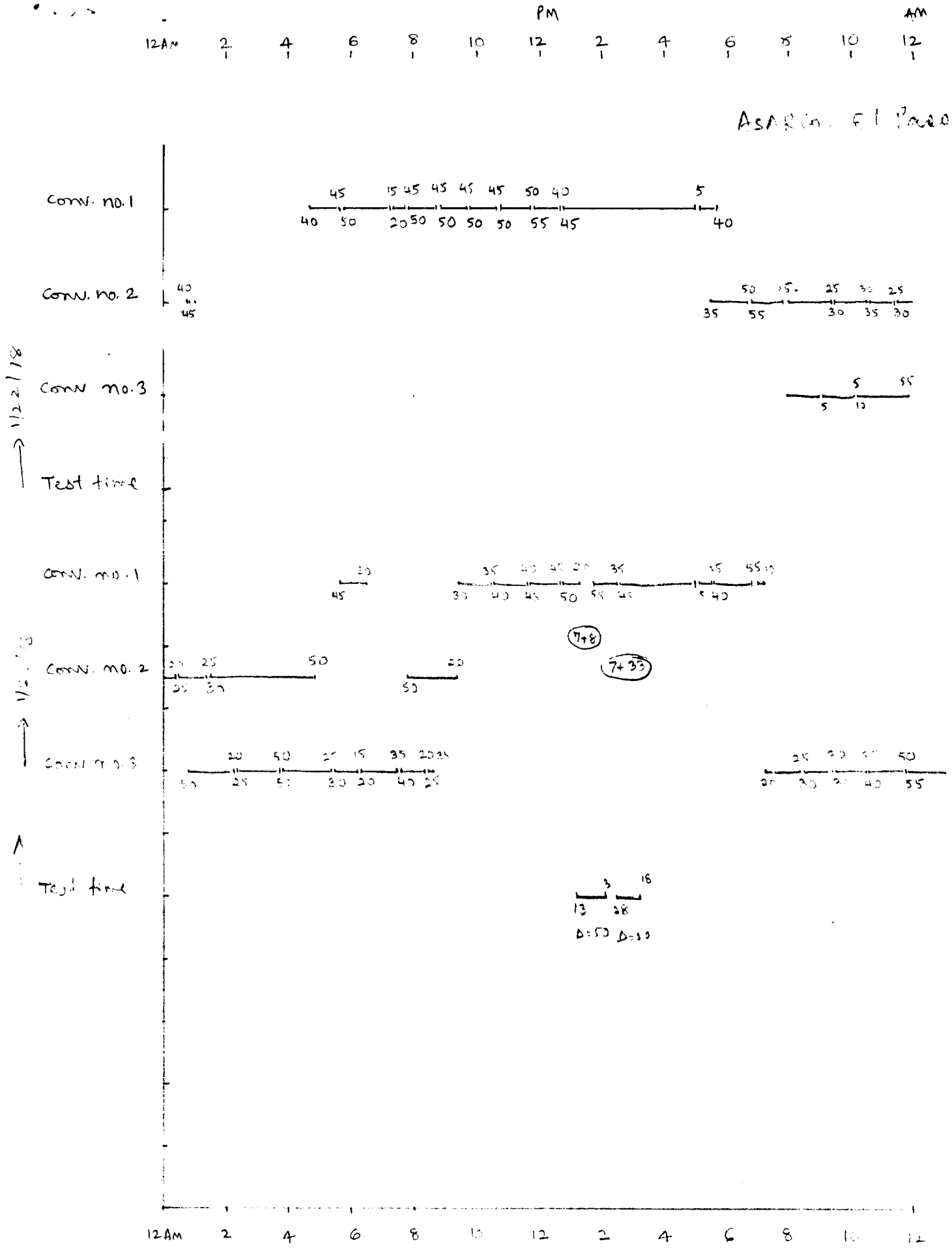
Test time => 10:00 to 10.50 and 11.18 to 12.08 i.e. 100 min

No. 1 converter was on from 10.00 to 10.15, 10.20 to 10.50, 11.20 to 12.00 and 12.05 to 12.[illegible]

i.e. 15' + 30' + 40' + 3' = 88'

ASARCO - EL PASO



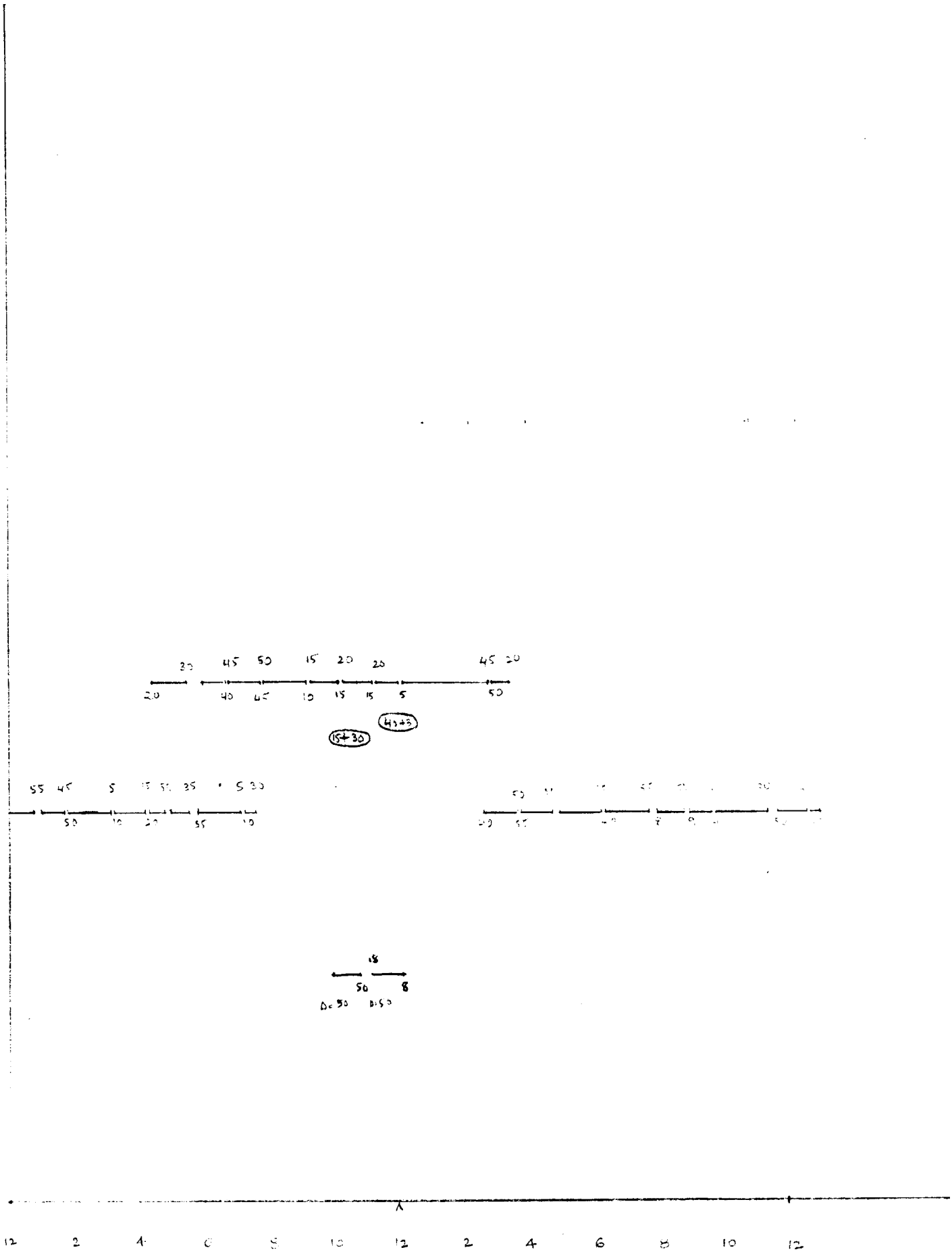

PM
AM
12AM 2 4 6 8 10 12 2 4 6 8 10 12
Conv. no. 1
Conv. no. 2
Conv no. 3
Test time
Conv. no. 1
Conv. no. 2
Conv. no. 3
Test time
7+8
7+33
12AM 2 4 6 8 10 12 2 4 6 8 10 12

ASARCO - El Paso

1/23/78

#1

#2



INTRODUCTION

Fugitive dust emissions from copper smelting operations are a significant source of airborne particulates. These particulates also contain varying concentrations of arsenic which may pose a public health hazard. The fugitive emissions of dust from operating equipment are controlled by placing hoods over the equipment and ducting the emissions to a control device. From January 17 to 27, 1978 TRW personnel tested fugitive emissions from several copper smelting processes at the Asarco copper smelter in El Paso, Texas. These tests were performed to provide data to the EPA for the establishment of fugitive emissions standards for copper smelting.

The testing consisted of isokinetic sampling of emissions from the converter building, matte tapping, and calcining processes to determine particulate, arsenic, and sulfur dioxide emissions. The testing of converter building fugitive emissions was done simultaneously at the inlet and outlet of a baghouse in order to determine the efficiency of this device. Two particulate samples and an SO_2 sample were taken at the outlet from a spray chamber and electrostatic precipitator to determine the amount of uncontrolled emissions from this process. TRW personnel also performed particle sizing tests with a Brinks impactor at the inlet and outlet from the converter building fugitive emissions baghouse and on the fugitive emissions from the calcining process.

This report presents the results of the testing program. The following sections of the report contain a summary of the results, descriptions of the sampling points, a description of the processes, delineation of sampling and analytical procedures, and appendices containing field and laboratory data and calculations.

SUMMARY & DISCUSSION OF RESULTS

The results of the emission testing at the five test locations are summarized in this section of the report. Three sets of tests were performed at the inlet and outlet of the converter building fugitive emissions baghouse and calcining fugitive emissions duct. These tests included three tests each for particulate/SO_2 (Tables 1,2, and 3), three tests each for arsenic/trace elements (Tables 4, 5 and 6), and several tests each for particle sizing (Table 9). Testing at the matte tapping fugitive emissions duct included particulate/SO_2 (Table 7), arsenic/trace elements (Table 8). Testing at the outlet from the roaster/reverb spray chamber and electrostatic precipitator included particulates (Table 10) and SO_2 (Table 11). In addition, analyses were performed on composited process samples taken by plant personnel on the days that the fugitive emission testing was being performed. This data is summarized in Table 12 & 13.

The particulate sampling of the converter building fugitive emissions baghouse showed efficiency for the equipment of up to 99%. The average efficiency for the three tests was 88%, based on the grain loading of collected particulates in and out of the unit. The efficiency of the unit for arsenic removal based on arsenic analysis of collected particulates averaged 96% for the three tests. Particle sizing tests showed an approximately equal proportion of particles in the 1-5 micron range on the inlet and outlet, but the outlet had less particles in the greater than 5 micron range, and a higher percentage of particles in the less than one micron range.

Sulfur dioxide tests on the converter building fugitive emissions show an average concentration of 64 parts per million. Sulfur dioxide emissions are quite variable on this source with maximum emissions occurring when the converters are being charged. Since the inlet and outlet tests were not exactly simultaneous, they reflect this fluctuation in sulfur dioxide concentration.

Particulate tests on the calcine fugitive duct showed an average concentration of .218 grains per standard cubic foot. The great majority of these were inorganic condensables (0.187 grains per standard cubic feet). Particle sizing tests showed that the particles were primarily greater than 5 microns (85%).

Sulfur dioxide emissions were highly variable, averaging 67 parts per million. The arsenic concentration averaged 2.5 parts per million.

Particulate testing at the matte tapping fugitive emissions duct showed generally lower particulate concentrations than at the two other locations. The average particulate concentration was 0.097 grains per standard cubic foot. The sulfur dioxide concentration averaged 110 parts per million. The arsenic concentration averaged 1.7 parts per million.

Particulate testing of the balloon flue showed an average particulate concentration of 0.091 grains per standard cubic foot. The sulfur dioxide of the gas stream was 5098 parts per million.

TABLE 1. BAGHOUSE INLET PARTICULATE/SO_2 RESULTS

RUN NUMBER	1		2		3		AVERAGE	
	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS
I DATE	1/17/78	1/17/78	1/18/78	1/18/78	1/21/78	1/21/78		
II STACK PARAMETERS								
Pst - Static Pressure, "Hg (mmHg)	-.18	4.57	-.18	-4.57	-.18	-4.57	-.18	-4.57
Ps - Stack Gas Pressure, "Hg Absolute (mmHg)	25.87	657.10	25.92	658.37	26.02	660.91	25.93	658.79
% CO_2 - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% O_2 - Volume % Dry	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
% CO - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% N_2 - Volume % Dry	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5
Ts - Average Stack Temperature °F (°C)	115.1	46.1	113.0	45.0	115.0	46.1	114.3	45.7
% H_2O - % Moisture in Stack Gas, By Volume	1.2	1.2	1.4	1.4	1.4	1.4	1.3	1.3
As - Stack Area, ft^2 (m^2)	125.95	11.34	125.95	11.34	125.95	11.34	125.95	11.34
Md - Molecular Weight of Stack Gas, Dry Basis	28.82	28.82	28.82	28.82	28.82	28.82	28.82	28.82
Ms - Molecular Weight of Stack Gas, Wet Basis	28.69	28.69	28.67	28.67	28.67	28.67	28.67	28.67
Vs - Stack Gas Velocity, ft/sec, (m/sec)	73.44	22.38	86.45	26.37	85.75	26.14	81.88	24.95
Qa - Stack Gas Volumetric Flow at Stack Conditions, ACFM (Nm^3/min)	554,986.1	15,721.9	653,302.6	18,507.2	648,012.7	18,357.3	618,767.1	17,528.8
Qs - Stack Gas Volumetric Flow at Standard Conditions, DSCFM (Nm^3/min)	435,426.8	12,335.0	514,278.7	14,568.8	510,318.2	14,456.6	486,674.6	13,786.8
% EA - Percent Excess Air	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
III TEST CONDITIONS								
Pb - Barometric Pressure, "Hg (mmHg)	26.05	661.67	26.10	662.94	26.20	665.48	26.11	663.36
Dn - Sampling Nozzle Diameter, in. (mm)	.185	4.70	.185	4.70	.185	4.70	.185	4.70
T - Sampling Time, min	105	105	100	100	100	100	102	102
Vm - Sample Volume, ACF (m^3)	84.9	2.1	83.8	2.1	82.6	2.1	83.8	2.1
Np - Net Sampling Points	20	20	20	20	20	20	20	20
Cp - Pitot Tube Coefficient	.84	.84	.84	.84	.84	.84	.84	.84
Tm - Average Meter Temperature °F (°C)	61.0	16.1	72.0	22.2	60.0	15.6	64.3	18.0
ΔH - Average Orifice Pressure Drop, "H_2O (mmH_2O)	2.18	55.37	2.24	56.9	2.29	58.17	2.24	56.81
Vlc - Condensate Collected (Impingers and Gel), mls	-	19.0	-	22.0	-	22.0	-	21.0
ΔP - Stack Velocity Head "H_2O (mmH_2O)	1.35	34.29	1.88	47.75	1.85	46.99	1.69	43.01
IV TEST CALCULATIONS								
Vw - Condensed Water Vapor, SDCF (Nm^3)	.89	.03	1.04	.03	1.04	.03	.99	.03
Vm - Volume of Gas Sampled at Standard Conditions, DSCF (Nm^3)	75.61	2.1	73.26	2.1	74.10	2.1	74.32	2.10
% H_2O - Percent Moisture, By Volume	1.2	1.2	1.4	1.4	1.4	1.4	1.3	1.3
Ms - Molecular Weight of Stack Gas, Wet Basis	28.69	28.69	28.67	28.67	28.67	28.67	28.67	28.67
Vs - Stack Velocity, ft/sec (m/sec)	73.44	22.38	86.45	26.37	85.75	26.14	81.88	24.96
% I - Percent Isokinetic	109.7	109.7	94.5	94.5	96.3	96.3	100.2	100.2
V ANALYTICAL DATA								
A) Particulates Front Half								
Probe (mg)	-	31.0	-	32.8	-	51.1	-	40.3
Cyclone (mg)	-	-	-	-	-	-	-	-
Filter (mg)	-	98.1	-	71.0	-	96.7	-	88.6
Particulates Front Half Total (mg)	-	129.1	-	109.8	-	147.8	-	128.9
grs/SDCF, (mg/m^3)	.026	60.33	.008	52.96	.031	70.48	.021	61.26
#/hr, (kg/hr)	98.25	44.66	101.86	46.30	134.52	61.15	111.54	50.70
B) Particulates - Condensables								
Organic (mg)	-	9.4	-	.2	-	N.D.	-	3.2
grs/SDCF, (mg/m^3)	.002	4.39	.000	.10	-	-	.001	2.24
#/hr, (kg/hr)	7.15	3.25	.18	.08	-	-	3.66	1.66
Inorganic (mg)	-	1,239.20	-	1,163.0	-	N.D.	-	1,201.0
grs/SDCF, (mg/m^3)	.253	579.13	.245	560.95	-	-	.249	570.04
#/hr, (kg/hr)	943.11	428.69	1,078.90	490.45	-	-	1011.00	459.56
C) Particulates - Total Condensables (mg)	-	1,248.6	-	1,163.2	-	N.D.	-	1,205.9
grs/SDCF, (mg/m^3)	.255	583.52	.245	561.05	-	-	0.160	572.29
#/hr, (kg/hr)	950.26	431.94	1,079.08	490.51	-	-	1,014.67	461.22
D) Total Particulates (mg)	-	1,377.7	-	1,273.0	-	147.8	-	932.83
grs/SDCF, (mg/m^3)	.281	643.85	.253	614.01	.031	70.48	.188	442.78
#/hr, (kg/hr)	1,048.51	476.60	1,180.94	536.81	134.52	61.15	787.99	358.187
E) Total SO_2 (mg)	-	982.8	-	66.2	-	43.1	-	364.0
ppm	172.23	172.23	11.80	11.00	7.60	7.60	63.87	63.87
(mg/m^3)	-	459.30	-	31.95	-	20.55	-	170.59
#/hr, (kg/hr)	747.97	339.99	61.42	27.92	39.23	17.83	282.87	128.58

310 TPD ave 140 TPD ave 227 TPD ave ave = 212 TPD ave.

Wet 11 204 #/HR

TABLE 2. BAGHOUSE OUTLET PARTICULATE/SO_2 RESULTS

RUN NUMBER	1		2		3		AVERAGE	
	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS
I DATE	1/17/78	1/17/78	1/18/78	1/18/78	1/21/78	1/21/78		
II STACK PARAMETERS								
Pst - Static Pressure, "Hg (mmHg)	-.17	-4.32	-.07	-1.78	-.07	-1.78	-.02	-2.63
Ps - Stack Gas Pressure, "Hg Absolute (mmHg)	25.83	657.35	26.03	661.16	26.13	663.70	26.01	660.74
% CO_2 - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% O_2 - Volume % Dry	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
% CO - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% N_2 - Volume % Dry	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5
Ts - Average Stack Temperature °F (°C)	114.0	45.6	118.0	47.8	114.0	45.6	115	46.3
% H_2O - % Moisture in Stack Gas, By Volume	1.0	1.0	.9	.9	1.1	1.1	1.0	1.0
As - Stack Area, FT^2 (M^2)	180.00	16.20	180	16.20	180	16.20	180	16.20
Md - Molecular Weight of Stack Gas, Dry Basis	28.82	28.82	28.82	28.82	28.82	28.82	28.82	28.82
Ms - Molecular Weight of Stack Gas, Wet Basis	28.71	28.71	28.72	28.72	28.70	28.70	28.74	28.74
Vs - Stack Gas Velocity, FT/SEC, (M/SEC)	61.84	18.85	55.41	16.89	57.92	17.66	58.33	17.80
Qa - Stack Gas Volumetric Flow at Stack Conditions, ACFM (NM^3/min)	667,072	18,919.9	598,428.0	16,952.6	625,536.0	17,720.6	629,954.0	17,846.0
Qs - Stack Gas Volumetric Flow at Standard Conditions, DSCFM (NM^3/min)	526,009.2	14,899.2	471,190.8	13,348.4	498,907.0	14,072.7	498,062.3	14,105.4
% EA - Percent Excess Air	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
III TEST CONDITIONS								
Pb - Barometric Pressure, "Hg (mmHg)	26.05	661.67	26.10	662.94	26.20	665.48	26.12	663.36
Dn - Sampling Nozzle Diameter, in. (mm)	.185	4.70	.185	4.70	.185	4.70	.185	4.70
T - Sampling Time, min	120	120	160	160	160	160	146	146
Vm - Sample Volume, ACF (M^3)	74.5	1.8	90.5	2.3	97.4	2.5	87.47	2.2
Np - Net Sampling Points	40	40	40	40	40	40	40	40
Cp - Pitot Tube Coefficient	.84	.84	.84	.84	.84	.84	.84	.84
Tm - Average Metep Temperature °F (°C)	61.5	20.0	74.8	13.9	61.0	16.1	65.7	16.7
Pm - Average Orifice Pressure Drop, "H_2O (mmH_2O)	1.07	27.18	.88	22.35	.94	23.88	.96	24.47
Vlc - Condensate Collected (Impingers and Gel), mls		14.0		16.0		21.0		17.0
ΔP - Stack Velocity Head "H_2O (mmH_2O)	.96	24.38	.77	19.56	.85	21.59	.86	21.84
IV TEST CALCULATIONS								
Vw - Condensed Water Vapor, SDCF (NM^3)	.66	.02	.75	.02	.99	.03	.80	.02
Vm - Volume of Gas Sampled at Standard Conditions, DSCF (NM^3)	65.28	1.8	81.04	2.3	86.93	2.5	77.75	2.2
% H_2O - Percent Moisture, By Volume	1.0	1.0	.9	.9	.9	1.1	1.0	1.0
Ms - Molecular Weight of Stack Gas, Wet Basis	28.71	28.71	28.82	28.82	28.70	28.70	28.74	28.74
Vs - Stack Velocity, FT/SEC (M/SEC)	61.84	18.85	28.72	28.72	57.92	17.66	58.33	17.80
% I - Percent Isokinetic	98.0	98.0	97.7	97.7	103.7	103.7	101.2	101.2
V ANALYTICAL DATA								
A) Particulates Front Half								
Probe (mg)	-	21.5	-	5.0	-	2.6	-	9.97
Cyclone (mg)	-	-	-	-	-	-	-	-
Filter (mg)	-	0.0	-	0.0	-	0.0	-	0.0
Particulates Front Half Total (mg)	-	21.5	-	5.8	-	2.6	-	9.97
grs/SDCF, (mg/M^3)	.00508	11.607	.0011	2.522	.0009	1.06	.00219	5.06
#/hr, kg/hr)	22.87	10.37	4.45	2.02	1.96	.89	9.76	4.43
B) Particulates - Condensables								
Organic (mg)	-	3.0	-	8.2	-	1.80	-	4.3
grs/SDCF, (mg/M^3)	.0007	1.62	.0015	3.58	.0003	.73	.00083	1.977
#/hr, (kg/hr)	3.19	1.45	6.30	2.86	1.360	.62	3.62	1.64
Inorganic (mg)	-	448.6	-	724.40	-	41.0	-	404.60
grs/SDCF, (mg/M^3)	.1060	242.82	.1397	315.86	.007	16.67	.083	191.78
#/hr, (kg/hr)	477.78	217.17	556.63	253.01	30.97	14.07	355.12	161.41
C) Particulates - Total Condensables (mg)	-	451.6	-	732.6	-	42.9	-	409.0
grs/SDCF, (mg/M^3)	.1067	244.44	.1394	319.44	.0073	17.44	.0845	193.76
#/hr, (kg/hr)	480.97	218.62	562.93	255.87	32.33	14.73	358.74	163.06
D) Total Particulates (mg)	-	473.1	-	738.4	-	45.4	-	418.90
grs/SDCF, (mg/M^3)	.1118	256.05	.1405	321.96	.0077	18.50	.0867	198.83
#/hr, (kg/hr)	503.34	228.99	567.30	257.89	34.29	15.62	368.50	167.50
E) Total SO_2 (mg)	-	403.4	-	603.3	-	30.0	-	345.6
ppm	-	81.08	-	90.64	-	4.57	-	61.69
(mg/M^3)	-	210.36	-	263.06	-	12.19	-	164.53
#/hr, (kg/hr)	429.64	195.29	463.57	210.71	22.66	10.30	305.29	138.76

TABLE 3. CALCINE FUGITIVE PARTICULATE/SO_2 RESULTS

RUN NUMBER	1		2		3		AVERAGE	
	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS
I DATE 1978	1/24	1/24	1/25	1/25	1/25			
II STACK PARAMETERS								
Pst - Static Pressure, "Hg (mmHg)	-.05	-1.27	-.06	-1.52	-.06	-1.52	-.06	-1.44
Ps - Stack Gas Pressure, "Hg Absolute (mmHg)	26.00	660.40	26.15	664.21	26.15	664.21	26.10	662.94
% CO_2 - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% O_2 - Volume % Dry	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
% CO - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% N_2 - Volume % Dry	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5
Ts - Average Stack Temperature °F (°C)	57.0	13.9	88.0	31.1	96.0	35.6	80.3	26.9
% H_2O - % Moisture in Stack Gas, By Volume	.4	.4	.3	.3	1.0	1.0	.6	.6
As - Stack Area, ft^2 (m^2)	4.43	.41	4.43	.41	4.43	.41	4.43	.41
Md - Molecular Weight of Stack Gas, Dry Basis	28.82	28.82	28.82	28.82	28.82	28.82	28.82	28.82
Ms - Molecular Weight of Stack Gas, Wet Basis	28.77	28.77	28.79	28.79	28.71	28.71	28.76	28.76
Vs - Stack Gas Velocity, ft/sec, (m/sec)	33.77	10.29	34.66	10.56	33.85	10.32	34.09	10.39
Qa - Stack Gas Volumetric Flow at Stack Conditions, ACFM (Nm^3/min)	8,976.1	254.3	7,652.4	216.8	8,997.3	254.9	8,541.9	242.0
Qs - Stack Gas Volumetric Flow at Standard Conditions, DSCFM (Nm^3/min)	7,931.5	224.6	7,736.9	219.1	7,393.5	209.4	7,687.3	217.7
% EA - Percent Excess Air	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
III TEST CONDITIONS								
Pb - Barometric Pressure, "Hg (mmHg)	26.05	661.67	26.21	665.73	26.21	665.73	26.16	664.38
Dn - Sampling Nozzle Diameter, in. (mm)	.245	6.22	.245	6.22	.245	6.22	.245	6.22
T - Sampling Time, min	57	57	60	60	60	60	59	59
Vm - Sample Volume, ACF (m^3)	36.2	.9	39.7	1.0	37.2	.9	37.7	.9
Np - Net Sampling Points	20	20	20	20	20	20	20	20
Cp - Pitot Tube Coefficient	.84	.84	.84	.84	.84	.84	.84	.84
Tm - Average Meter Temperature °F (°C)	58.0	14.4	57.0	13.9	61	16.1	43.7	14.8
Pm - Average Orifice Pressure Drop, "H_2O (mmH_2O)	1.41	35.81	1.41	35.81	1.1	27.94	1.3	33.2
Vlc - Condensate Collected (Impingers and Gel), mls	-	3.0	-	2.0	-	7.0	-	4.0
ΔP - Stack Velocity Head "H_2O (mmH_2O)	.32	8.13	.32	8.13	.30	7.62	.31	7.96
IV TEST CALCULATIONS								
Vw - Condensed Water Vapor, SDCF (Nm^3)	.14	0.0	.09	0.0	.33	.01	.19	.01
Vm - Volume of Gas Sampled at Standard Conditions, DSCF (Nm^3)	32.35	.9	35.81	1.0	33.22	.9	33.79	.9
% H_2O - Percent Moisture, By Volume	.4	.4	.3	.3	1.0	1.0	.6	.6
Ms - Molecular Weight of Stack Gas, Wet Basis	28.77	28.77	28.79	28.79	28.71	28.71	28.76	28.76
Vs - Stack Velocity, ft/sec (m/sec)	33.77	10.29	34.66	10.56	33.85	10.32	34.09	10.39
% I - Percent Isokinetic	96.1	96.1	103.6	103.6	100.6	100.6	100.1	100.1
V ANALYTICAL DATA								
A) Particulates Front Half								
Probe (mg)	-	80.4	-	58.1	-	14.6	-	51.0
Cyclone (mg)	-	-	-	-	-	-	-	-
Filter (mg)	-	27.4	-	20.1	-	4.7	-	17.4
Particulates Front Half Total (mg)	-	107.8	-	78.2	-	19.3	-	68.4
grs/SDCF, (mg/m^3)	.051	117.75	.034	77.16	.009	20.53	.031	71.81
#/hr, (kg/hr)	3.49	1.59	2.23	1.01	.57	.26	2.09	.95
B) Particulates - Condensables								
Organic (mg)	-	2.7	-	1.3	-	0.0	-	2.0
grs/SDCF, (mg/m^3)	.001	2.95	.001	1.28	-	-	.001	2.11
#/hr, (kg/hr)	.09	.04	.037	.017	-	-	.060	.029
Inorganic (mg)	-	281.6	-	263.0	-	668.5	-	404.4
grs/SDCF, (mg/m^3)	.134	307.59	.113	259.52	.311	711.07	.186	426.06
#/hr, (kg/hr)	9.12	4.15	7.51	3.41	19.66	8.94	12.09	5.50
C) Particulates - Total Condensables (mg)	-	284.3	-	264.4	-	668.5	-	405.7
grs/SDCF, (mg/m^3)	.135	310.54	.114	260.80	.311	711.07	.187	427.47
#/hr, (kg/hr)	9.21	4.19	7.88	3.43	19.66	8.94	12.25	5.52
D) Total Particulates (mg)	-	392.1	-	342.5	--	687.8	-	474.13
grs/SDCF, (mg/m^3)	.186	428.29	.148	337.96	.320	731.60	.218	499.28
#/hr, (kg/hr)	12.70	5.78	10.11	4.44	20.23	9.20	14.34	6.47
E) Total SO_2 (mg)	-	340.5	-	134.1	-	28.4	-	167.67
ppm	139.46	139.46	49.62	49.62	11.33	11.33	66.80	66.80
(mg/m^3)	-	371.93	-	132.32	-	30.21	-	178.15
#/hr, (kg/hr)	11.03	5.02	3.83	1.74	.84	.38	5.23	2.38

TABLE 4. BAGHOUSE INLET ARSENIC RESULTS

RUN NUMBER	1		2		3		AVERAGE	
	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS
	1/18/78	1/18/78	1/19/78	1/19/78	1/23/78	1/23/78		
II STACK PARAMETERS								
Pst - Static Pressure, "Hg (mmHg)	-.184	-4.67	-.184	-4.67	-.184	-4.67	-.184	-4.67
Ps - Stack Gas Pressure, "Hg Absolute (mmHg)	25.97	658.27	26.12	663.35	25.87	657.00	25.97	659.64
% CO_2 - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
% O_2 - Volume % Dry	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
% CO < Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% N_2 - Volume % Dry	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5
Ts - Average Stack Temperature °F (°C)	100.0	37.8	97.0	36.1	123.0	50.6	106.7	41.5
% H_2O - % Moisture in Stack Gas, By Volume	1.0	1.0	.4	.4	1.1	1.1	.8	.8
As - Stack Area, ft^2 (m^2)	125.95	11.59	125.95	11.59	125.95	11.59	125.95	11.59
Md - Molecular Weight of Stack Gas, Dry Basis	28.82	28.82	28.82	28.82	28.82	28.82	28.82	28.82
Ms - Molecular Weight of Stack Gas, Wet Basis	28.71	28.71	28.78	28.78	28.70	28.70	28.73	28.73
Vs - Stack Gas Velocity, ft/sec, (m/sec)	85.42	26.04	84.24	25.68	86.56	26.38	86.97	26.51
Qa - Stack Gas Volumetric Flow at Stack Conditions, ACFM (Nm^3/min)	645,518.9	18,286.7	636,602	17,858	654,133.9	18,530.7	657,257.5	18,619.2
Qs - Stack Gas Volumetric Flow at Standard Conditions, DSCFM (Nm^3/min)	521,955.5	14,786.3	528,463	14,966	506,478.6	14,347.8	527,496.9	14,943.3
% EA - Percent Excess Air	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
III TEST CONDITIONS								
Pb - Barometric Pressure, "Hg (mmHg)	26.10	662.94	26.30	668.02	26.05	661.67	26.15	664.21
Dn - Sampling Nozzle Diameter, in. (mm)	.185	4.70	.185	4.70	.185	4.70	.185	4.70
T - Sampling Time, min	101	101	100	100	100	100	100	100
Vm - Sample Volume, ACF (m^3)	84.8	2.1	82.6	2.3	82.7	2.0	83.37	2.07
Np - Net Sampling Points	20	20	20	20	20	20	20	20
Cp - Pitot Tube Coefficient	.84	.84	.84	.84	.84	.84	.84	.84
Tm - Average Meter Temperature °F (°C)	62.0	16.7	56.0	13	76.0	24.4	64.7	18.1
Pm - Average Orifice Pressure Drop, "H_2O (mmH_2O)	2.26	57.4	2.3	58.67	2.21	56.13	2.26	57.4
Vlc - Condensate Collected (Impingers and Gel), mls	-	16	-	6	-	17.0	-	13
ΔP - Stack Velocity Head "H_2O (mmH_2O)	- 1.88	47.75	1.87	52.57	1.85	46.99	1.93	49.10
IV TEST CALCULATIONS								
Vw - Condensed Water Vapor, SDCF (Nm^3)	.75	.02	.28	.01	.80	.02	.61	.02
Vm - Volume of Gas Sampled at Standard Conditions, DSCF (Nm^3)	75.48	2.1	75.02	2.1	71.59	2.0	74.03	2.1
% H_2O - Percent Moisture, By Volume	1.0	1.0	.4	.4	1.1	1.1	.8	.8
Ms - Molecular Weight of Stack Gas, Wet Basis	28.71	28.71	28.78	28.78	28.70	28.70	28.73	28.73
Vs - Stack Velocity, ft/sec (m/sec)	85.42	26.04	84.24	25.68	86.56	26.38	86.97	26.51
% I - Percent Isokinetic	95.0	95.0	94.2	94.2	93.8	93.8	94.3	94.3
V ANALYTICAL DATA								
A) Arsenic Front Half								
Probe (mg)	-	.250	-	.830	-	.08	-	.387
Cyclone (mg)	-	-	-	-	-	-	-	-
Filter (mg)	-	13.00	-	3.550	-	3.00	-	6.517
Arsenic Front Half Total (mg)	-	13.25	-	4.38	-	3.08	-	6.903
ppm, (mg/m^3)	1.99	6.20	.66	2.06	.49	1.52	1.047	3.26
#/hr, (kg/hr)	12.11	5.50	4.28	1.94	2.88	1.30	6.423	2.913
B) Arsenic - Impinger Collection								
Impinger #1, 2 (mg)	-	.015	-	.021	-	.010	-	.015
ppm, (mg/m^3)	.002	.007	.003	.010	.001	.004	.002	.007
#/hr, (kg/hr)	.014	.006	.020	.009	.009	.004	.0143	.006
Impinger #3,4,5 (mg)	-	0.0	-	.028	-	.006	-	.011
ppm, (mg/m^3)	0.00	0.0	.004	.013	.0009	.003	.001	.005
#/hr, (kg/hr)	0.0	0.0	.027	.012	.006	.003	.011	.005
C) Arsenic - Impinger Total (mg)								
ppm, (mg/m^3)	-	.015	-	.049	-	.016	-	.027
#/hr, (kg/hr)	.002	.007	.007	.030	.0019	.007	.0038	.014
	.014	.006	.047	.021	.015	.007	.0253	.0113
D) Total Arsenic (mg)	-	13.27	-	4.43	-	3.10	-	6.93
ppm, (mg/m^3)	1.99	6.207	.667	2.09	.492	1.527	1.050	3.275
#/hr, (kg/hr)	12.12	5.506	4.327	1.96	2.895	1.307	6.447	2.924

TABLE 5. BAGHOUSE OUTLET ARSENIC RESULTS

RUN NUMBER	1		2		3		AVERAGE	
	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS
	1/18/78	1/18/78	1/19/78	1/19/78	1/23/78	1/23/78		
II STACK PARAMETERS								
Pst - Static Pressure, "Hg (mmHg)	-.07	-1.78	-.07	-1.78	-.07	-1.78	-.07	-1.78
Ps - Stack Gas Pressure, "Hg Absolute (mmHg)	26.03	661.16	26.23	666.24	25.98	659.89	26.08	662.43
% CO_2 - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% O_2 - Volume % Dry	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
% CO - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% N_2 - Volume % Dry	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5
Ts - Average Stack Temperature °F (°C)	101.0	38.3	99.0	37.0	124.0	51.1	108.0	42.13
% H_2O - % Moisture in Stack Gas, By Volume	0.0	0.0	.7	.7	1.3	1.3	.7	.7
As - Stack Area, ft^2 (m^2)	180.0	16.56	180.0	16.56	180.0	16.56	180.0	16.56
Md - Molecular Weight of Stack Gas, Dry Basis	28.82	28.82	28.82	28.82	28.82	28.82	28.82	28.82
Ms - Molecular Weight of Stack Gas, Wet Basis	28.82	28.82	28.74	28.74	28.68	28.68	28.75	28.75
Vs - Stack Gas Velocity, ft/sec, (m/sec)	49.49	15.08	59.31	18.08	58.62	17.87	56.50	17.22
Qa - Stack Gas Volumetric Flow at Stack Conditions, ACFM (Nm^3/min)	534,452	15,137	640,548.0	18,145.8	633,096.0	17,934.7	610,236.0	17,287.1
Qs - Stack Gas Volumetric Flow at Standard Conditions, DSCFM (Nm^3/min)	437,609	12,393	526,564.8	14,916.8	490,454.9	13,893.0	491,062.2	13,911.1
% EA - Percent Excess Air	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
III TEST CONDITIONS								
Pb - Barometric Pressure, "Hg (mmHg)	26.10	662.94	26.30	668.02	26.05	661.67	26.15	664.21
Dn - Sampling Nozzle Diameter, in. (mm)	.185	4.70	.185	4.70	.185	4.70	.185	4.70
T - Sampling Time, min	160	160	160	160	200	200	173	173
Vm - Sample Volume, ACF (m^3)	88.4	2.5	101.0	2.9	123.5	3.5	104.3	2.9
Np - Net Sampling Points	40	40	40	40	40	40	40	40
Cp - Pitot Tube Coefficient	.84	.84	.84	.84	.84	.84	.84	.84
Tm - Average Meter Temperature °F (°C)	64.0	17.8	65.0	18.3	78.0	25.6	69	20.6
Pm - Average Orifice Pressure Drop, "H_2O (mmH_2O)	.80	20.32	1.06	26.67	.96	24.38	.94	23.79
Vlc - Condensate Collected (Impingers and Gel), mls	-	0.0	-	14.0	-	30	-	14.7
ΔP - Stack Velocity Head "H_2O (mmH_2O)	0.635	16.129	.92	23.36	.85	21.59	.82	20.83
IV TEST CALCULATIONS								
Vw - Condensed Water Vapor, SDCF (Nm^3)	0.0	0.0	.66	.02	1.41	.04	.69	.02
Vm - Volume of Gas Sampled at Standard Conditions, DSCF (Nm^3)	78.10	2.2	89.86	2.5	106.13	3.01	91.36	2.6
% H_2O - Percent Moisture, By Volume	0.0	0.0	.7	.7	1.3	1.3	.7	.7
Ms - Molecular Weight of Stack Gas, Wet Basis	28.82	28.82	28.74	28.74	28.68	28.68	28.75	28.75
Vs - Stack Velocity, ft/sec (m/sec)	49.49	15.08	59.31	18.08	58.62	17.87	56.50	17.22
% I - Percent Isokinetic	105.7	105.7	101.1	101.1	102.6	102.6	103.14	103.14
V ANALYTICAL DATA								
A) Arsenic Front Half								
Probe (mg)	-	.040	-	.005	-	.019	-	.021
Cyclone (mg)	-	-	-	-	-	-	-	-
Filter (mg)	-	.830	-	.027	-	.024	-	.294
Arsenic Front Half Total (mg)	-	.87	-	.032	-	.043	-	.315
ppm, (mg/m^3)	.130	.390	.009	.01	.004	.005	.046	.135
#/hr, (kg/hr)	.672	.305	.025	.011	.026	.012	.241	.119
B) Arsenic - Impinger Collection								
Impinger #1, 2 (mg)	-	0.0	-	.018	-	0.00	-	.006
ppm, (mg/m^3)	0.00	0.00	.002	.007	0.00	0.00	0.00	.002
#/hr, (kg/hr)	0.00	0.00	.014	.006	0.00	0.00	.005	.002
Impinger #3,4,5 (mg)	-	0.0	-	.007	-	.001	-	.0006
ppm, (mg/m^3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#/hr, (kg/hr)	0.00	0.00	.001	.000	0.00	0.00	0.00	0.00
C) Arsenic - Impinger Total (mg)	-	0.00	-	.025	-	.001	-	.0066
ppm, (mg/m^3)	0.00	0.00	.002	.007	0.00	0.00	0.00	.002
#/hr, (kg/hr)	0.00	0.00	.015	.006	0.00	0.00	.005	.002
D) Total Arsenic (mg)	-	.87	-	.057	-	.044	-	.3216
ppm, (mg/m^3)	.130	.390	.006	.017	.004	.015	.046	.1370
#/hr, (kg/hr)	.672	.305	.040	.017	.027	.012	.246	.1190

TABLE 6. CALCINE FUGITIVE ARSENIC RESULTS

RUN NUMBER	1		2		3		AVERAGE	
	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS
	1/24/78	1/24/78	1/24/78	1/24/78	1/24/78	1/24/78		
II STACK PARAMETERS								
Pst - Static Pressure, "Hg (mmHg)	-.05	-1.27	-.05	-1.27	-.05	-1.27	-.05	-1.27
Ps - Stack Gas Pressure, "Hg Absolute (mmHg)	26.00	660.40	26.00	660.40	26.00	660.40	26.00	660.40
% CO_2 - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% O_2 - Volume % Dry	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
% CO - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% N_2 - Volume % Dry	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5
Ts - Average Stack Temperature °F (°C)	56.0	13.3	57.0	13.9	61.0	16.1	58.0	14.4
% H_2O - % Moisture in Stack Gas, By Volume	.1	.1	.4	.4	.3	.3	.3	.3
As - Stack Area, ft^2 (m^2)	4.43	.412	4.43	.412	4.43	.412	4.43	.412
Md - Molecular Weight of Stack Gas, Dry Basis	28.82	28.82	28.82	28.82	28.82	28.82	28.82	28.82
Ms - Molecular Weight of Stack Gas, Wet Basis	28.30	28.80	28.78	28.78	28.79	28.79	28.79	28.79
Vs - Stack Gas Velocity, ft/sec, (m/sec)	32.65	9.95	33.24	10.13	32.82	10.00	32.90	10.03
Qa - Stack Gas Volumetric Flow at Stack Conditions, ACFM (Nm^3/min)	8,678.4	245.8	8,835.2	250.3	8,723.6	247.1	8,746.7	247.75
Qs - Stack Gas Volumetric Flow at Standard Conditions, DSCFM (Nm^3/min)	7,705.2	218.2	7,808.8	221.1	7,658.0	216.9	7,724.3	218.82
% EA - Percent Excess Air	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
III TEST CONDITIONS								
Pb - Barometric Pressure, "Hg (mmHg)	26.05	661.67	26.05	661.67	26.05	661.67	26.05	661.67
Dn - Sampling Nozzle Diameter, in. (mm)	.245	6.22	.245	6.22	.245	6.22	.245	6.22
T - Sampling Time, min	60	60	60	60	60	60	60	60
Vm - Sample Volume, ACF (m^3)	35.7	1.01	39.2	1.11	36.1	1.02	37.0	1.05
Np - Net Sampling Points	20	20	20	20	20	20	20	20
Cp - Pitot Tube Coefficient	.84	.84	.84	.84	.84	.84	.84	.84
Tm - Average Meter Temperature °F (°C)	54.0	12.2	56.0	13.3	59.0	15.0	56.3	13.5
Pm - Average Orifice Pressure Drop, "H_2O (mmH_2O)	1.26	32.00	1.46	37.08	1.34	34.04	1.35	34.37
Vlc - Condensate Collected (Impingers and Gel), mls	-	1.0	-	3.0	-	2.0	-	2.0
ΔP - Stack Velocity Head "H_2O (mmH_2O)	.30	7.62	.31	7.87	.30	7.62	.30	7.70
IV TEST CALCULATIONS								
Vw - Condensed Water Vapor, SDCF (Nm^3)	.05	0.00	.14	0.00	.09	0.00	.09	0.00
Vm - Volume of Gas Sampled at Standard Conditions, DSCF (Nm^3)	32.15	.9	35.14	1.0	32.17	.9	33.15	.9
% H_2O - Percent Moisture, By Volume	.1	.1	.4	.4	.3	.3	.3	.3
Ms - Molecular Weight of Stack Gas, Wet Basis	28.80	28.80	28.78	28.78	28.79	28.79	28.79	28.79
Vs - Stack Velocity, ft/sec (m/sec)	32.65	9.95	33.24	10.13	32.82	10.00	32.90	10.03
% I - Percent Isokinetic	93.4	93.4	100.7	100.7	94.0	94.0	96.0	96.0
V ANALYTICAL DATA								
A) Arsenic Front Half								
Probe (mg)	-	.60	-	.12	-	1.89	-	.87
Cyclone (mg)	-	-	-	-	-	-	-	-
Filter (mg)	-	9.70	-	3.00	-	5.200	-	5.97
Arsenic Front Half Total (mg)	-	10.30	-	3.12	-	7.09	-	6.84
ppm, (mg/m^3)	3.62	11.32	1.00	3.14	2.49	7.79	2.37	7.42
#/hr, (kg/hr)	.326	.148	.092	.042	.223	.101	.2137	.0970
B) Arsenic - Impinger Collection								
Impinger #1, 2 (mg)	-	.100	-	.055	-	.018	-	.0510
ppm, (mg/m^3)	.04	.11	.01	.04	.010	.02	.020	.057
#/hr, (kg/hr)	.003	.001	.001	.0005	.001	.0002	.0017	.0006
Impinger #3,4,5 (mg)	-	.087	-	.0507	-	0.00	-	.0469
ppm, (mg/m^3)	.03	.10	.020	.05	0.00	0.00	.017	.050
#/hr, (kg/hr)	.003	.001	.001	.0005	0.00	0.00	.0013	.0005
C) Arsenic - Impinger Total (mg)	-	.187	-	.0857	-	.018	-	.0969
ppm, (mg/m^3)	.07	.21	.030	.090	.010	.02	.037	.1067
#/hr, (kg/hr)	.006	.002	.002	.001	.001	.002	.003	.0017
D) Total Arsenic (mg)	-	10.49	-	3.205	-	7.108	-	6.934
ppm, (mg/m^3)	3.690	11.53	1.030	3.23	2.500	7.810	2.4067	7.523
#/hr, (kg/hr)	.332	.150	.094	.043	.224	.103	.2167	.0987

TABLE 7. MATTE TAPPING PARTICULATE/SO_2 RESULTS

RUN NUMBER	1		2		3		AVERAGE	
	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS
I DATE	1/25/78	1/25/78	1/26/78	1/26/78	1/26/78	1/26/78		
II STACK PARAMETERS								
Pst - Static Pressure, "Hg (mmHg)	+.44	11.18	+.44	11.18	+.44	11.18	+.44	11.18
Ps - Stack Gas Pressure, "Hg Absolute (mmHg)	26.65	676.91	26.64	676.66	26.64	276.91	26.64	676.74
% CO_2 - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% O_2 - Volume % Dry	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
% CO - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% N_2 - Volume % Dry	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5
Ts - Average Stack Temperature °F (°C)	73.0	22.8	82.0	22.8	82.0	22.8	79.0	22.8
% H_2O - % Moisture in Stack Gas, By Volume	.8	.8	0.0	0.0	0.0	0.0	.3	.3
As - Stack Area, FT^2 (M^2)	5.85	.543	5.85	.543	5.85	.543	5.85	.543
Md - Molecular Weight of Stack Gas, Dry Basis	28.82	28.82	28.82	28.82	28.82	28.82	28.82	28.82
Ms - Molecular Weight of Stack Gas, Wet Basis	28.74	28.74	28.82	28.82	28.82	28.82	28.79	28.79
Vs - Stack Gas Velocity, FT/SEC, (M/SEC)	87.43	26.65	89.90	27.40	88.06	26.84	88.46	26.96
Qa - Stack Gas Volumetric Flow at Stack Conditions, ACFM (Nm^3/min)	30,687.9	869.4	31,554.9	893.9	30,909.0	875.6	31,050.6	879.62
Qs - Stack Gas Volumetric Flow at Standard Conditions, DSCFM (Nm^3/min)	26,871.0	760.9	27,369.8	775.0	26,802.1	759.0	27,014.5	765.3
% EA - Percent Excess Air	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
III TEST CONDITIONS								
Pb - Barometric Pressure, "Hg (mmHg)	26.21	665.73	26.20	665.48	26.20	665.48	26.20	665.56
Dn - Sampling Nozzle Diameter, in. (mm)	.185	4.70	.185	4.70	.185	4.70	.185	4.70
T - Sampling Time, min	389	389	360	360	360	360	369	369
Vm - Sample Volume, ACF (M^3)	372.1	9.0	368.0	8.7	350.6	8.2	363.6	8.6
Np - Net Sampling Points	24	24	24	24	24	24	24	24
Cp - Pitot Tube Coefficient	.84	.84	.84	.84	.84	.84	.84	.84
Tm - Average Meter Temperature °F (°C)	87	30.6	100.0	37.8	110.0	43.3	99.0	37.2
Pm - Average Orifice Pressure Drop, "H_2O (mmH_2O)	2.52	64.01	2.76	70.10	3.28	83.31	2.85	72.5
Vlc - Condensate Collected (Impingers and Gel), mls	-	52		0	-	2.0	-	27.0
ΔP - Stack Velocity Head "H_2O (mmH_2O)	2.13	54.10	2.22	56.39	2.13	54.10	2.16	54.86
IV TEST CALCULATIONS								
Vw - Condensed Water Vapor, SDCF (Nm^3)	2.45	.07	0.0	0.0	.09	0.0	.84	.02
Vm - Volume of Gas Sampled at Standard Conditions, DSCF (Nm^3)	317.8	9.0	307.1	8.7	287.9	8.2	304.3	8.6
% H_2O - Percent Moisture, By Volume	.8	.8	0.0	0.0	0.0	0.0	.3	.3
Ms - Molecular Weight of Stack Gas, Wet Basis	28.74	28.74	28.82	28.82	28.82	28.82	28.79	28.79
Vs - Stack Velocity, FT/SEC (M/SEC)	87.43	26.65	84.90	27.40	88.06	26.84	88.46	26.96
% I - Percent Isokinetic	93.7	93.7	96.0	96.0	91.9	91.9	93.9	93.9
V ANALYTICAL DATA								
A) Particulates Front Half	-	12.8	-	48.4	-	32.2	-	31.13
Probe (mg)	-	-	-	-	-	-	-	-
Cyclone (mg)	-	100.2	-	335.9	-	273.9	-	236.67
Filter (mg)	-	113.0	-	384.3	-	305.9	-	267.73
Particulates Front Half Total (mg)								
grs/SDCF, (mg/M^3)	.005	10.73	.016	36.90	.013	30.83	.011	26.15
#/hr, kg/hr)	1.07	.49	3.77	1.71	3.09	1.41	2.64	1.20
B) Particulates - Condensables								
Organic (mg)	-	10.3	-	20.2	-	19.5	-	16.67
grs/SDCF, (mg/M^3)	.004	.98	.001	1.94	.001	1.97	.002	1.63
#/hr, (kg/hr)	.100	.045	.199	.09	.197	.09	.165	.075
Inorganic (mg)	-	1,891.6	-	2,865.7	-	2,868.6	-	2,541.97
grs/SDCF, (mg/M^3)	.078	179.63	.120	275.17	.126	289.12	.108	247.97
#/hr, (kg/hr)	18.05	8.20	28.17	12.80	28.98	13.17	25.07	11.39
C) Particulates - Total Condensables (mg)	-	1,901.9	-	2,885.9	-	2,888.1	-	2,558.6
grs/SDCF, (mg/M^3)	.081	180.61	.121	277.09	.127	291.09	.085	249.60
#/hr, (kg/hr)	18.15	8.25	28.37	12.89	29.18	13.26	25.23	11.47
D) Total Particulates (mg)	-	2,014.9	-	3,270.2	-	3,194.0	-	2,826.3
grs/SDCF, (mg/M^3)	.086	191.34	.137	313.99	.140	321.92	.097	275.75
#/hr, (kg/hr)	19.12	8.74	32.14	14.60	32.27	14.67	27.84	12.67
E) Total SO_2 (mg)	-	1,728.4	-	2,500.8	-	5,331.0	-	3,186.7
ppm	61.55	61.55	90.04	90.04	201.47	201.47	117.69	117.69
(mg/M^3)	-	164.13	-	240.13	-	537.29	-	313.85
#/hr, (kg/hr)	16.49	7.50	24.58	11.17	53.86	24.48	31.64	14.38

TABLE 8. MATTE TAPPING ARSENIC RESULTS

RUN NUMBER	1		2		3		AVERAGE	
	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS
	1/20/78	1/20/78	1/20/78	1/20/78	1/25/78	1/25/78		
II STACK PARAMETERS								
Pst - Static Pressure, "Hg (mmHg)	+.44	11.18	+.44	11.18	+.44	11.18	+.44	11.18
Ps - Stack Gas Pressure, "Hg Absolute (mmHg)	26.54	674.12	26.54	674.12	26.65	676.91	26.58	675.05
% CO_2 - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% O_2 - Volume % Dry	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
% CO - Volume % Dry	0.0	.0.0	0.0	0.0	0.0	0.0	0.0	0.0
% N_2 - Volume % Dry	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5
Ts - Average Stack Temperature °F (°C)	105.0	40.6	98.0	36.7	73.0	22.8	92.0	33.37
% H_2O - % Moisture in Stack Gas, By Volume	.3	.3	0.0	0.0	0.0	0.0	.1	.1
As - Stack Area, FT^2 (M^2)	5.85	.543	5.85	.543	5.85	.543	5.85	.543
Md - Molecular Weight of Stack Gas, Dry Basis	28.82	28.82	28.82	28.82	28.82	28.82	28.82	28.82
Ms - Molecular Weight of Stack Gas, Wet Basis	28.79	28.79	28.82	28.82	28.82	28.82	28.81	28.81
Vs - Stack Gas Velocity, FT/SEC, (M/SEC)	80.27	24.47	89.52	27.29	88.53	26.98	86.11	26.25
Qa - Stack Gas Volumetric Flow at Stack Conditions, ACFM (Nm^3/MIN)	28,174.8	798.2	31,421.5	890.1	31,074.0	880.3	30,223.4	856.2
Qs - Stack Gas Volumetric Flow at Standard Conditions, DSCFM (Nm^3/MIN)	23,295.8	659.7	26,367.0	746.6	27,417.9	776.71	25,693.6	727.9
% EA - Percent Excess Air	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
III TEST CONDITIONS								
Pb - Barometric Pressure, "Hg (mmHg)	26.10	662.94	26.10	662.94	26.21	665.73	26.14	663.9
Dn - Sampling Nozzle Diameter, in. (mm)	.185	4.70	.185	4.70	.185	4.70	.185	4.70
T - Sampling Time, min	240	240	240	240	396	396	292	292
Vm - Sample Volume, ACF (M^3)	205.2	5.81	222.3	5.2	361.2	10.23	262.9	7.45
Np - Net Sampling Points	24	24	24	24	24	24	24	24
Cp - Pitot Tube Coefficient	.84	.84	.84	.84	.84	.84	.84	.84
Tm - Average Meter Temperature °F (°C)	96.0	35.6	98.0	36.7	91.0	32.8	95.0	35.0
Pm - Average Orifice Pressure Drop, "H_2O (mmH_2O)	2.04	51.82	2.50	63.50	2.50	63.50	2.34	59.60
Vlc - Condensate Collected (Impingers and Gel), mls	-	9.5	-	1.0	-	0.0	-	3.5
ΔP - Stack Velocity Head "H_2O (mmH_2O)	1.69	42.93	2.13	54.10	2.19	55.63	2.00	50.88
IV TEST CALCULATIONS								
Vw - Condensed Water Vapor, SDCF (Nm^3)	.46	.01	.05	0.0	0.0	0.0	.17	0.00
Vm - Volume of Gas Sampled at Standard Conditions, DSCF (Nm^3)	171.48	4.9	185.30	5.2	306.23	8.7	221.00	6.26
% H_2O - Percent Moisture, By Volume	.3	.3	0.0	0.0	0.0	0.0	.1	.1
Ms - Molecular Weight of Stack Gas, Wet Basis	28.79	28.79	28.82	28.82	28.82	28.82	28.81	28.81
Vs - Stack Velocity, FT/SEC (M/SEC)	80.27	24.47	89.52	27.29	88.53	26.98	86.11	26.25
% I - Percent Isokinetic	94.5	94.5	90.2	90.2	86.9	86.9	90.5	90.5
V ANALYTICAL DATA								
A) Arsenic Front Half								
Probe (mg)	-	1.18	-	.79	-	.87	-	.95
Cyclone (mg)	-	-	-	-	-	-	-	-
Filter (mg)	-	31.00	-	31.00	-	23.5	-	28.5
Arsenic Front Half Total (mg)	-	32.18	-	31.79	-	24.37	-	29.45
PPM, (MG/M^3)	2.12	6.63	1.94	6.06	.90	2.81	1.65	5.17
#/HR, (KG/HR)	.578	.263	.598	.272	.288	.131	.488	.222
B) Arsenic - Impinger Collection								
Impinger #1, 2 (mg)	-	.045	-	.035	-	.020	-	.033
PPM, (MG/M^3)	00.2	.019	00.23	.007	.0007	.002	.0017	.006
#/HR, (KG/HR)	.001	.0003	.001	.0003	.0002	.001	.0007	.0005
Impinger #3,4,5 (mg)	-	.055	-	.045	-	.007	-	.036
PPM, (MG/M^3)	.0036	.011	.0027	.009	.0002	.0008	.0022	.0069
#/HR, (KG/HR)	.001	.0004	.001	.0003	.0001	.0000	.0007	.0002
C) Arsenic - Impinger Total (mg)	-	.1000	-	.08	-	.027	-	.069
PPM, (MG/M^3)	.0056	.020	.005	.016	.0009	.0028	.0039	.0129
#/HR, (KG/HR)	.002	.0007	.002	.0006	.0003	.001	.0014	.0007
D) Total Arsenic (mg)	-	32.28	-	31.87	-	34.397	-	29.519
PPM, (MG/M^3)	2.126	6.65	1.945	6.076	.9009	2.813	1.654	5.1829
#/HR, (KG/HR)	.580	.264	.600	.273	.2883	.132	.489	.2227

TABLE 9 PARTICLE SIZING SUMMARY (LOCATION-ASARCO PLANT, EL PASO, TEXAS)

		PARTICLE SIZE DISTRIBUTION %			
LOCATION	TEST	>5 μ	3-5 μ	1-3 μ	1 μ
Baghouse Inlet	303-ABI-1a	7.0	10.0	39.0	44.0
Baghouse Inlet	303-ABI-1b	52.0	8.0	15.0	25.0
Baghouse Inlet	303-ABI-1c	49.0	9.0	18.0	24.0
Baghouse Inlet	303-ABI-1d	8.0	9.0	30.0	53.0
Baghouse Inlet	303-ABI-1e	42.0	10.0	20.0	28.0
Baghouse Outlet	302-ABE-1a	16.0	11.0	27.0	46.0
Baghouse Outlet	302-ABE-1b	23.0	9.0	23.0	45.0
Calcining Duct	334-DBE-1	89.0	3.0	3.5	4.5
Calcining Duct	335-DBE-2	81.0	6.0	8	5.0
Calcining Duct	336-DBE-3	91.0	2.5	3.5	3.0
Calcining Duct	337-DBE-4	79.0	6.0	9.5	5.5

TABLE 10. ROASTER/REVERB ELECTROSTATIC PRECIPITATOR OUTLET PARTICULATE RESULTS

RUN NUMBER	1		2		3		AVERAGE	
	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS
I DATE	1/26/78	1/26/78	1/26/78	1/26/78	1/27/78	1/27/78		
II STACK PARAMETERS								
Pst - Static Pressure, "Hg (mmHg)	0.0	0.0	-.10	-2.54	-1.0	-2.54	-.07	-1.69
Ps - Stack Gas Pressure, "Hg Absolute (mmHg)	26.20	665.48	26.10	662.94	26.02	660.91	26.11	663.11
% CO_2 - Volume % Dry	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
% O_2 - Volume % Dry	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
% CO - Volume % Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% N_2 - Volume % Dry	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5
Ts - Average Stack Temperature °F (°C)	219.0	103.9	205.0	96.1	220.0	104.5	214.7	101.5
% H_2O - % Moisture in Stack Gas, By Volume	6.0	6.0	6.2	6.2	7.3	7.3	6.5	6.5
As - Stack Area, ft^2 (m^2)	180.0	16.20	180.0	16.20	180.0	16.20	180.0	16.20
Md - Molecular Weight of Stack Gas, Dry Basis	29.30	29.30	29.30	29.30	29.30	29.30	29.30	29.30
Ms - Molecular Weight of Stack Gas, Wet Basis	28.62	28.62	28.60	28.00	28.47	28.47	23.56	28.56
Vs - Stack Gas Velocity, ft/sec, (m/sec)	28.99	8.84	29.54	9.00	29.99	9.14	29.51	8.99
Qa - Stack Gas Volumetric Flow at Stack Conditions, ACFM (Nm^3/min)	313,092.0	8,869.5	319,082.0	9,037.7	323,892.0	9,175.4	318,672.0	9,027.5
Qs - Stack Gas Volumetric Flow at Standard Conditions, DSCFM (Nm^3/min)	200,352.4	5,673.4	207,295.2	5,870.0	202,650.9	5,738.5	203,432.8	5,760.6
% EA - Percent Excess Air	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95
III TEST CONDITIONS								
Pb - Barometric Pressure, "Hg (mmHg)	26.20	665.48	26.20	665.48	26.12	663.45	26.17	664.80
Dn - Sampling Nozzle Diameter, in. (mm)	.308	7.32	.308	7.82	.308	7.82	.308	7.82
T - Sampling Time, min	144	144	147	147	150	150	147	147
Vm - Sample Volume, ACF (m^3)	91.4	2.2	91.7	2.3	97.4	2.5	93.5	2.33
Np - Net Sampling Points	50	50	50	50	50	50	50	50
Cp - Pitot Tube Coefficient	.84	.84	.84	.84	.84	.84	.84	.84
Tm - Average Meter Temperature °F (°C)	82.0	27.8	75.0	23.9	61.0	16.1	72.7	22.6
Pm - Average Orifice Pressure Drop, "H_2O (mmH_2O)	1.10	27.94	1.20	30.48	1.22	30.99	1.17	29.80
Vlc - Condensate Collected (Impingers and Gel), mls	-	107.0	-	112.0	-	146.0	-	121.7
ΔP - Stack Velocity Head "H_2O (mmH_2O)	.180	4.57	.190	4.82	.190	4.83	.19	4.74
IV TEST CALCULATIONS								
Vw - Condensed Water Vapor, SDCF (Nm^3)	5.04	.14	5.27	.15	6.87	.19	5.73	.16
Vm - Volume of Gas Sampled at Standard Conditions, DSCF (Nm^3)	78.44	2.2	79.71	2.3	86.71	2.5	81.62	2.3
% H_2O - Percent Moisture, By Volume	6.0	6.0	6.2	6.2	7.3	7.3	6.5	6.5
Ms - Molecular Weight of Stack Gas, Wet Basis	28.62	28.62	28.60	28.60	28.47	28.47	28.56	28.56
Vs - Stack Velocity, ft/sec (m/sec)	28.99	8.84	29.54	9.00	29.99	9.14	29.51	8.99
% I - Percent Isokinetic	94.2	94.2	90.6	90.6	98.8	98.8	94.5	94.5
V ANALYTICAL DATA								
A) Particulates Front Half								
Probe (mg)	-	81.6	-	59.3	-	28.0	-	56.3
Cyclone (mg)	-	-	-	-	-	-	-	-
Filter (mg)	-	226.5	-	408.4	-	202.2	-	279.0
Particulates Front Half Total (mg)	-	308.1	-	467.7	-	230.2	-	335.3
grs/SDCF, (mg/m^3)	.061	133.79	.091	207.33	.041	93.81	.064	146.64
#/hr, kg/hr)	104.00	47.27	160.74	73.06	71.10	32.32	111.95	50.88
B) Particulates - Condensables								
Organic (mg)	-	0.0	-	1.2	-	0	-	.4
grs/SDCF, (mg/m^3)	0.00	0.00	.000	.53	0.00	0.00	0.00	.17
#/hr, (kg/hr)	0.00	0.00	.41	.187	0.00	0.00	.14	.06
Inorganic (mg)	-	225.6	-	106.4	-	79.7	-	137.23
grs/SDCF, (mg/m^3)	.044	101.63	.021	47.17	.014	32.48	.026	60.43
#/hr, (kg/hr)	76.15	34.62	36.57	16.62	24.62	11.19	45.78	20.81
C) Particulates - Total Condensables (mg)	-	225.6	-	107.6	-	79.7	-	137.6
grs/SDCF, (mg/m^3)	.044	101.63	.021	47.70	.014	32.48	.026	60.60
#/hr, (kg/hr)	76.15	34.62	36.98	16.81	24.62	11.19	45.92	20.87
D) Total Particulates (mg)	-	533.7	-	575.3	-	309.9	-	472.97
grs/SDCF, (mg/m^3)	.105	240.42	.112	255.03	.055	126.29	.091	207.25
#/hr, (kg/hr)	180.15	81.89	197.72	89.87	95.72	43.51	157.86	71.76
E) Total SO_2 (mg)								
ppm								
(mg/m^3)								
#/hr, (kg/hr)								

TABLE 11. ROASTER/REVERB ELECTROSTATIC PRECIPITATOR OUTLET SO_2 RESULTS

RUN NUMBER	1		2		3		AVERAGE	
	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS	ENGLISH UNITS	METRIC UNITS
I DATE	1/27/78	1/27/78						
II STACK PARAMETERS								
Pst - Static Pressure, "Hg (mmHg)	0.0	0.0						
Ps - Stack Gas Pressure, "Hg Absolute (mmHg)	26.20	665.48						
% CO_2 - Volume % Dry	3.0	3.0						
% O_2 - Volume % Dry	20.5	20.5						
% CO - Volume % Dry	0.0	0.0						
% N_2 - Volume % Dry	76.5	76.5						
Ts - Average Stack Temperature °F (°C)	219.0	103.9						
% H_2O - % Moisture in Stack Gas, By Volume	6.0	6.0						
As - Stack Area, ft^2 (m^2)	180.0	16.2						
Md - Molecular Weight of Stack Gas, Dry Basis	29.30	29.30						
Ms - Molecular Weight of Stack Gas, Wet Basis	28.62	28.62						
Vs - Stack Gas Velocity, ft/sec, (m/sec)	28.99	8.84						
Qa - Stack Gas Volumetric Flow at Stack Conditions, ACFM (Nm^3/min)	313,092.0	8,869.5						
Qs - Stack Gas Volumetric Flow at Standard Conditions, DSCFM (Nm^3/min)	200,352.4	5,673.4						
% EA - Percent Excess Air	4.95	4.95						
III TEST CONDITIONS								
Pb - Barometric Pressure, "Hg (mmHg)	26.20	665.48						
Dn - Sampling Nozzle Diameter, in. (mm)	.308	7.82						
T - Sampling Time, min	15	15						
Vm - Sample Volume, ACF (m^3)	3.674	.104						
Np - Net Sampling Points	1	1						
Cp - Pitot Tube Coefficient	.84	.84						
Tm - Average Meter Temperature °F (°C)	72.25	22.36						
Pm - Average Orifice Pressure Drop, "H_2O (mmH_2O)	-	-						
Vlc - Condensate Collected (Impingers and Gel), mls	-	-						
ΔP - Stack Velocity Head "H_2O (mmH_2O)	.180	4.57						
IV TEST CALCULATIONS								
Vw - Condensed Water Vapor, SDCF (Nm^3)	3.190	.09						
Vm - Volume of Gas Sampled at Standard Conditions, DSCF (Nm^3)	-	-						
% H_2O - Percent Moisture, By Volume	28.62	28.62						
Ms - Molecular Weight of Stack Gas, Wet Basis	28.99	8.84						
Vs - Stack Velocity, ft/sec (m/sec)	-	-						
% I - Percent Isokinetic								
V ANALYTICAL DATA								
A) Particulates Front Half	-	-						
Probe (mg)	-	-						
Cyclone (mg)	-	-						
Filter (mg)	-	-						
Particulates Front Half Total (mg)	-	-						
grs/SDCF, (mg/m^3)	-	-						
#/hr, kg/hr)	-	-						
B) Particulates - Condensables								
Organic (mg)	-	-						
grs/SDCF, (mg/m^3)	-	-						
#/hr, (kg/hr)	-	-						
Inorganic (mg)	-	-						
grs/SDCF, (mg/m^3)	-	-						
#/hr, (kg/hr)	-	-						
C) Particulates - Total Condensables (mg)	-	-						
grs/SDCF, (mg/m^3)	-	-						
#/hr, (kg/hr)	-	-						
D) Total Particulates (mg)	-	-						
grs/SDCF, (mg/m^3)	-	-						
#/hr, (kg/hr)	-	-						
E) Total SO_2 (mg)	-	1,223.4						
ppm	-	5,081.52						
(mg/m^3)	-	13,551.62						
#/hr, (kg/hr)	10,154.48	4,615.67						

TABLE 12. Process Samples From ASARCO, El Paso

LOCATION	DATE SAMPLED	% As
WEDGE ROASTER CALCINE	1-17-78	0.149
	1-18-78	0.131
	1-19-78	0.568
	1-20-78	0.481
	1-21-78	0.050
	1-22-78	0.135
	1-23-78	0.641
	1-24-78	0.197
	1-25-78	0.342
RAW REVERB SLAG	1-17-78	0.096
	1-18-78	0.088
	1-19-78	0.157
	1-22-78	0.083
	1-23-78	0.086
	1-24-78	0.203
	1-25-78	0.201
H.F. REVERB SLAG	1-17-78	0.074
	1-18-78	0.146
	1-19-78	0.156
	1-20-78	0.108
	1-21-78	0.102
	1-22-78	0.058
	1-23-78	0.058
	1-24-78	0.184
	1-25-78	0.171
	1-28-78	0.075
CONVERTER SLAG	1-17-78	0.044
	1-18-78	0.060
	1-19-78	0.088
	1-20-78	0.044
	1-21-78	0.090
	1-22-78	0.048
	1-23-78	0.046
	1-24-78	0.128
	1.25-78	0.049
REVERB MATTE	1-17-78	0.059
	1-18-78	0.082
	1-19-78	0.101
	1-20-78	0.083
	1-21-78	0.083
	1-22-78	0.072
	1-23-78	0.062
	1-24-78	0.119
WEDGE ROASTER CONC. FEED	1-18-78	0.083
	1-19-78	0.109
	1-20-78	0.090
	1-21-78	0.075
	1-22-78	0.301
	1-23-78	0.125
	1-24-78	0.016
	1-25-78	0.384
	1-26-78	0.430
ROASTER/ REVERB SPRAY CHAM.	1-23-78	0.805

TABLE 13

MASS SPECTROMETRY ANALYSIS RESULTS

Prepared by CDM/ACCU LABS

11485 W. 48th Ave./WheatRidge CO. 80033

CDM/ ACCU-LABS

11485 W. 48th Ave./Wheat Ridge CO 80033
(303) 423-2766

Baghouse Outlet
1/17-21/78

To: Mr. Dave Ringwald
TRW
3001 Aviation Boulevard
Manhattan Beach, California 90266

DATE: April 28, 1978
ALR No: 273-6312-4-1
Sample Identification No. AME Test #1
Purchase Order No. E04149JC8E
CONCENTRATION IN µg/ml

Uranium	<0.003	Terbium		Ruthenium		Vanadium	0.005
Thorium	<0.002	Gadolinium	<0.004	Molybdenum	0.26	Titanium	0.050
Bismuth	0.52	Europium	<0.002	Niobium	0.024	Scandium	<0.003
Lead	13	Samarium	<0.005	Zirconium	0.030	Calcium	26
Thallium	0.036	Neodymium	<0.005	Yttrium	0.002	Potassium	29
Mercury	NR	Praseodymium	0.007	Strontium	0.29	Chlorine	1.1
Gold		Cerium	0.004	Rubidium	0.18	Sulphur	39
Platinum		Lanthanum	0.004	Bromine	1.3	Phosphorus	0.14
Iridium		Barium	0.88	Selenium	2.0	Silicon	6.2
Osmium		Cesium	0.008	Arsenic	250	Aluminum	9.5
Rhenium	Internal Standard	Iodine	0.010	Germanium		Magnesium	19
Tungsten	<0.003	Tellurium		Gallium	0.003	Sodium	760
Tantalum	<0.002	Antimony	0.035	Zinc	6.8	Fluorine	1.3
Hafnium	<0.010	Tin	0.082	Copper	7.1	Oxygen	NR
Lutecium		Indium	Internal Standard	Nickel	0.025	Nitrogen	NR
Ytterbium	<0.005	Cadmium	0.086	Cobalt	0.013	Carbon	NR
Thullium	<0.002	Silver	0.027	Iron	2.6	Boron	NR
Erbium	<0.006	Palladium		Manganese	0.063	Beryllium	<0.003
Holmium		Rhodium		Chromium	0.16	Lithium	0.016
Dysprosium							

All elements for which values are not entered <0.001 µg/ml.

NOTES: NR - Not Reported

William R Wilgren
Supervisor
Mass Spectrometry

CDM/ ACCU-LABS
11485 W. 48th Ave./Wheat Ridge CO 80033
(303) 423-2766

Matte Tapping
1/20-25/78

To: Mr. Dave Ringwald
TRW

DATE: April 28, 1978
ALR No: 273-6312-4-2
Sample Identification No. CME Composite
Purchase Order No.
CONCENTRATION IN μg/ml

Uranium	<0.003	Terbium		Ruthenium		Vanadium	0.21
Thorium	≤0.022	Gadolinium	<0.005	Molybdenum	2.1	Titanium	0.44
Bismuth	70	Europium	<0.002	Niobium		Scandium	0.003
Lead	150	Samarium	<0.007	Zirconium	0.036	Calcium	44
Thallium	0.64	Neodymium	0.015	Yttrium	0.016	Potassium	68
Mercury	NR	Praseodymium	0.008	Strontium	0.17	Chlorine	0.43
Gold		Cerium	0.010	Rubidium	0.87	Sulphur	290
Platinum		Lanthanum	0.006	Bromine	0.38	Phosphorus	0.19
Iridium		Barium	0.89	Selenium	2.6	Silicon	470
Osmium		Cesium	<0.020	Arsenic	>0.5%	Aluminum	36
Rhenium	Internal Standard	Iodine	0.035	Germanium	0.045	Magnesium	42
Tungsten	<0.004	Tellurium	0.42	Gallium	0.004	Sodium	380
Tantalum	<0.003	Antimony	4.7	Zinc	490	Fluorine	1.8
Hafnium	<0.013	Tin	1.9	Copper	72	Oxygen	NR
Lutecium	<0.002	Indium	Internal Standard	Nickel	0.34	Nitrogen	NR
Ytterbium	<0.006	Cadmium	11	Cobalt	0.17	Carbon	NR
Thullium	<0.003	Silver	0.036	Iron	65	Boron	NR
Erbium	<0.008	Palladium		Manganese	0.59	Beryllium	<0.004
Holmium		Rhodium		Chromium	0.090	Lithium	0.052
Dysprosium	<0.002						

NOTES: All elements for which values are not entered <0.001 μg/ml
NR - Not Reported

William R Pilgren
Supervisor
Mass Spectrometry

CDM/ ACCU-LABS
11485 W. 48th Ave./Wheat Ridge CO 80033
(303) 423-2766

Baghouse Inlet
1/18-21/78

To: Mr. Dave Ringwald
TRW

DATE: April 28, 1978
ALR No: 273-6312-4-4
Sample Identification No. AMI Composite
Purchase Order No.
CONCENTRATION IN µg/ml

Uranium	0.004	Terbium		Ruthenium		Vanadium	0.012
Thorium	<0.003	Gadolinium	<0.004	Molybdenum	5.9	Titanium	0.74
Bismuth	20	Europium	<0.002	Niobium		Scandium	<0.003
Lead	370	Samarium	<0.006	Zirconium	0.029	Calcium	84
Thallium	0.52	Neodymium	0.011	Yttrium	0.013	Potassium	16
Mercury		Praseodymium	0.008	Strontium	0.63	Chlorine	0.70
Gold		Cerium	0.012	Rubidium	0.40	Sulphur	330
Platinum		Lanthanum	0.012	Bromine	0.13	Phosphorus	1.6
Iridium		Barium	4.8	Selenium	3.3	Silicon	10
Osmium		Cesium	0.015	Arsenic	590	Aluminum	35
Rhenium	Internal Standard	Iodine	0.028	Germanium	0.014	Magnesium	20
Tungsten	<0.003	Tellurium	0.29	Gallium	0.003	Sodium	230
Tantalum	<0.003	Antimony	1.8	Zinc	310	Fluorine	0.63
Hafnium	<0.010	Tin	0.89	Copper	220	Oxygen	NR
Lutecium		Indium	Internal Standard	Nickel	0.54	Nitrogen	NR
Ytterbium	<0.005	Cadmium	3.3	Cobalt	0.18	Carbon	NR
Thullium	<0.002	Silver	0.58	Iron	280	Boron	NR
Erbium	<0.007	Palladium		Manganese	1.6	Beryllium	<0.003
Holmium		Rhodium		Chromium	0.51	Lithium	0.018
Dysprosium							

All elements for which values are not entered <0.001 µg/ml.

NOTES: NR - Not Reported

William R Pilgren
Supervisor
[illegible] trometry

CDM/ ACCU-LABS
11485 W. 48th Ave./Wheat Ridge CO 80033
(303) 423-2766

Calcine Fugitive Duct
1/24/78

To: Mr. Dave Ringwald
TRW

DATE: April 28, 1978
ALR No: 273-6312-4-3
Sample Identification No. DME Composite
Purchase Order No.
CONCENTRATION IN μg/ml

Uranium	0.010	Terbium		Ruthenium		Vanadium	0.021
Thorium	<0.003	Gadolinium	<0.005	Molybdenum	20	Titanium	1.8
Bismuth	6.9	Europium	<0.002	Niobium		Scandium	<0.003
Lead	250	Samarium	<0.007	Zirconium	0.018	Calcium	100
Thallium	0.31	Neodymium	0.018	Yttrium	0.036	Potassium	8.1
Mercury	NR	Praseodymium	0.019	Strontium	1.6	Chlorine	1.4
Gold		Cerium	0.015	Rubidium	0.85	Sulphur	350
Platinum		Lanthanum	0.014	Bromine	0.56	Phosphorus	3.3
Iridium		Barium	1.2	Selenium	1.7	Silicon	16
Osmium		Cesium	<0.020	Arsenic	≈1700	Aluminum	19
Rhenium	Internal Standard	Iodine	0.068	Germanium	0.088	Magnesium	25
Tungsten	<0.004	Tellurium	0.095	Gallium	0.012	Sodium	180
Tantalum	<0.003	Antimony	2.2	Zinc	110	Fluorine	1.8
Hafnium	<0.013	Tin	0.81	Copper	300	Oxygen	NR
Lutecium	<0.002	Indium	Internal Standard	Nickel	0.58	Nitrogen	NR
Ytterbium	<0.006	Cadmium	2.3	Cobalt	0.22	Carbon	NR
Thullium	<0.003	Silver	0.35	Iron	640	Boron	NR
Erbium	<0.008	Palladium		Manganese	0.68	Beryllium	<0.004
Holmium		Rhodium		Chromium	0.73	Lithium	0.022
Dysprosium	<0.002						

NOTES: All elements for which values are not entered <0.001 μg/ml
NR - Not Reported

William R Gilgren
Supervisor
Mass Spectrometry

LOCATION OF SAMPLING POINTS

1) Inlet to the Converter Building Fugitive Emissions Baghouse

Samples from the inlet to the converter building fugitive baghouse were taken from a 152" diameter horizontal duct which is 50 feet above the ground. Sampling ports on the top and side of the duct allowed for vertical and horizontal traverses of the duct during sampling. The nearest upstream flow disturbance was a bend 90 feet (7 diameters) away from the sampling point. The nearest downstream disturbance was a bend 100 feet (8 diameters) downstream. Forty traverse points were chosen so that the sampling period would coincide with that at the outlet from the baghouse. Figure 1 is a diagram of the sampling location.

2) Outlet from the Converter Building Fugitive Emissions Baghouse

Samples from the outlet of the converter building fugitive baghouse were taken from a 20' by 9' rectangular duct. The duct was horizontal and the sampling point was 35 feet above the ground. The nearest upstream flow disturbance was 45 feet (3.5 equivalent diameters) away. The nearest downstream disturbance was 12.5 feet (1 equivalent duct diameter) away. Ten traverse points were selected at each of the four sampling ports. Figure 2 is a diagram of this location.

3) Roaster Calcining Fugitive Emissions Duct

The roaster calcining fugitive emissions were sampled from a 28.5 inch diameter circular duct which was 15 feet above the ground and at a 10 degree angle to the horizontal. The nearest upstream flow disturbance was 75 feet away (32 diameters); the nearest downstream disturbance was 8 feet away (3.5 diameters). Twenty traverse points were selected for sampling, ten on each of the two traverses. Figure 3 is a diagram of this sampling location.

4) Outlet from the Roaster/Reverberatory Furnace Electrostatic Precipitator

The duct exiting the roaster/reverberatory furnace electrostatic precipitator is a balloon shaped duct twenty-two feet high and twelve feet wide at the

top. The nearest upstream disturbance was 50 feet (4 diameters) away; the nearest downstream disturbance was 20 feet (1.5 diameters) away. Sampling was done at 50 traverse points. Figure 4 is the plan view diagram of this sampling location. Figure 5 illustrates the cross-sectioned view.

5) Matte Tapping Reverbatory Furnace Outlet

The fugitive emissions from the matte tapping reverbatory furnace were sampled from a 32.75" diameter horizontal round duct. The nearest upstream disturbance was 20 feet (6 diameters) away; the nearest downstream disturbance was 12 feet (4 diameters) away. Sampling was done at 24 traverse points on two traverses. Figure 6 is a diagram of this sampling location.

TRAVERSE POINT LOCATIONS

Traverse Point Locations	Fraction of Stack I.D.	Distance From Inside Wall (in)
1	0.026	4.0
2	0.082	12.5
3	0.146	22.2
4	0.226	34.4
5	0.342	52.0
6	0.658	100.0
7	0.774	117.6
8	0.854	129.8
9	0.918	139.5
10	0.974	148.0

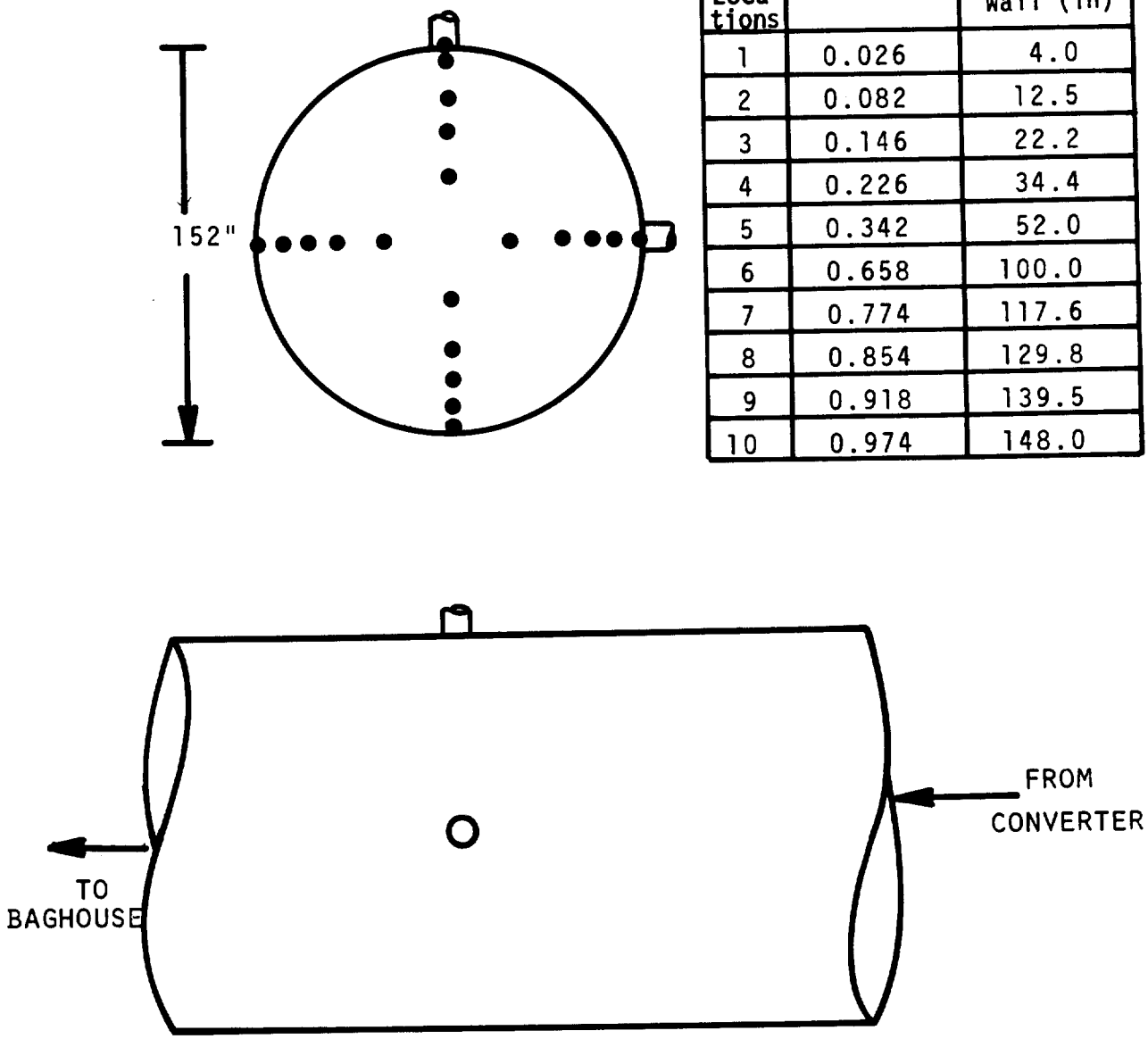
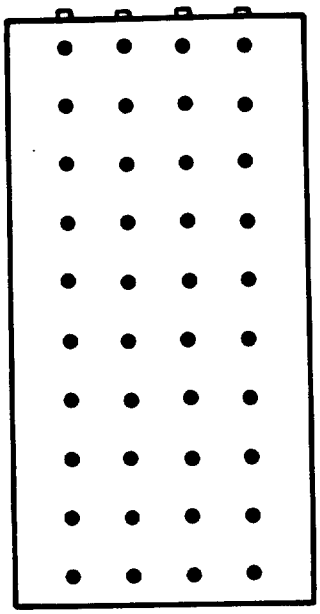


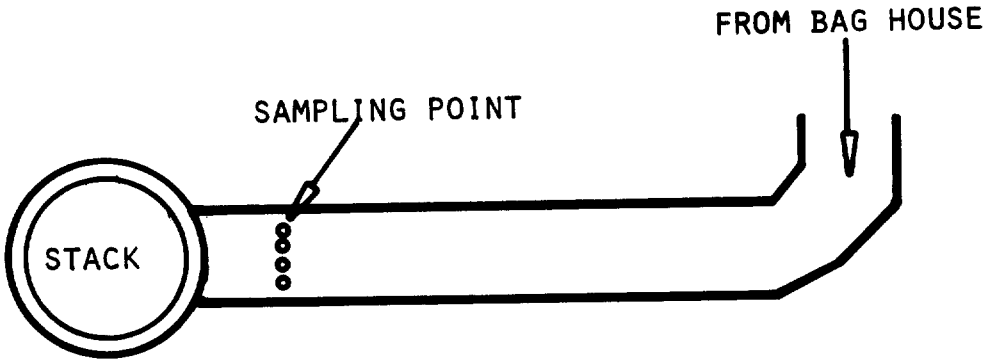
FIGURE 1.
INLET TO CONVERTER FUGITIVE EMISSIONS BAGHOUSE

DISTANCE OF SAMPLING POINT FROM PORT

TRAVERSE POINT	DISTANCE FROM INSIDE WALL (IN)
1	12
2	36
3	60
4	84
5	108
6	132
7	156
8	180
9	204
10	228

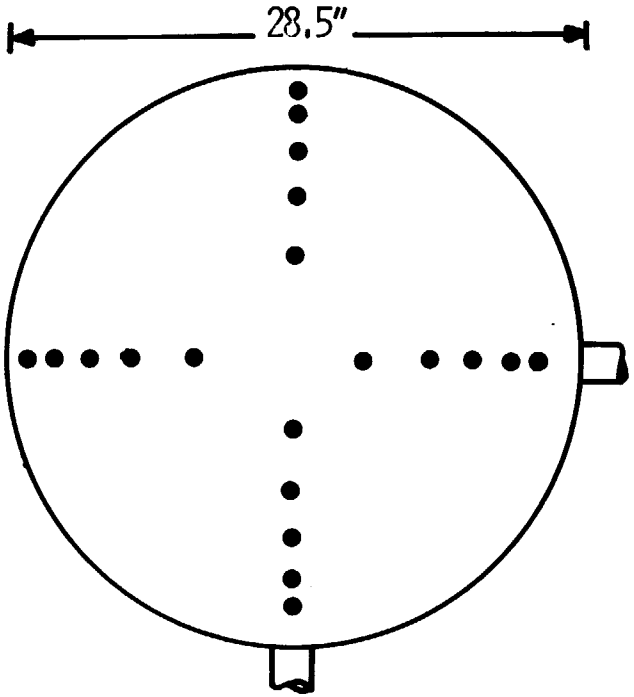


CROSS SECTION



PLAN VIEW

FIGURE 2. OUTLET FROM CONVERTER BUILDING FUGITIVE EMISSIONS BAGHOUSE



TRAVERSE POINT LOCATION

TRAVERSE POINT NUMBERS	FRACTION OF STACK I.D.	DISTANCE FROM INSIDE WALL (IN)
1	0.026	1.0
2	0.082	2.25
3	0.146	4.25
4	0.226	6.5
5	0.342	9.75
6	0.658	18.75
7	0.774	22.0
8	0.854	24.25
9	0.918	26.25
10	0.974	27.75

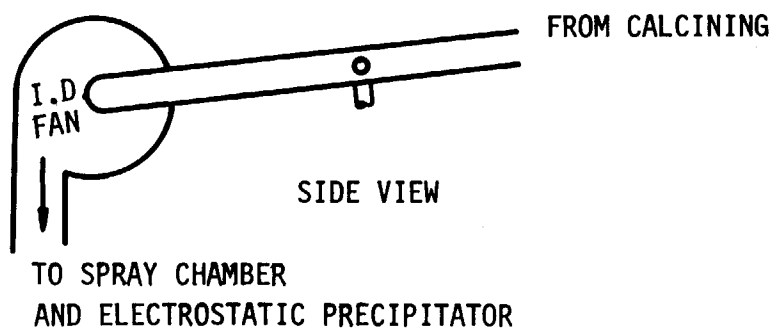


FIGURE 3. ROASTER CALCINING FUGITIVE EMISSIONS DUCT

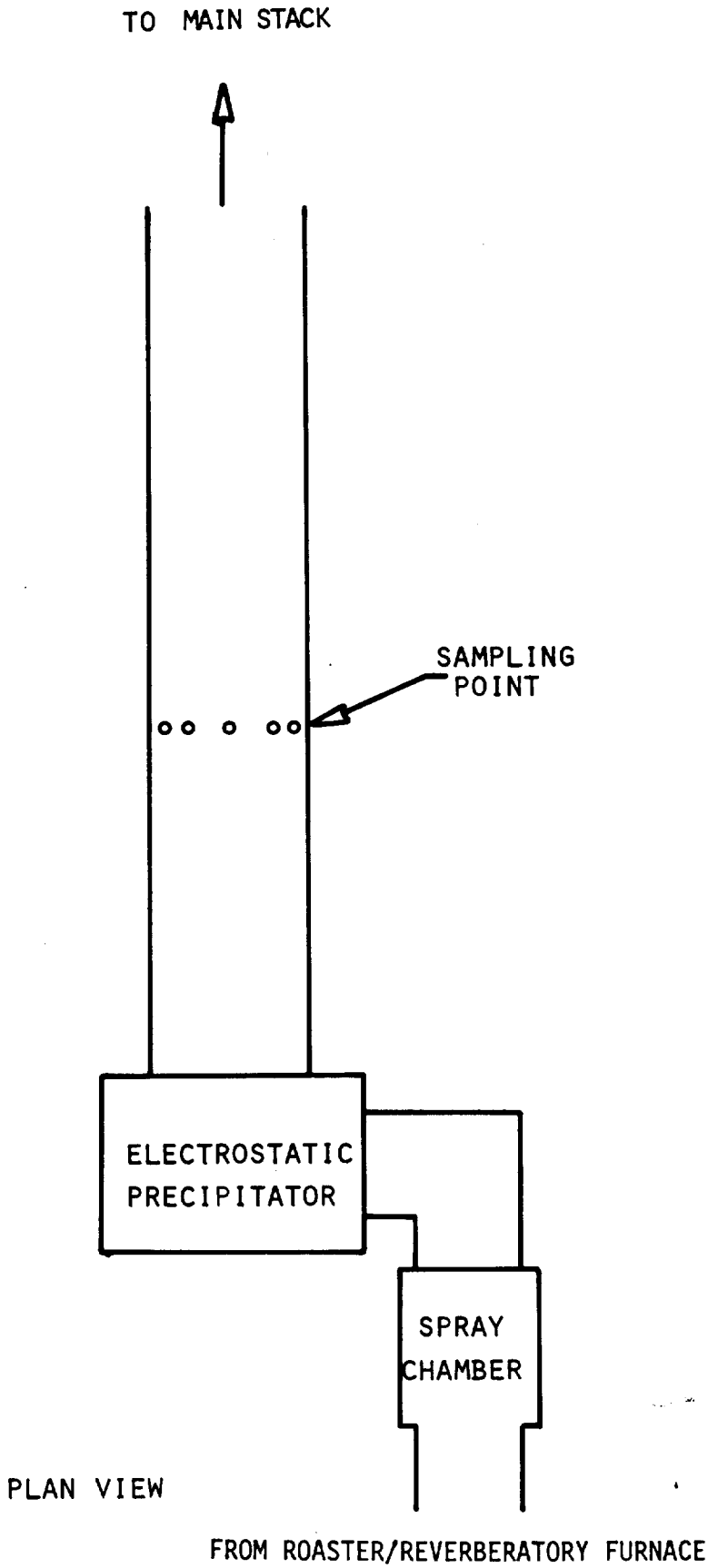


FIGURE 4. OUTLET FROM THE ROASTER/REVERBERATORY FURNACE ESP

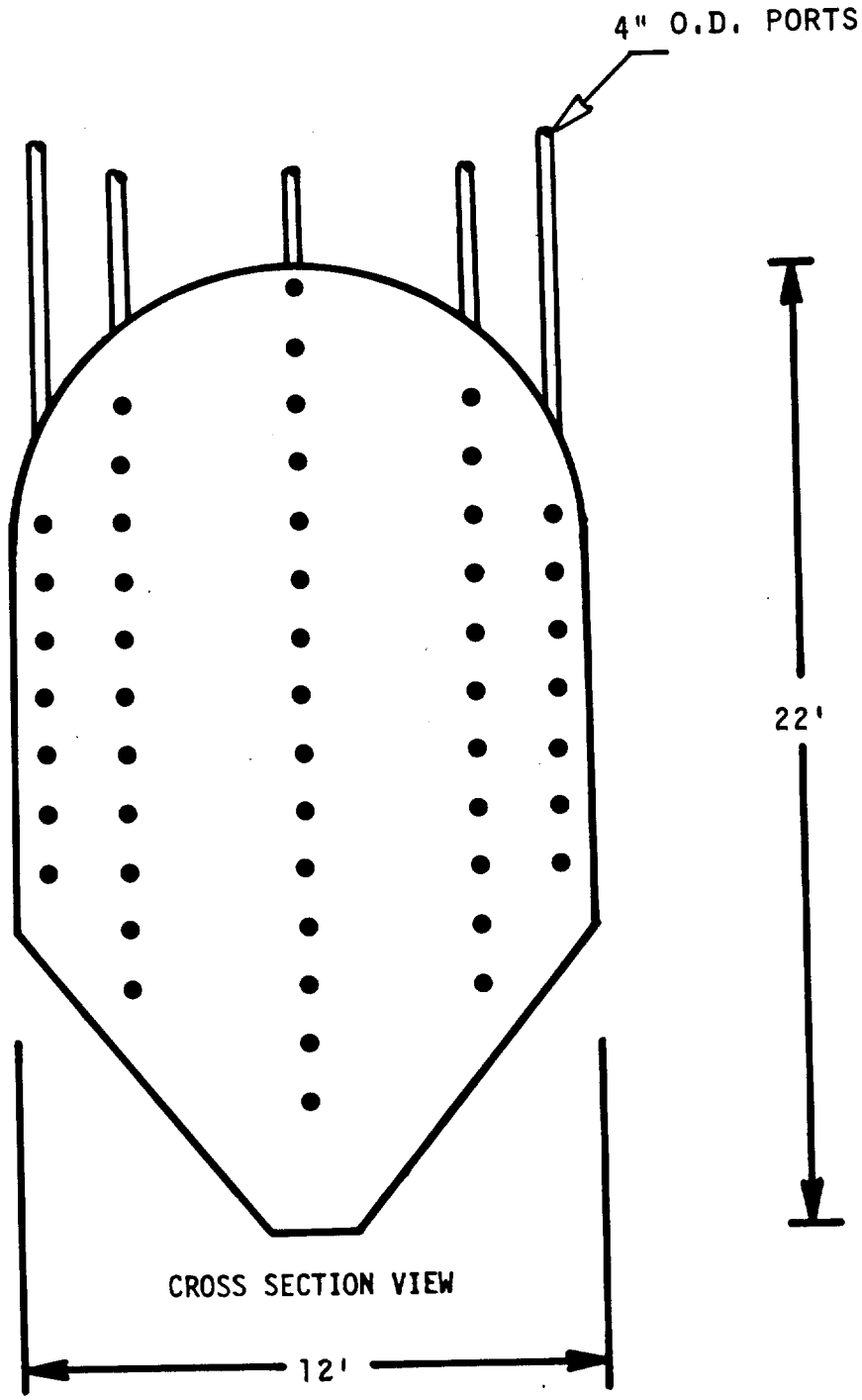
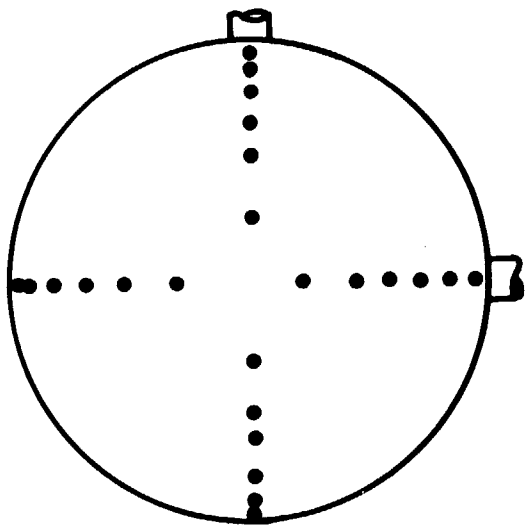


FIGURE 5.

OUTLET FROM ROASTER REVERB SPRAY CHAMBER
AND ELECTROSTATIC PRECIPITATOR



TRAVERSE POINT LOCATIONS

Traverse Point #	Fraction of Duct I.D.	Distance From Inside Wall
1	0.021	1.0
2	0.067	1.8
3	0.118	3.1
4	0.177	4.7
5	0.250	6.6
6	0.356	9.4
7	0.644	17.1
8	0.750	19.9
9	0.823	21.8
10	0.882	23.4
11	0.933	24.7
12	0.979	25.5

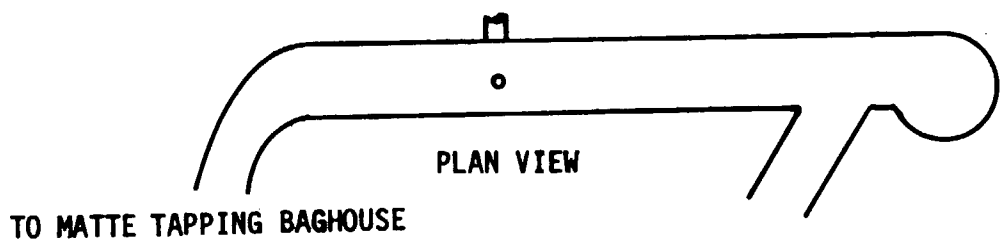


FIGURE 6. MATTE TAPPING REVERBERATORY FURNACE OUTLET

SAMPLING AND ANALYTICAL PROCEDURE

A) Particulate Sampling

Particulate sampling was performed according to EPA Method 5, as revised in the Federal Register, Volume 42, Number 160, Thursday, August 18, 1977. Figure 7 is a diagram of the sampling train used for the particulate tests.

Before each test a velocity traverse of the stack was done to determine the average stack temperature and velocity pressure. The velocity traverse was done according to EPA Methods 1 and 2. A grab sample of the stack gas was taken and analyzed with a Fryrite apparatus for CO_2. Before the first test at each location the moisture content of the gas stream was estimated by either condensation in impingers as in EPA Method 4, or by wet and dry bulb thermometer if the stack gas temperature was below $120^{o}F$.

The particulate samples were taken at traverse points at the center of equal areas within the stack. The number of traverse points was determined by the number of duct diameters upstream and downstream from the nearest flow disturbances. The sampling rate was adjusted to isokinetic conditions using a nomograph which had been set based on the preliminary velocity traverse data, and moisture estimate.

The sampling time per traverse point varied at different sampling locations depending upon the particulate concentration in the gas stream at each location. The sampling times varied from 3 minutes to 5 minutes per traverse point.

Leak checks of the sampling train were done at the beginning of each test, just before the sampling port change, and at the end of the test. At the end of each test the sampling train was inspected for cracked or broken glassware, and to assure that the filter remained intact.

Sample Recovery

After completing the particulate test the sampling probe was removed from the sampling train, the nozzle wiped off, and the probe rinsed into a clean sample container with acetone, using a nylon brush with a teflon handle to scrub particulates out of the probe. The filter holder of the sampling train was then capped and the filter holder and impingers were removed to the mobile laboratory for sample recovery.

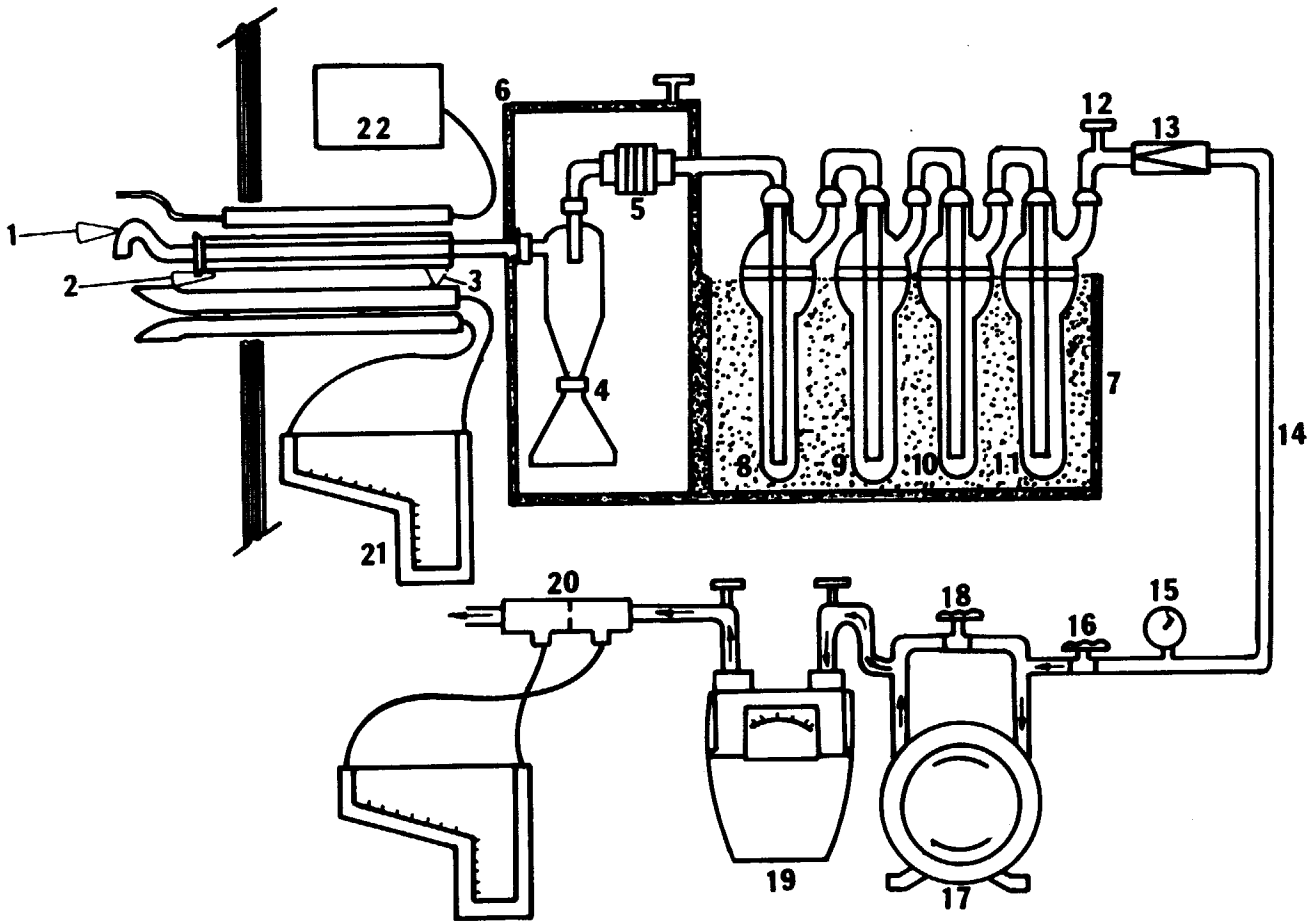


FIGURE 7. EPA METHOD 5 PARTICULATE SAMPLING TRAIN

KEY

1. Calibrated Nozzle
2. Heated Probe
3. Reverse Type Pitot
4. Cyclone Assembly
5. Filter Holder
6. Heated Box
7. Ice Bath
8. Impinger - (Water)
9. Impinger - (Water)
10. Impinger - (Water)
11. Impinger - (Silica Gel)
12. Thermometer
13. Check Valve
14. Vacuum Line
15. Vacuum Gauge
16. Main Valve
17. Air Tight Pump
18. By-Pass Valve
19. Dry Test Meter
20. Orifice
21. Pitot Manometer

The collected particulate sample was recovered and placed in four containers. The particulate filter was folded and placed in a polyethylene jar and the jar was labeled and sealed. The acetone rinse of the nozzle, probe liner, and front half of the filter was placed in a 250ml glass jar with teflon lined lid, labeled and sealed. The impinger solutions were measured, and placed in a glass jar along with a water rinse of the impingers. The front half of the filter holder, first three impingers, and connecting glassware were rinsed with acetone; this rinse was placed in a glass jar with a teflon lid liner, sealed, and labeled.

Analysis

The front half acetone rinse and back half acetone rinse were placed in tared glass beakers and evaporated. The impinger solutions and water rinse was extracted with ether and chloroform, and the fractions placed in separate tared beakers and evaporated. Aqueous fractions were dried on a steam bath. The filter and tared beakers were then placed in a dessicator until they reached a constant weight and weighed to a tenth of a milligram.

B) Particulate/Sulfur Dioxide Sampling

Most of the particulate tests were done concurrently with sulfur dioxide sampling. This was accomplished by setting up the sampling train in the same configuration as for Method 5 particulate sampling, but replacing the water in the first two impingers with 3% hydrogen peroxide. Sulfur dioxide in the sampled gas was oxidized to $SO_3^=$ in these first two impingers.

Analysis

The samples were analyzed for sulfur dioxide by taking an aliquot of the hydrogen peroxide impinger solutions and titrating with barium perchlorate solution and thorin indicator as described in EPA Method 6 (Determination of Sulfur Dioxide Emissions from Stationary Sources). The remainder of the impinger solution was then analyzed for organic and inorganic fractions as described in the section on particulate sample analysis (Section A). An aliquot factor was used

to account for the aliquot withheld for SO_2 analysis. The amount of SO_2 determined to be in the sample by Barium-Thorin titration was subtracted from the amount of inorganic condensables determined gravimetrically.

C) Arsenic Sampling

The sampling train used for arsenic collection was an EPA Method 5 sampling train modified by adding three additional impingers in series to the four used in the Method 5 train. The first two impingers contained 150 milliliters of distilled water, the third was empty and the fourth, fifth and sixth contained 200 milliliters of 10% hydrogen peroxide. The seventh impinger contained 200 grams of silica gel.

The sampling procedure was identical with that used in Method 5 particulate sampling. The sampling was done isokinetically at the centers of equal areas within the duct, sampling for the same amount of time at each point.

Sample Recovery

The sampling nozzle and probe liner were rinsed with 0.1N NaOH and brushed out with a nylon bristle brush with a teflon tubing handle. The remainder of the sampling train was removed to the mobile laboratory. The front half of the filter and connecting glassware were rinsed with 0.1N NaOH and this rinse was added to the nozzle and probe rinse. The filter was removed from the filter holder and placed in a polyethylene container, which was labeled and sealed. The first two impinger solutions were measured and placed in a glass sample container along with a 0.1N NaOH rinse of the impingers. The contents of the fourth, fifth and sixth impingers were measured and placed in a separate glass sample container along with a 0.1N NaOH rinse of the impingers. The third impinger was rinsed with 0.1N NaOH and placed in a separate glass sample container. The silica gel in the seventh impinger was weighed to the nearest gram, and regenerated.

Analysis

1. Filter - warm filter and loose particulate matter with 50ml 0.1N NaOH for about 15 minutes. Add 10ml concentrated HNO_3 and bring to boil for 15 minutes. Filter solution through no. 41 Whatman paper and wash with hot water. Evaporate filtrate, cool, redissolve in 5ml of 1:1 HNO_3, transfer to a 50ml volumetric flask and dilute.

2. Probe wash and impinger solns. These should be combined and a 200ml sample withdrawn. Add 10ml concentrated HNO_3 and evaporate to a few milliliters. Redissolve with 5ml 1:1 HNO_3 and dilute to 50mls. A reagent blank should be carried through the same procedure. The resulting blank solution should be used in the dilution of standards to matrix match samples and standards.

3. All the samples prepared above should be screened by air/acetylene flame. The filter samples may require dilution with 0.8N HNO_3. Impinger solutions containing more than 25 mg/l of arsenic should be diluted since linearity decreases dramatically above that level.

Since an entrained hydrogen flame provides about five times as much sensitivity as the air/acetylene flame, a matrix check of a sample in a hydrogen flame should be carried out by the method of standard additions, and compared with a value obtained from matrix matched standards in a hydrogen flame. If values are comparable ($\pm$ 5%) the air entrained hydrogen flame may be used.

Due to high concentrations of copper on the filter an air/acetylene flame should always be used to dissociate any AsCu compounds stable in the cooler hydrogen flame.

4. For samples below the 1mg/l level, hydride generation is necessary. An appropriate aliquot of digested sample in 0.8N HNO_3 containing less than about 10ug of arsenic is chosen (some screening may be necessary). Five mls of concentrated H_2SO_4 is added to the sample which is then placed on a hot plate until SO_3 fumes fill the flask. A reduction in volume to about 5ml or less may be necessary. This step removes HNO_3 which causes a violent reaction when the reducing agent is added resulting in poor reproducibility and lowered sensitivity by producing I_2, NO_2 and possibly other species.

One ml of 30% KI and 1ml of 30% $SnCl_2$ are added to the sample, the former to act as a catalyst in hydride formation and the latter to reduce all the arsenic to As^{+3}. The sample is then diluted to about 15ml and 15ml of concentrated HCl is added. Powdered Zn (or $NaBH_4$) is then added, the reaction vessel is immediately closed and the nitrogen or argon carrier flow initiated. A peak should be produced within a few seconds.

D. Particle Sizing

The size distribution of the particulates was estimated with a Brinks six stage impactor. Figure 8 is a diagram of the Brinks impactor sampling system used.

Sampling Procedure

The Brinks impactor was introduced into the gas stream through the sampling port with the nozzle facing the flow of gas. The sampling pump was turned on and the pressure drop across the impactor adjusted with the bypass valve. The pressure drop across the impactor was read from the mercury manometer. The pressure drop is proportional to the flowrate through the impactor and to the particle sizing cutoffs of each stage.

Sampling time at each location varied according to grain loading in the particular duct being sampled. The impactor plates were inspected after each test and the sampling time altered on the succeeding test to optimize the amount of particulate sampled. Sampling for too long results in carryover from one stage to the next, while sampling for too short a time can result in insufficient particulate on one or more of the stages for accurate analysis.

Analysis

The impactor plates and filters had been dessicated to a constant weight before the tests, and tare weights taken. After the test the same procedure was used to get the final weights of the impactor plates and filters. The difference between the tare weight and final weight is the weight of particulate collected.

The cummulative percentage of the total particulate catch which was collected in each stage was plotted on log normal graph paper against the size cutoffs for each stage. The resulting best fit straight line is the estimated particle size distribution of the collected particulates.[1]

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1. Brink, J.A. "Cascade Impactor for Adiabatic Measurements," Industrial and Engineering Chemistry, Vol. 5, No. 4, April 1958, page 647.

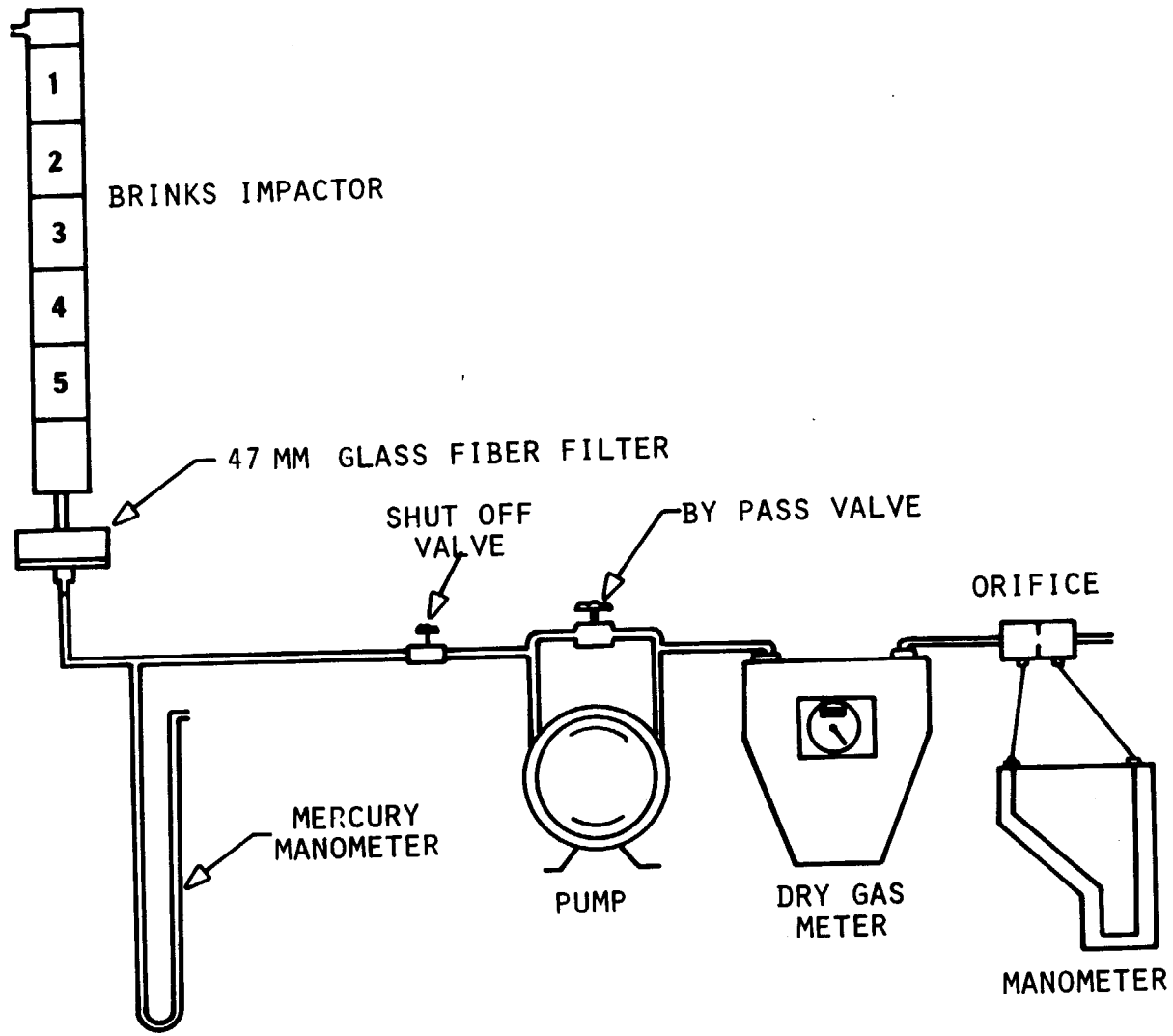

FIGURE 8. BRINKS IMPACTOR PARTICLE SIZING SYSTEM SCHEMATIC

APPENDIX A

Field and Laboratory Data

FIELD DATA SHEETS

5.0
1 of 2

FIELD DATA

PLANT: ASARCO
DATE: 1/17/78
SAMPLING LOCATION: Baghouse Outlet
SAMPLE TYPE: PART/SO_2
RUN NUMBER: APE-1
OPERATOR: Schayer
AMBIENT TEMPERATURE: 45°F
BAROMETRIC PRESSURE: 26.05
STATIC PRESSURE, (P_s): -0.9 "H_2O
FILTER NUMBER (s):

PROBE LENGTH AND TYPE: 20' 316 SS
NOZZLE I.D.: 2.185
ASSUMED MOISTURE, %: 3
SAMPLE BOX NUMBER:
METER BOX NUMBER: 2315
METER $\Delta H_@$: 1.83
C FACTOR: 0.99
PROBE HEATER SETTING: 50%
HEATER BOX SETTING: 300°F
REFERENCE Δp: 1.6

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

leak rate .02 cfm at 5" Hg

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
	0	10:10	495.00									
1	3	10:13	496.91	0.76	0.85	0.85	107	42	44	3	300	50
2	6	10:16	497.88	0.76	0.85	0.85	107	46	44	3	300	50
3	9	10:19	499.60	0.70	0.78	0.78	107	48	45	3	300	50
4	12	10:22	501.22	0.64	0.74	0.74	108	52	45	3	300	50
5	15	10:25	502.78	0.64	0.74	0.74	111	55	45	3	300	50
6	18	10:28	504.34	0.62	0.68	0.68	111	56	46	3	300	50
7	21	10:31	505.93	0.55	0.63	0.63	111	59	47	3	300	50
8	24	10:34	507.55	0.68	0.76	0.76	111	61	47	3	300	50
9	27	10:37	509.02	0.61	0.70	0.70	110	61	48	3	300	50
10	30	10:40	509.93	0.40	0.45	0.20	113	59	49	25	300	50
1	3	10:51	511.00	0.54	0.62	0.62	115	55	50	3	300	50
2	6	10:54	513.25	0.84	0.95	0.95	113	62	51	3	300	50
3	9	10:57	515.02	0.84	0.95	0.95	115	64	52	3	300	50
4	12	11:00	516.87	0.94	1.10	1.10	113	66	52	3	300	50
5	15	11:03	518.75	0.88	1.00	1.00	113	68	53	3	300	50
6	18	11:06	520.58	0.88	1.00	1.00	113	69	53	3	300	50
7	21	11:09	522.45	0.92	1.05	1.05	113	71	54	3	300	50
8	24	11:12	524.40	1.05	1.20	1.20	113	73	55	4	300	50
9	27	11:15	526.35	1.10	1.28	1.28	113	72	55	4	300	50
10	30	11:18	528.32	1.10	1.28	1.28	113	73	56	3	300	50

COMMENTS:
Initial leak ✓ .02 @ 15"
Final leak ✓ .02 @ 7"

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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
	0	11:23	528.32									
1	3	11:26	530.44	1.15	1.30	1.30	113	67	56	3	300	50
2	6	11:29	532.55	1.20	1.40	1.40	112	72	57	3	300	50
3	9	11:32	535.30	1.20	1.40	1.40	113	74	57	3	300	50
4	12	11:35	536.85	1.20	1.40	1.40	114	75	58	3	300	50
5	15	11:38	538.99	1.15	1.30	1.30	114	75	58	3	300	50
6	18	11:41	541.20	1.15	1.30	1.30	115	76	58	3	300	50
7	21	11:44	543.15	1.15	1.30	1.30	115	76	59	3	300	50
8	24	11:47	545.20	1.05	1.20	1.20	114	76	59	3	300	50
9	27	11:50	547.18	0.48	1.02	1.02	117	76	59	3	300	50
10	30	11:53	548.645	0.50	0.57	0.57	115	75	60	3	300	50
	0	11:56										
1	3	11:59	550.99	1.10	1.25	1.25	117	70	59	3	300	50
2	6	12:02	552.92	1.20	1.40	1.40	118	75	60	3	300	50
3	9	12:05	555.14	1.25	1.45	1.45	119	78	61	3	300	50
4	12	12:08	657.29	1.25	1.45	1.45	120	79	61	3	300	50
5	15	12:11	559.39	1.15	1.30	1.30	119	80	62	3	300	50
6	18	12:14	561.48	1.10	1.25	1.25	119	80	62	4	300	50
7	21	12:17	563.50	1.10	1.25	1.25	119	79	62	4	300	50
8	24	12:20	565.55	1.10	1.25	1.25	119	80	62	4	300	50
9	27	12:23	567.61	1.10	1.25	1.25	118	82	63	4	300	50
10	30	12:26	569.524	1.00	1.15	1.15	118	82	63	4	300	50
											300	50
	120 min		74.524	0.98	1.07		113.95	~~68.48~~ 64.575				

$\sqrt{\Delta P} = 0.96$

$\overline{\Delta P} = 0.92$

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4 72

FIELD DATA

PLANT ASARCO
DATE 1/18/78
SAMPLING LOCATION Baghouse Inlet
SAMPLE TYPE PART/SO_2
RUN NUMBER API-1
OPERATOR Powell
AMBIENT TEMPERATURE 50
BAROMETRIC PRESSURE 26.05
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 15' SS-316
NOZZLE I.D. 0.185
ASSUMED MOISTURE, % 3
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.75
C FACTOR 0.96
PROBE HEATER SETTING 50%
HEATER BOX SETTING 300°F
REFERENCE Δp 1.55

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 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	10:12	827.518									
horiz. 1	5	10:17	832.00	1.7	2.0	2.0	111	48	49	3.2	250	55
2	10	10:22	835.4	2.0	2.37	2.37	113	55	50	4.0	250	55
3	15	10:27	839.3	2.0	2.37	2.37	114	60	51	4.0	250	55
4	20	10:32	843.4	1.9	2.28	2.28	113	64	53	4.0	250	55
5	25	10:37	847.6	2.0	2.37	2.37	111	66	54	4.2	250	55
6	30	10:42	851.9	1.95	2.3	2.3	117	70	57	4.3	250	56
7	35	10:47	861.2	2.0	2.37	2.37	118	70	58	4.3	250	59
8	40	10:52	863.8	1.95	2.3	2.3	120	72	60	4.3	250	59
9	45	10:57	867.9	1.8	2.15	2.15	115	72	60	4.3	250	62
10	55	11:07	871.506	1.5	1.75	1.75	112	72	62	3.3	250	64
	0	12:13 after leak check	871.792									
Vert 1	5	12:18	875.4	1.5	1.75	1.75	117	60	58	3.1	250	55
2	10	12:23	879.4	1.95	2.3	2.3	118	68	60	4.2	250	55
3	15	12:28	883.7	2.0	2.37	2.37	117	75	62	4.3	250	55
4	20	12:33	888.0	2.0	2.37	2.37	116	78	64	4.3	250	55
5	25	12:38	892.4	2.0	2.37	2.37	119	80	66	4.6	250	58
6	30	12:43	896.8	2.0	2.37	2.37	113	82	68	4.6	250	59
7	35	12:48	901.5	1.8	2.15	2.15	116	82	69	4.3	250	59
8	40	12:53	905.0	1.7	2.0	2.0	115	84	70	4.0	250	60
9	45	12:58	908.0	1.7	2.0	2.0	115	85	72	4.0	250	60
10	50	1:03	912.716	1.4	1.65	1.65	112	86	73	3.5	250	60
	105		84.912	1.358	2.18		115.1	60.8				

Traverse at 3" off cluster railing

held this pt for 10 min

COMMENTS: leak check before test <0.01 cfm. leak check at port change = 0.01 cfm

leak check at end of test = 0.015 cfm

$\sqrt{\Delta P} = 1.36$
$\bar{\Delta P} = 1.85$

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-05
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FIELD DATA

PLANT ASARCO
DATE 1/18/78
SAMPLING LOCATION Outlet B/House
SAMPLE TYPE Part/SO2
RUN NUMBER APE-2
OPERATOR Scheyer
AMBIENT TEMPERATURE 59°
BAROMETRIC PRESSURE 26.10
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 20' 31655
NOZZLE I.D. 0.185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER 2315
METER $\Delta H_@$
C FACTOR
PROBE HEATER SETTING 50%
HEATER BOX SETTING 300
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 4 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
	0	2:45	577.95									
1	4	2:49	579.80	0.74	0.82	0.82	121	57	59	3	300	50
2	8	2:53	582.19	0.99	1.06	1.06	121	65	60	3	300	50
3	12	2:57	584.75	1.00	1.07	1.07	120	69	60	3	300	50
4	16	3:01	587.20	1.05	1.12	1.12	125	74	60	3	300	50
5	20	3:05	589.77	1.05	1.12	1.12	124	78	61	3	300	50
6	24	3:09	592.34	1.00	1.07	1.07	122	78	62	3	300	50
7	28	3:13	594.95	1.20	1.30	1.30	123	80	62	3	300	50
8	32	3:17	597.80	1.20	1.30	1.30	120	80	63	3	300	50
9	36	3:21	600.57	1.20	1.30	1.30	114	82	64	3	300	50
10	40	3:25	603.240	1.10	1.18	1.18	120	83	65	3	300	50
	0	3:27										
1	4	3:31	605.95	1.10	1.18	1.18	120	75	64	4	300	50
2	8	3:35	608.70	1.20	1.30	1.30	121	79	63	5	300	50
3	12	3:39	611.39	1.05	1.12	1.12	120	85	65	5	300	50
4	16	3:43	614.05	1.05	1.12	1.12	123	89	67	5	300	50
5	20	3:47	616.46	0.84	0.90	0.90	120	88	68	4	300	50
6	24	3:51	618.90	1.00	1.07	1.07	120	87	69	4	300	50
7	28	3:55	621.49	1.05	1.12	1.12	121	90	70	4	300	50
8	32	3:59	624.08	1.05	1.12	1.12	120	94	71	4	300	50
9	36	4:03	626.49	0.85	0.90	0.90	120	96	73	4	300	50
10	40	4:07		0.62	0.66	0.66	120	95	74	3	300	50

COMMENTS:

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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
	0	4:11	628.63									
1	4	4:15	631.47	1.25	1.30	1.30	121	91	65	4	300	50
2	8	4:19	634.51	1.10	1.20	1.20	119	99	77	4	300	50
3	12	4:23	636.71	0.78	0.82	0.82	119	101	78	4	300	50
4	16	4:27	639.08	0.84	0.90	0.90	118	95	78	4	300	50
5	20	4:31	641.46	0.80	0.86	0.86	120	90	77	4	300	50
6	24	4:35	643.88	0.81	0.86	0.86	119	87	76	4	300	50
7	28	4:39	646.05	0.74	0.80	0.80	118	86	75	4	300	50
8	32	4:43	648.29	0.71	0.76	0.76	117	85	75	4	300	50
9	36	4:47	650.43	0.68	0.74	0.74	116	82	73	4	300	50
10	40	4:51	652.62	0.70	0.75	0.75	117	83	72	4	300	50
	0	4:55										
1	4	4:59	654.61	0.65	0.70	0.70	113	75	69	3	300	50
2	8	5:03	656.72	0.66	0.72	0.72	111	77	69	3	300	50
3	12	5:07	658.66	0.55	0.59	0.59	109	74	68	3	300	50
4	16	5:11	660.38	0.34	0.36	0.36	108	74	67	3	300	50
5	20	5:15	661.88	0.32	0.34	0.34	116	72	66	3	300	50
6	24	5:19	663.54	0.27	0.28	0.28	111	73	66	3	300	50
7	28	5:23	664.70	0.23	0.24	0.24	109	71	65	3	300	50
8	32	5:27	666.09	0.26	0.27	0.27	108	68	65	3	300	50
9	36	5:31	667.48	0.26	0.27	0.27	107	68	64	3	300	50
10	40	5:35	668.42	0.42	0.45	0.45	109	67	64	3	300	50
	160 min		90.47	0.88	0.88		117.5	56.8				
			leak rate .00 at 5" Hg					74.88				

$\sqrt{\Delta P} = 0.885$

$\bar{\Delta P} = .783$

EPA (Dur) 236
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FIELD DATA

PLANT ASARCO
DATE 1/18/78
SAMPLING LOCATION Inlet Baghouse
SAMPLE TYPE Part
RUN NUMBER API-2
OPERATOR Powell
AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE 26.10
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 15' 316 SS
NOZZLE I.D. 0.185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.75
C FACTOR 0.96
PROBE HEATER SETTING 50%
HEATER BOX SETTING 300°
REFERENCE Δp 1.55

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 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
	0	2:57	913.068									
horizontal 1	5	3:02	917.2	1.9	2.25	2.25	101	60	60	3.0	250	60
2	10	3:07	921.5	2.0	2.35	2.35	112	69	61	3.5	250	55
3	15	3:12	925.7	2.1	2.5	2.5	118	74	63	3.8	250	55
4	20	3:17	930.2	2.1	2.5	2.5	120	78	63	3.9	250	55
5	25	3:22	934.5	1.95	2.3	2.3	123	80	67	4.0	250	55
6	30	3:27	938.7	2.0	2.35	2.35	117	82	69	3.8	250	65
7	35	3:32	943.1	2.0	2.35	2.35	120	82	70	3.9	250	64
8	40	3:37	947.3	2.0	2.35	2.35	118	82	70	3.9	250	64
9	45	3:42	951.7	1.9	2.25	2.25	121	80	70	3.7	250	64
10	50	3:47	955.407	1.4	1.65	1.65	116	82	72	2.9	250	64
	0	leak check 4:14	955.606									
next 1	5	4:19	959.40	1.6	1.9	1.9	80	61	63	3.0	250	60
2	10	4:24	963.6	2.0	2.35	2.35	103	67	63	3.8	250	60
3	15	4:29	970.0	2.0	2.35	2.35	119	72	64	3.8	250	60
4	20	4:34	972.4	2.1	2.5	2.5	117	76	65	4.0	250	60
5	25	4:39	976.7	2.0	2.35	2.35	116	78	66	3.9	250	60
6	30	4:44	981.1	2.0	2.35	2.35	114	80	68	4.0	250	60
7	35	4:49	985.3	2.0	2.35	2.35	119	82	70	4.1	250	60
8	40	4:54	989.4	1.7	2.05	2.05	114	83	71	3.2	250	60
9	45	4:59	993.5	1.7	2.05	2.05	113	80	72	3.2	250	60
10	50	5:04	997.107	1.4	1.65	1.65	104	80	72	3.0	250	60
	100 min		83.87	1.37	2.24		113.25	71.8				

traverse pt 8 & 9 port change another due to rolling

-42-

COMMENTS: leak check before test = <0.01 cfm leak check at port change = 0.015 cfm

leak check at end of test = 0.015 cfm

$\sqrt{\Delta P} = 1.37$

$\overline{\Delta P} = 1.89$

EPA (Dwl) 235

3 of 2

FIELD DATA

PLANT ASARCO
DATE 1/18/78
SAMPLING LOCATION Outlet Baghouse
SAMPLE TYPE Arsenic
RUN NUMBER A-ME-1
OPERATOR Schayes
AMBIENT TEMPERATURE 40°
BAROMETRIC PRESSURE 26.10
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 20' SS
NOZZLE I.D. .185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER 2315
METER $\Delta H_@$
C FACTOR
PROBE HEATER SETTING 50%
HEATER BOX SETTING 300
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 4 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
	0	6:50	670.18									
1	4	6:54	670.78	0.10	0.13	0.13	107	52	54	2	300	50
2	8	6:58	672.02	0.34	0.38	0.38	105	52	54	2	300	50
3	12	7:02	673.42	0.17	0.19	0.19	103	58	55	2	300	50
4	16	7:06	674.75	0.30	0.34	0.34	102	58	55	2	300	50
5	20	7:10	676.01	0.13	0.14	0.14	103	58	54	2	300	50
6	24	7:14	677.21	0.20	0.22	0.22	103	58	54	2	300	50
7	28	7:18	678.92	0.67	0.77	0.77	105	58	54	2	300	50
8	32	7:22	680.59	0.60	0.69	0.69	104	58	54	2	300	50
9	36	7:26	682.77	0.71	0.82	0.82	104	58	54	2	300	50
10	40	7:30	685.005	0.77	0.85	0.85	103	58	54	2	300	50
	0	7:32										
1	4	7:36	687.86	1.05	1.20	1.20	107	60	55	3	300	50
2	8	7:40	690.59	1.10	1.25	1.25	102	60	55	3		
3	12	7:44	693.31	1.10	1.25	1.25	102	72	58	3		
4	16	7:48	696.05	1.10	1.25	1.25	103	80	56	3		
5	20	7:52	698.61	0.88	1.00	1.00	103	81	58	3		
6	24	7:56	701.18	0.94	1.10	1.10	102	80	58	3		
7	28	8:00	703.88	0.94	1.10	1.10	102	80	58	3		
8	32	8:04	706.23	0.75	0.86	0.86	100	76	60	3		
9	36	8:08	707.55	0.65	0.15	0.75	100	76	60	3		
10	40	8:12	709.12				99	70	58	3		

COMMENTS:

Stop 5:06 for 1 minute

EPA (Dur) 235

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
	0	~~8:19~~	709.12									
1	4	8:23	710.42	0.21	0.23	0.23	98	60	58	2	300	50
2	8	8:27	712.18	1.00	1.10	1.10	97	60	58	2		
3	12	8:31	714.85	1.10	1.25	1.25	97	68	58	3		
4	16	8:34	716.93	1.10	1.25	1.25	97	68	58	3		
5	20	8:38	719.61	1.10	1.25	1.25	99	74	58	3		
6	24	8:42	722.24	1.05	1.20	1.20	102	80	60	3		
7	28	8:46	724.78	0.83	0.95	0.95	102	80	60	3		
8	32	8:50	727.58	0.60	0.68	0.68	104	80	60	3		
9	36	8:54	728.79	0.40	0.46	0.46	104	80	60	3		
10	40	8:58	730.185	0.22	0.24	0.24	104	80	60	3		
	0	9:03	~~732.82~~	~~1.20~~	~~1.40~~	~~1.40~~	~~104~~	~~68~~	~~60~~	~~3~~		
1	4	9:07	732.82	1.20	1.40	1.40	101+	78	60	3	300	50
2	8	9:11	735.70	1.20	1.40	1.40	101	78	60	3		
3	12	9:15	738.63	1.00	1.20	1.20	99	78	60	3		
4	16	9:19	744.28	1.10	1.25	1.25	99	84	60	3		
5	20	9:23+2	748.78	0.75	.86	.86	96	80	61	3		
6	24	9:27+2	751.31	0.76	.86	.86	96	80	62	3		
7	28	9:31+2	753.27	0.61	.70	.70	97	82	62	3		
8	32	9:35+2	755.36	0.59	0.68	0.68	96	82	63	3		
9	36	9:39+2	757.23	0.38	0.42	0.42	96	82	63	3		
10	40	9:43+2	758.565	0.33	0.42	0.42	96	82	63	3		
				~~0.635~~								
	160 min.		88.385	0.63	0.80		104.88	63.73				
			leak rate	.04	cfm	at	5					

$\sqrt{\Delta P} = .7969$

$\overline{\Delta P} = 0.635$

EPA (Dur) 236
4 72

9:26 stopped for two minutes

FIELD DATA

PLANT ASARCO
DATE 1/18/79
SAMPLING LOCATION Inlet [illegible]
SAMPLE TYPE ARSENIC
RUN NUMBER AMI-1
OPERATOR JONGLEUX / POWELL
AMBIENT TEMPERATURE 45
BAROMETRIC PRESSURE 26.10
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 15' SS
NOZZLE I.D. .185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER 2345
METER $\Delta H_@$ 1.75
C FACTOR .96
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 1.50 + 1.53

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 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
vertical	0	7:00	997.426									
1	5	7:05	801.2	1.8	2.2	2.2	79	55	55	8.0	250	55
2	10	7:10	005.5	2.0	2.4	2.4	94	60	55	9.0	250	55
3	15	7:15	10.0	2.1	2.55	2.55	103	66	58	11.0	250	55
4	20	7:20	14.5	2.1	2.55	2.55	109	68	58	11.0	250	55
5	25	7:25	18.3	2.0	2.55	2.55	102	70	59	11.0	250	55
6	30	7:30	22.7	2.0	2.4	2.4	101	72	59	11.0	250	55
7	35	7:35	27.0	1.85	2.25	2.25	102	73	60	10.5	250	55
8	40	7:40	31.2	1.65	2.0	2.0	99	74	62	9.5	250	55
9	45	7:45	35.0	1.50	1.8	1.8	102	75	62	8.0	250	55
10	50	7:50	39.104	1.35	1.65	1.65	99	76	64	7.5	250	55
	0 [illegible]	8:13	39.222	1.8	2.2	2.2	76	52	55	8.5	250	55
1	5	8:18	43.5	2.0	2.5	2.5	88	60	55	10.0	250	55
2	10	8:23	47.4	2.2	2.7	2.7	92	64	55	11.0	250	55
3	15	8:28	51.7	2.1	2.6	2.6	98	65	55	11.0	250	55
4	20	8:33	56.3	2.0	2.5	2.5	102	66	55	11.0	250	55
5	25	8:38	60.8	2.0	2.4	2.4	114	62	55	11.0	250	55
6	30	8:43	64.6	2.0	2.4	2.4	111	65	56	11.0	250	55
7	35	8:48	68.3	1.9	2.3	2.3	110	65	56	11.0	250	55
8	40	8:53	73.6	1.9	2.3	2.3	108	65	56	11.0	250	55
9	45	8:58	77.8	1.4	1.8	1.8	101	64	56	10	250	55
10	50 51	9:04	82.298									
	101											
			84.754	1.37	2.26		99.5	61.65				

held last point 1 min longer (6 min)

COMMENTS: leak check before test < 0.02 cfm
end of test < 0.02 cfm

$\sqrt{\Delta P} = 1.38$
$\bar{\Delta P} = 1.90$

EPA (Dur) 235

FIELD DATA

1 of 2

PLANT PSARCO
DATE 1/19/77
SAMPLING LOCATION Outlet B/House
SAMPLE TYPE Metals
RUN NUMBER AME-2
OPERATOR
AMBIENT TEMPERATURE 30
BAROMETRIC PRESSURE 26.30
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 20' SS
NOZZLE I.D. .185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$
C FACTOR
PROBE HEATER SETTING 50
HEATER BOX SETTING 300
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 4 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
	0	12:03	759.98									
1	4	12:07	761.24	0.71	0.82	0.82	96	42	40	2	300	50
2	8	12:11	764.19	1.30	1.50	1.50	95	50	41	2		
3	12	12:15	766.82	1.30	1.50	1.50	96	56	42	2		
4	16	12:19	769.30	0.98	1.10	1.10	98	60	42	2		
5	20	12:23	772.25	1.40	1.58	1.58	98	61	43	3		
6	24	12:27	776.58	~~1.50~~ 1.520	~~1.80~~ 1.85	4.80	98	66	45	5		
7	28	12:31	779.45	0.98	1.10	1.10	99	75	48	3		
8	32	12:35	781.93	0.97	1.10	1.10	98	71	49	3		
9	36	12:39	785.38	0.82	0.94	0.94	100	71	50	3		
10	40	12:43	786.73	0.68	0.75	0.75	103	72	52	3		
	0	12:48		~~1.2~~								
1	4	12:58	788.84	1.20	1.33	1.33	95	59	52	3	300	50
2	8	12:57	792.49	1.25	1.40	1.40	98	70	54	3		
3	12	~~12~~ 1:01	795.24	1.25	1.40	1.40	98	75	55	3		
4	16	1:05	798.15	1.10	1.23	1.23	100	77	56	3		
5	20	1:09	800.48	0.85	0.95	0.95	99	80	57	3		
6	24	1:13	803.16	1.10	1.23	1.23	99	78	57	3		
7	28	1:17	805.89	1.15	1.30	1.30	100	78	59	3		
8	32	1:21	808.56	1.05	1.17	1.17	99	80	60	3		
9	36	1:25	811.09	0.95	1.08	1.08	99	80	60	3		
10	40	1:29	813.715	1.05	1.17	1.17	99	80	60			

COMMENTS:

DP on point 6 was to high
Value changed after rotation of probe
to approx. 1.0

EPA (Dun) 235

3·11 2 of 2

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
	0	1:38	813.715									
1	4	1:42	816.33	0.98	1.10	1.10	99	71	61	2	300	50
2	8	1:46	818.98	1.05	1.18	1.18	98	80	63	3		
3	12	1:50	821.69	1.15	1.30	1.30	98	80	63	2		
4	16	1:54	824.22	0.86	0.97	0.97	94	80	63	2		
5	20	1:58	826.72	0.94	1.05	1.05	97	79	63	2		
6	24	2:02	829.35	~~0.88~~	~~1.00~~	~~1.00~~	99	79	63	2		
7	28	2:06	831.85	1.05	1.18	1.18	99	79	63	2		
8	32	2:10	834.19	0.68	0.76	0.76	99	80	63	2		
9	36	2:14	836.35	0.62	0.70	0.70	100	80	63	2		
10	40	2:18	838.316	0.56	0.63	0.63	101	79	63	2		
	0	2:23										
1	4	2:27	840.92	0.74	0.83	0.83	102	69	61	2	300	50
2	8	2:31	842.86	0.60	0.68	0.68	103	74	62	2		
3	12	2:35	844.93	0.60	0.68	0.68	103	75	62	2		
4	16	2:39	847.51	0.78	0.88	0.88	104	77	62	2		
5	20	2:43	849.48	0.76	0.86	0.86	103	78	62	2		
6	24	2:47	852.05	1.05	1.18	1.18	103	78	62	2		
7	28	2:51	854.55	0.72	0.80	0.80	103	78	63	2		
8	32	2:55	856.78	0.87	1.00	1.00	102	78	63	2		
9	36	2:59	859.02	0.62	0.70	0.70	100	78	63	2		
10	40	3:03	861.027	0.58	0.66	0.66	101	78	63			
	160 min		101.047	0.96	1.05		99.4	65.1				
			leak rate	.005 cfm	at	5" Hg						

$\sqrt{\Delta p} = 0.96$

$\bar{\Delta} p = 0.92$

EPA (Dur) 236
4 72

FIELD DATA

PLANT: ASARCO
DATE: 1/14/78
SAMPLING LOCATION: Inlet B House
SAMPLE TYPE: Mod.
RUN NUMBER: AMI-2
OPERATOR: Powell
AMBIENT TEMPERATURE: 30°
BAROMETRIC PRESSURE: 26.30
STATIC PRESSURE, (P_s):
FILTER NUMBER (s):

PROBE LENGTH AND TYPE: 15' SS
NOZZLE I.D.: .185
ASSUMED MOISTURE, %: 2
SAMPLE BOX NUMBER:
METER BOX NUMBER:
METER $\Delta H_@$: 1.75
C FACTOR: 1.01
PROBE HEATER SETTING: 50°
HEATER BOX SETTING: 300
REFERENCE Δp: 1.53

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 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
vertical	0	12:20	87.788									
1	5	12:25	91.7	1.7	2.1	2.1	69	41	43	9.5	250	40
2	10	12:30	95.8	1.9	2.35	2.35	88	52	45	11.0	250	40
3	15	12:35	100.1	2.1	2.55	2.55	92	60	47	12.0	250	40
4	20	12:40	104.5	2.1	2.55	2.55	99	64	49	12.0	250	40
5	25	12:45	108.6	2.1	2.55	2.55	105	65	50	12.0	250	40
6	30	12:50	113.0	2.0	2.5	2.5	97	66	52	11.0	250	40
7	35	12:55	117.4	1.9	2.35	2.35	94	56	52	11.0	250	40
8	40	1:00	121.5	1.8	2.2	2.2	99	60	52	11.0	250	40
9	45	1:05	125.4	1.6	1.95	1.95	96	62	52	9.5	250	40
10	50	1:10	129.117	1.5	1.85	1.85	98	65	53	9.0	250	40
	0 after leak chk		129.352									
1	95	1:49	133.4	1.8	2.25	2.25	75	59	48	10.0	250	45
2	5 10	1:54	137.6	2.1	2.55	2.55	92	57	49	12.0	250	45
3	10 15	1:59	142.0	2.1	2.55	2.55	96	60	50	12.0	250	45
4	15 20	2:04	146.3	2.1	2.55	2.55	104	62	51	12.9	250	45
5	20 25	2:09	150.6	2.0	2.5	2.5	104	64	51	12.9	250	45
6	25 30	2:14	155.2	1.9	2.35	2.35	108	65	52	12.0	250	45
7	30 35	2:19	159.1	1.9	2.35	2.35	101	68	54	12.0	250	45
8	35 40	2:24	163.5	1.9	2.35	2.35	107	65	54	12.00	250	45
9	40 45	2:29	167.4	1.7	2.1	2.1	110	62	54	10.20	256	44
10	45 50	2:34	170.647	1.4	1.75	1.75	104	61	54	10	250	44
	100 min.		82.624	1.44	2.31		96.9	55.7			$\sqrt{\Delta P}$ = 1.37	

lost power at pt change no discernable problems with filter or impingers

COMMENTS: leak chk before test < 0.02 cfm
leak chk at point change < 0.02 cfm
final leak check < 0.02 cfm
ΔP = 1.87

EPA (Dwl) 235

313
1 of 2

FIELD DATA

PLANT ASARCO
DATE 1/20/78
SAMPLING LOCATION MATTE TAPPING
SAMPLE TYPE Metals
RUN NUMBER CME-2
OPERATOR
AMBIENT TEMPERATURE 50
BAROMETRIC PRESSURE 26.10
STATIC PRESSURE, (P_s) +6" H_2O
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' pyrex
NOZZLE I.D. .185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER 2187
METER $\Delta H_@$
C FACTOR
PROBE HEATER SETTING 50
HEATER BOX SETTING 300
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

10 minutes per point

READ AND RECORD ALL DATA EVERY 5 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
1	0	1:35	532.005									
1 1	5	1:40	536.56	1.45	1.67	1.67	126°F	72	67	3.5	300	50
2 1 2	10	1:45	540.92	1.40	1.60	1.60	127	79	68	3.5	300	50
2 3 2	15	1:50	544.00	1.55	1.85	1.85	113	88	71	3.5	300	50
3 4 2	20	1:55	548.30	1.50	1.80	1.80	110	92	72	3.5	300	50
3 5 3	25	2:00	550.35	1.55	1.85	1.85	108	96	76	3.5	300	50
4 6 3	30	2:05	555.02	1.60	1.90	1.90	105	98	78	3.5	300	50
4 7 4	35	2:10	559.01	1.55	1.85	1.85	104	100	80	3.5	300	50
5 8	40	2:15	562.03	1.55	1.85	1.85	102	102	80	3.5	300	55
5 9	45	2:20	566.94	1.55	1.85	1.85	120	102	82	3.5	300	55
6 10	50	2:25	570.92	1.50	1.80	1.80	141	102	82	3.5	300	55
6 11	55	2:30	574.25	1.60	1.90	1.90	115	104	84	4.0	300	55
7 12	60	2:35	578.68	1.60	1.90	1.90	108	104	84	4.0	300	55
7	65	2:40	584.20	2.0	2.4	2.4	103	106	86	4.0	300	55
8	70	2:45	587.90	2.1	2.5	2.5	97	108	92	4.0	300	55
8	75	2:50	593.40	2.4	2.9	2.9	106	108	92	4.0	300	55
9	80	2:55	597.40	2.2	2.6	2.6	99	108	92	4.0	300	55
9	85	3:00	602.10	2.4	2.8	2.8	103	110	92	4.0	300	55
10	90	3:05	607.15	2.4	2.8	2.8	99	110	92	4.0	300	55
10	95	3:10	613.78	2.5	3.0	3.0	75	110	92	4.0	300	55
11	100	3:15	616.91	2.5	3.0	3.0	70	110	92	4.0	300	55
11	105	3:20	621.97	2.75	3.25	3.25	79	110	92	4.0	300	55
12	110	3:25	627.25	2.75	3.25	3.25	101	110	92	4.0	300	55
12	116	3:30	632.30	2.40	2.90	2.90	109	110	92	4.0	300	55

COMMENTS:

EPA (Dur) 235

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
12	120	3:35	637.333	2.40	2.90	2.90	113	110	90	4.0	300	55
	0	4:06										
1	5	4:11	641.46	1.65	2.00	2.00	76°	82	82	4.0	300	55
1	10	4:16	645.62	~~1.05~~ 1.60	2.00	2.00	76	93	82	4.0	300	55
2	15	4:21	649.75	1.65	2.00	2.00	74	96	83	4.0	300	55
2	20	4:26	653.96	1.75	2.10	2.10	79	100	84	4.0	300	55
3	25	4:31	658.52	2.16	2.60	2.60	95	104	86	4.25	300	55
3	30	4:36	663.28	2.15	2.60	2.60	99	106	88	4.25	300	55
4	35	4:41	667.94	2.25	2.70	2.70	101	107	90	4.25	300	55
4	40	4:46	672.86	2.3	2.75	2.75	91	108	90	4.5	300	55
5	45	4:51	677.91	2.5	3.0	3.0	87	109	92	4.5	300	55
5	50	4:56	682.96	2.5	3.0	3.0	84	111	92	4.75	300	55
6	55	5:01	688.12	2.6	3.1	3.1	83	111	93	4.75	300	55
6	60	5:06	693.29	2.6	3.1	3.1	83	111	94	4.9	300	55
7	65	5:11	698.47	2.65	3.15	3.15	80	114	95	4.9	300	55
7	70	5:16	703.72	2.7	3.2	3.2	74	114	96	4.9	300	55
8	75	5:21	708.92	2.65	3.15	3.15	83	114	96	4.9	300	55
8	80	5:26	714.06	2.6	3.1	3.1	101	113	97	4.9	300	55
9	85	5:31	719.15	2.5	3.0	3.0	102	114	97	4.9	300	55
9	90	5:36	724.29	2.55	3.05	3.05	80	114	97	5.0	300	55
10	95	5:41	729.36	2.60	2.9	2.9	103	114	97	4.9	300	55
10	100	5:46	734.39	2.4	2.9	2.9	110	113	97	4.9	300	55
11	105	5:51	739.33	2.3	2.75	2.75	100	112	96	4.9	300	55
11	110	5:56	744.38	2.45	2.95	2.9	89	111	95	4.9	300	55
12	115	6:01	749.34	2.3	2.75	2.75	86	112	95	5.0	300	55
12	120	6:06	754.259	2.15	2.60	2.60	108	111	95	4.75	300	55
	240		222.254	1.46	2.50		97.69	107.96	88.12			
									97.78			

$\sqrt{\Delta p_s}$

$\sqrt{\Delta P} = 1.45$

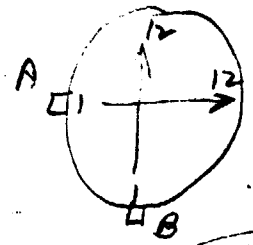
$\bar{\Delta P} = 2.11$

EPA (Dur) 236
4 72

leak check at end of test < 0.015 cfm. 1/15"

FIELD DATA

PLANT: ASARCO
DATE: 1/20/78
SAMPLING LOCATION: MATTE TAPPING
SAMPLE TYPE: Metals
RUN NUMBER: AME-1
OPERATOR: JONGLEUX
AMBIENT TEMPERATURE: 50
BAROMETRIC PRESSURE: 26.10
STATIC PRESSURE, (P_s): +6" H_2O
FILTER NUMBER (s):



SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE: 3' pyrex™
NOZZLE I.D.: .186
ASSUMED MOISTURE, %: 2
SAMPLE BOX NUMBER:
METER BOX NUMBER:
METER $\Delta H_@$: 1.80
C FACTOR: 1.0
PROBE HEATER SETTING: 50%
HEATER BOX SETTING: 300
REFERENCE Δp: 1.6

READ AND RECORD ALL DATA EVERY 5 MINUTES

10 minutes per point

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	11:08	903.482									
1 b	5	11:13	908.9	2.0	2.3	2.3	128	50	48	9.9	250	50
2	10	11:18	911.9	1.55	1.8	1.8	101	76	59	7.5	250	50
2	15	11:23	916.1	1.9	2.15	2.15	95	83	59	9.0	250	50
4	20	11:28	920.2	1.9	2.15	215	92	88	62	9.0	250	50
3 5	25	11:33	924.7	2.15	2.45	2.45	86	94	68	10.5	250	50
6	30	11:38	929.1	2.15	2.45	2.45	94	98	68	10.5	250	50
4 7	35	11:43	933.3	2.2	2.55	2.55	115	100	70	11.5	250	50
8	40	11:48	938.4	2.15	2.45	2.45	132	104	72	11.5	250	50
5	45	11:53	943.1	2.2	2.55	2.55	106	106	75	12.0	250	50
	50	11:58	947.8	2.2	2.55	2.55	97	108	77	12.0	250	50
6	55	12:03	952.6	1.65	1.9	1.9	92	110	80	8.75	250	60
	60	12:08	956.4	1.7	1.95	1.95	90	110	81	8.75	250	60
7	65	12:13	960.1	1.7	1.95	1.95	88	109	81	8.75	250	60
	70	12:18	964.7	1.7	1.95	1.95	89	108	82	8.75	250	60
8	75	12:23	969.0	1.65	1.9	1.9	81	108	83	8.5	250	60
	80	12:28	973.1	1.5	1.75	1.75	126	108	84	8.25	250	60
9	85	12:33	977.05	1.4	1.6	1.6	110	108	84	7.5	250	60
	90	12:38	981.0	1.5	1.75	1.75	95	108	84	7.75	250	60
10	95	12:43	985.0	1.3	1.5	1.5	138	108	85	7.0	250	60
	100	12:48	988.6	1.3	1.5	1.5	128	109	85	7.0	250	60
11	105	12:53	992.4	1.4	1.6	1.6	101	110	87	7.25	250	60
	110	12:58	995.8	1.3	1.5	1.5	118	111	89	7.0	250	60
12	115	1:03	1000.2	1.2	1.35	1.35	143	112	90	6.5	250	60

COMMENTS:
Leak ✓ .01 cfm start
Leak .01 cfm post ✗
Leak rate final > .02 cfm @15" Hg

EPA (Dur) 235

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
	115	1:03	1000.2									
	120	1.08	1003.545	1.2	1.35	1.35	120	112	90	6.5	250	60
	120	1:39	1003.852									
B-1	125	1:44	1007.20	1.0	1.1	1.1	133	82	82	5.1	250	60
1	130	1:49	1010.5	1.1	1.3	1.3	107	92	84	5.5	250	60
2	135	1:54	1014.8	1.4	1.7	1.7	113	100	84	6.25	250	60
2	140	1:59	1018.0	1.4	1.7	1.7	108	105	85	7.0	250	60
3	145	2:04	1022.4	1.8	2.15	2.15	102	110	87	9.5	250	60
3	150	2:09	1026.4	1.8	2.15	2.15	104	111	88	9.5	250	60
4	155	2:14	1030.7	1.9	2.3	2.3	102	115	90	10.25	250	60
4	160	2:19	1035.4	1.9	2.3	2.3	104	116	90	10.25	250	60
5	165	2:24	1039.6	1.9	2.3	2.3	136	117	92	10.25	250	60
5	170	2:29	1044.8	2.0	2.4	2.4	114	117	92	11.0	250	60
6	175	2:34	1049.9	2.1	2.5	2.5	108	118	93	11.5	250	60
6	180	2:39	1054.1	2.1	2.5	2.5	103	119	93	11.5	250	60
7	185	2:44	1059.2	1.85	2.2	2.2	93	120	94	10.5	250	60
7	190	2:49	1064.2	2.0	2.4	2.4	106	120	94	11.0	250	60
8	195	2:54	1068.4	1.7	2.05	2.05	100	121	96	9.75	250	60
8	200	2:59	1072.6	1.7	2.05	2.05	101	120	96	9.75	250	60
9	205	3:04	1076.5	1.6	1.9	1.9	99	119	95	9.0	250	60
9	210	3:09	1081.62	2.2	2.6	2.5	74	119	95	11.0	250	60
10	215	3:14	1086.2	1.8	2.15	2.15	71	121	95	10.2	250	60
10	220	3:19	1091.1	2.3	2.75	2.75	80	121	95	13.0	250	60
11	225	3:24	1095.6	2.0	2.4	2.4	100	121	95	11.1	250	60
11	230	3:29	1100.5	1.8	2.15	2.15	108	120	95	10.0	250	60
12	235	3:34	1104.7	1.7	2.05	2.05	111	119	93	9.8	250	60
12	240	3:39	1109.022	1.7	2.05	2.05	100	118	94	9.8	250	60
	240		205.20	1.30	2.04		105	96				

$\sqrt{\Delta P} = 1.31$

$\overline{\Delta P} = 1.73$

EPA (Dur) 236
4 72

Le

FIELD DATA

PLANT ASARCO
DATE 1/21/78
SAMPLING LOCATION Outlet B/house
SAMPLE TYPE Part
RUN NUMBER APE-3
OPERATOR Schenger
AMBIENT TEMPERATURE 35
BAROMETRIC PRESSURE 26.2
STATIC PRESSURE, (P_s) 1.0"
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 20' SS
NOZZLE I.D. .185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.83
C FACTOR
PROBE HEATER SETTING 50
HEATER BOX SETTING 300
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 4 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	9:33	876.303									
1	4	9:37	878.58	0.705	0.82	0.82	104	40	40	2.5	300	50
2	8	9:41	880.54	0.56	0.69	0.69	104	48	40	2.5		
3	12	9:45	882.38	0.42	0.535	0.535	104	52	40	2.5		
4	16	9:49	884.58	0.40	0.445	0.445	104	60	44	3		
5	20	9:53	886.19	0.40	0.445	0.445	109	60	44	3		
6	24	9:57	887.92	0.80	0.92	0.92	109	60	44	3		
7	28	10:01	890.24	1.00	1.25	1.25	112	66	47	3		42
8	32	10:05	892.76	0.94	1.05	1.05	118	66	47	3		42
9	36	10:09	896.50	0.82	0.93	0.93	113	66	47	3		42
10	40	10:13	897.43	0.82	0.93	0.93	110	67	49	3		42
	0	10:17										
1	4	10:21	900.18	1.10	1.25	1.25	111	54	47		300	45
2	8	10:25	902.80	1.05	1.17	1.17	113	67	50	3		45
3	12	10:29	905.45	1.05	1.17	1.17	113	69	50	3		45
4	16	10:33	907.95	0.75	0.85	0.85	113	69	51	3		
5	20	10:37	910.20	0.73	0.80	0.80	115	68	51	3		
6	24	10:41	912.35	0.84	0.95	0.95	116	67	52	3		
7	28	10:45	914.72	0.68	0.79	0.79	115	69	52	3		
8	32	10:49	917.22	0.68	0.79	0.79	115	69	52	3		
9	36	10:53	919.38	1.0	1.10	1.10	116	73	53	3		
10	40	10:57	922.050	1.0	1.10	1.10	116	73	53	3		

moved up steadily to 0.96 chart ΔH to 1.1 at 9:31

COMMENTS: at point #3 on traverse one it was found that the nomograph was loose it was then reset.
readings on traverses 1-2 may be slightly wrong due to blocked pitot

EPA (Dur) 235

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
	0	11:05	922.050									
1	4	11:09	925.00	1.20	1.35	1.35	117	59	43	3	300	45
2	8	11:13	927.65	1.20	1.35	1.35	118	70	55	3		
3	12	11:17	930.40	1.15	1.30	1.30	119	74	55	3		
4	16	11:21	933.19	1.15	1.30	1.30	120	76	56	3		
5	20	11:25	935.87	1.05	1.18	1.18	120	78	58	3		
6	24	11:29	938.39	0.95	1.08	1.08	121	77	58	3		
7	28	11:33	940.82	0.87	0.98	0.98	120	78	59	3		
8	32	11:37	943.20	0.82	0.93	0.93	120	78	60	3		
9	36	11:41	945.48	0.75	0.84	.84	120	78	60	3		
10	40	11:45	948.995	0.71	0.79	0.79	121	75	60	3		
	0	11:48										
1	4	11:52	950.79	1.05	1.17	1.17	121	69	59	3	300	45
2	8	11:56	953.49	1.25	1.40	1.40	121	74	59	3		
3	12	12:00	956.27	1.25	1.40	1.40	123	78	60	3		
4	16	12:04	959.10	1.20	1.35	1.35	122	77	60	3		
5	20	12:08	961.90	1.10	1.25	1.25	119	76	60	3		
6	24	12:12	964.60	1.05	1.18	1.18	115	76	60	3		
7	28	12:16	967.41	0.90	1.00	1.00	112	74	59	3		
8	32	12:20	970.07	0.81	0.92	0.92	111	73	59	3		
9	36	12:24	971.98	0.50	0.56	0.56	111	73	59	3		
10	40	12:28	973.715	0.72	0.83	0.83	110	73	59	3		
		leak rate	<.02 cfm	at	10" Hg							
	160		97.412	.92	.94		114	68.6	52.7			
			$\sqrt{\Delta P} = .93$						60.6			
			$\overline{\Delta P} = 0.87$									

EPA (Dur) 236
4 72

FIELD DATA

PLANT ASARCO
DATE 1/21/78
SAMPLING LOCATION Anl. 7 Baghouse
SAMPLE TYPE Part
RUN NUMBER APE-3
OPERATOR Powell
AMBIENT TEMPERATURE 35
BAROMETRIC PRESSURE 26.2
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 15' SS
NOZZLE I.D. .185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.80
C FACTOR 1.01
PROBE HEATER SETTING 50
HEATER BOX SETTING 300
REFERENCE Δp 1.53

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 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	10:00	181.666									
vertical	1	5	10:05	185.5	1.7	2.1	2.1	91	38	40	3.2	250	40
	2	10	10:10	189.5	1.8	2.2	2.2	96	45	40	3.5	250	40
	3	15	10:15	193.5	1.9	2.3	2.3	105	53	42	3.6	250	40
	4	20	10:20	197.8	2.0	2.45	2.45	118	60	46	3.9	250	40
	5	25	10:25	202.1	2.0	2.45	2.45	115	62	47	4.0	250	40
	6	30	10:30	206.4	2.0	2.45	2.45	118	64	50	3.9	250	40
	7	35	10:35	210.5	1.8	2.2	2.2	120	65	52	3.5	250	40
	8	40	10:40	214.5	1.8	2.2	2.2	121	68	54	3.6	250	40
	9	45	10:45	218.3	1.55	1.9	1.9	119	59	55	3.1	250	40
	10	50	10:50	222.094	1.5	1.85	1.85	120	70	56	3.0	250	40
horizontal		0 after leak check	11:18	222.378									
	1	5	11:23	226.6	1.8	2.2	2.2	99	56	54	3.4	250	40
	2	10	11:28	230.5	2.0	2.45	2.45	113	64	55	3.7	250	40
	3	15	11:33	235.0	2.2	2.7	2.7	121	67	56	4.1	250	40
	4	20	11:38	239.6	2.1	2.6	2.6	126	68	56	4.0	250	40
	5	25	11:43	243.8	2.1	2.6	2.6	127	68	57	4.0	250	40
	6	30	11:48	248.2	2.0	2.45	2.45	120	69	58	3.8	250	40
	7	35	11:53	252.4	2.0	2.45	2.45	121	70	58	3.8	250	40
	8	40	11:58	256.6	1.8	2.3	2.3	122	72	60	3.5	250	50
	9	45	12:03	260.5	1.7	2.1	2.1	124	74	61	3.2	250	50
ran over 15 seconds →	10	50	12:08	264.513	1.5	1.85	1.85	112	74	62	3.0	250	50
									66.7	52.9			
		100		82.5630	1.36	2.29		115	59.8				

COMMENTS: leak check at start of test < 0.02 cfm @ 15 in. Hg.
leak check at port change < 0.02 cfm @ 7 in Hg.
leak check at end of test < .02 cfm @ 15 in Hg.

EPA (Dwl) 235

$\sqrt{\Delta P} = 1.36$
$\Delta P = 1.86$

FIELD DATA

PLANT ASARCO
DATE 1/23/78
SAMPLING LOCATION outlet Baghouse
SAMPLE TYPE Arsenic
RUN NUMBER AMC-3
OPERATOR Schuller
AMBIENT TEMPERATURE 55
BAROMETRIC PRESSURE 26.05
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 20' SS
NOZZLE I.D. 0.185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER 2315
METER $\Delta H_@$
C FACTOR
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 1.55

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

leak rate <.05cfm

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
	0	1:05	974.214									
1	5	1:10	977.25	1.07	1.21	1.21	126°	63	62	1	300	55
2	10	1:29	982.48	1.15	1.30	1.30	124	68	64	1	300	55
3	15	1:34	985.72	1.15	1.30	1.30	123	74	64	1	300	55
4	20	1:39	989.18	1.20	1.35	1.35	123	80	65	1	300	55
5	25	1:44	992.71	1.15	1.30	1.30	124	82	66	1	300	55
6	30	1:49	995.97	1.00	1.13	1.13	126	85	67	1		
7	35	1:54	1000.00	0.85	0.95	0.95	125	85	69	1		
8	40	1:59	1002.99	0.85	0.95	0.95	126	85	69	1		
9	45	2:04	1004.90	0.79	0.89	0.89	128	86	70	1		
10	50	2:09	1009.837	0.72	0.82	0.82	127	87	70	1		
	0	2:13										
1	5	2:18	1011.38	1.20	1.35	1.35	126	81	71	1	300	55
2	10	2:23	1014.92	1.20	1.35	1.35	127	91	73	1	300	55
3	15	2:28	1018.50	1.20	1.35	1.35	127	92	74	1.5	300	55
4	20	2:33	1021.90	1.10	1.28	1.28	127	92	78	1.5	300	55
5	25	2:38	1024.51	1.10	1.27	1.27	127	94	78	1.5	300	55
6	30	2:43	1028.01	.98	1.20	1.20	129	96	78	1	300	55
7	35	2:48	1031.90	.98	1.20	1.20	129	96	78	1	300	55
8	40	2:53	1035.00	0.82	0.93	0.93	130	98	79	1	300	55
9	45	2:58	1038.06	0.69	0.78	0.78	129	92	79	1	300	55
10	50	3:03	1040.956	0.67	0.76	0.76	129	97	79	1	300	55

COMMENTS:

at 1:10 shutdown because of no flow through mask
stopped at 978.10 resumed at 1:24 at 978.80

EPA (Dur) 235

2 of 2

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
	0	3:09	1040.955									
1	5	3:14	1044.39	1.05	1.18	1.18	126	82	77	1	300	55
2	10	3:19	1047.82	1.05	1.18	1.18	126	88	78	1		
3	15	3:24	1051.52	1.05	1.18	1.18	125	87	77	1		
4	20	3:29	1054.50	0.95	1.08	1.08	124	88	77	1		
5	25	3:34	1057.62	0.89	0.99	0.99	124	88	77	1		
6	30	3:39	1060.72	0.79	0.89	0.89	124	86	76	1		
7	35	3:44	1063.56	0.70	0.79	0.79	124	85	76	1		
8	40	3:49	1066.34	0.67	0.76	0.76	125	84	76	1		
9	45	3:54	1069.11	0.64	0.72	0.72	125	84	76	1		
10	50	3:59	1071.635	0.55	0.63	0.63	125	82	75	1		
	0	4:05										
1	5	4:10	1075.26	0.73	0.82	0.82	125	76	72	1		
2	10	4:15	1077.68	0.68	0.77	0.77	125	84	74	1		
3	15	4:20	1081.27	0.68	0.77	0.77	123	84	74	1		
4	20	4:25	1083.02	0.67	0.76	0.76	121	82	74	1		
5	25	4:30	1086.34	0.60	0.68	0.68	121	82	74	1		
6	30	4:35	1088.84	0.60	0.68	0.68	120	82	74	1		
7	35	4:40	1090.84	0.58	0.65	0.65	117	81	72	1		
8	40	4:45	1093.23	0.50	0.56	0.56	116	81	72	1		
9	45	4:50	1095.62	0.50	0.56	0.56	115	80	72			
10	50	4:55	1097.714	0.38	0.43	0.43	116	80	73			
								84	73			
	200		123.50	.92	.96		124	78				

leak rate at 5" Hg < .02cfm

plug was pulled to fast

2 impingers 1 & 2 overflowed

$\sqrt{\Delta P} = .915$

$\Delta P = 0.838$

EPA (Dur) 236
4 72

FIELD DATA

PLANT ASARCO
DATE 1/23/78
SAMPLING LOCATION inlet
SAMPLE TYPE arsenic
RUN NUMBER AMI-3
OPERATOR Bonnell / Longley
AMBIENT TEMPERATURE 55
BAROMETRIC PRESSURE 26.05
STATIC PRESSURE, (P_s) −2.5 in. H_2O
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 20' SS
NOZZLE I.D. 0.185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.75
C FACTOR 1.01
PROBE HEATER SETTING 80%
HEATER BOX SETTING 300
REFERENCE Δp 1.55

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 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	1:13	264.932									
1	5	1:18	268.8	1.55	1.85	1.85	92	62	62	7.5	250	50
2	10	1:23	272.5	1.7	2.0	2.0	108	65	62	8.0	250	50
3	15	1:28	277.3	1.95	2.3	2.3	121	70	63	9.5	250	50
4	20	1:33	281.5	2.1	2.51	2.51	122	72	64	10.5	250	50
5	25	1:38	285.6	2.1	2.51	2.51	123	73	65	11	250	50
6	30	1:43	289.9	2.0	2.4	2.4	128	73	65	10.5	250	50
7	35	1:48	293.7	1.8	2.15	2.15	129	73	65	9.5	250	50
8	40	1:53	297.6	1.7	2.0	2.0	126	78	66	8.8	250	50
9	45	1:58	301.6	1.6	1.9	1.9	129	81	69	8.2	250	50
10	50	2:03	305.196	1.5	1.8	1.8	129	84	71	8.0	250	50
	leak check	2:28	305.362									
1	5	2:33	309.5	1.8	2.15	2.15	108	72	72	11.1	250	50
2	10	2:38	313.8	2.1	2.55	2.55	119	82	73	11.5	250	50
3	15	2:43	318.2	2.1	2.55	2.55	130	88	75	11.5	250	50
4	20	2:48	322.8	2.05	2.45	2.45	134	92	77	11.3	250	50
5	25	2:53	327.1	2.0	2.4	2.4	131	95	78	11.0	250	50
6	30	2:58	331.4	1.9	2.3	2.3	127	95	80	10.5	250	50
7	35	3:03	335.2	1.95	2.35	2.35	127	94	82	11.0	250	50
8	40	3:08	339.6	1.95	2.35	2.35	127	95	82	11.0	250	50
9	45	3:13	343.8	1.8	2.15	2.15	128	92	83	10.5	250	50
10	50	3:18	347.801	1.4	1.7	1.7	126	88	82	8.75	250	50
								81	71			
	100		82.703	1.36	2.21		123	76				

COMMENTS: leak check at start of test <0.02 cfm @ 13 in. Hg.
leak check at port change <0.02 cfm @ 13 in Hg.

$\sqrt{\Delta P} = 1.36$
$\bar{\Delta P} = 1.85$

EPA (Dur) 235

ABORTED due to process shut down

FIELD DATA

PLANT ASARCO
DATE 1/24/78
SAMPLING LOCATION Slag Tapping
SAMPLE TYPE Metals
RUN NUMBER CME-3
OPERATOR
AMBIENT TEMPERATURE 35
BAROMETRIC PRESSURE 26.05
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' SS
NOZZLE I.D.
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.80
C FACTOR 1.[illegible]
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 1.6

SCHEMATIC OF TRAVERSE POINT LAYOUT

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	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
	0	10:09	754.664									
1	5	10:14	757.72	1.6	1.9	1.9	82	48	42	5.0	250	50
	10	10:19	761.17	1.6	1.9	1.9	79	52	43	5.0	250	50
2	15	10:24	765.08	1.75	2.1	2.1	76	60	45	5.0		
	20	10:29	769.09	1.70	2.05	2.05	73	68	47	6.5		
3	25	10:34	773.13	1.70	2.05	2.05	74	72	51	6.5		
	30	10:39	776.50	1.70	2.05	2.05	74	77	55	6.5		
4	35	10:44		2.05	2.50		71	80	60	7.5		
	40	10:49										
5	45											
	50											
6	55											
	60											
7	65											
	70											
8	75											
	80											
9	85											
	90											
10	95											
	100											
11	105											
	110											
12	115											

COMMENTS:

EPA (Dur) 235

ABORTED due to power shut down

FIELD DATA

PLANT ASARCO
DATE 1/24/78
SAMPLING LOCATION Metric Tapping
SAMPLE TYPE Part. /SO2
RUN NUMBER CPE-1
OPERATOR
AMBIENT TEMPERATURE 35
BAROMETRIC PRESSURE 26.05
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' SS
NOZZLE I.D.
ASSUMED MOISTURE, %
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.80
C FACTOR 1.0
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 1.6

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY _____ 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	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
	0	9:29	109.911									
1	5	9:34	112.545 113.1	.46	.51	.47	68	54	50	1.0	250	50
	10	9:39	115.4	.44	.52	.52	66	56	52	1.0	250	50
2	15	9:44	117.1	.36	.42	.42	66	66	54	1.0	250	50
	20	9:49	119.2	.36	.42	.42	66	67	54	1.0	250	50
3	25	9:54	121.2	.38	.44	.44	67	70	56	1.0	250	50
	30	9:59	122.8	.35	.40	.40	66	70	57	<1.0	250	50
4	35	10:04	124.9	.35	.40	.40	101	72	60	<1.0	250	50
1.55 →	40	10:09	127.6	1.55 .35	1.55 .40	1.55 .40	92	72	61	<1.0	250	50
5	45	10:14	130.9	1.2	1.45	1.45	82	72	63	2.0	250	50
	50	10:19	134.1	1.6	1.7	1.7	77	73	64	2.5	250	50
6	55	10:24	138.5	1.9	2.3	2.3	76	85	68	3.5	250	50
	60	10:29	142.7	2.0	2.4	2.4	76	90	69	3.75	250	50
7	65	10:34	147.7	2.3	2.8	2.8	74	92	70	4.0	250	50
	70	10:39	152.01	2.3	2.8	2.8	74	94	71	4.0	250	50
8	75	10:44	155.009	2.3	2.8	2.8	71	100	73	4.0	250	50
	80	10:49										
9	85	10:54										
	90	10:59										
10	95	11:04										
	100	11:09										
11	105	11:14										
	110	11:19										
12	115	11:24										

COMMENTS: crimp in pitot lines caused low Δp readings it was found at 10:09

EPA (Rev) 235

FIELD DATA

PLANT AARSCO
DATE 1/24/77
SAMPLING LOCATION CALCINE Fugitive
SAMPLE TYPE ~~[illegible]~~ Metal
RUN NUMBER ~~[illegible]~~ BMS-1
OPERATOR T. Kooper
AMBIENT TEMPERATURE 33
BAROMETRIC PRESSURE 26.05
STATIC PRESSURE, (P_s) -.750
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' Glass
NOZZLE I.D. 0.242
ASSUMED MOISTURE, % 2%
SAMPLE BOX NUMBER
METER BOX NUMBER 2010
METER $\Delta H_@$ 1.80
C FACTOR 1.0
PROBE HEATER SETTING 70
HEATER BOX SETTING 70
REFERENCE Δp 0.43

SCHEMATIC OF TRAVERSE POINT LAYOUT

Prior Leak Test 0.0 at 5" Hg
Leak Test after change over

READ AND RECORD ALL DATA EVERY 3 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
	1126	348.058									
H 1	1129	349.701	.33	1.1	1.1	63	42	48	1	300	50
2	1132	350.995	.33	1.1	1.1	56	42	50	1	300	50
3	1135	352.890	.35	1.4	1.4	56	50	50	1	300	50
4	1138	354.601	.35	1.4	1.4	53	50	52	1	300	50
5	1141	356.710	.35	1.4	1.4	55	50	52	1	300	50
6	1144	358.620	.34	1.4	1.4	49	58	55	1	300	50
7	1147	360.580	.34	1.45	1.45	55	58	50	1	300	50
8	1150	362.542	.32	1.38	1.38	54	58	50	1	300	50
9	1153	364.230	.32	1.38	1.38	54	58	50	1	300	50
10	1156	366.115	.32	1.38	1.38	54	58	50	1	300	50
	1210	366.435									
V 1	1213	367.690	.25	.65	.65	50	58	52	1	300	50
2	1216	369.280	.22	.90	.90	55	55	50	1	300	50
3	1219	370.980	.28	1.18	1.18	63	55	50	1	300	50
4	1222	372.750	.30	1.25	1.25	64	58	52	1	300	50
5	1225	374.650	.30	1.25	1.25	64	58	55	1	300	50
6	1228	376.545	.36	1.5	1.5	55	58	55	1	300	50
7	1231	378.650	.34	1.4	1.4	55	58	52	1	300	50
8	1234	380.412	.32	1.4	1.4	55	58	50	1	300	50
9	1237	382.300	.29	1.25	1.25	54	58	50	1	300	50
10	1240	384.092	.25	1.05	1.05	54	58	50	1	300	50
							55	52			
	60	35.714	.35	1.26		56	54				

COMMENTS: Unable to reach first 5 points due to Acid Dew .308

EPA (Dur) 235

Leak Test post test — .02 at 1" Hg

FIELD DATA

PLANT ASARCO
DATE 1/24/78
SAMPLING LOCATION Calcine Fugitive
SAMPLE TYPE Metal
RUN NUMBER BME-2
OPERATOR JONGLEUX
AMBIENT TEMPERATURE 40
BAROMETRIC PRESSURE 26.95
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' glass
NOZZLE I.D. 0.245
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER 2010
METER $\Delta H_@$ 1.8
C FACTOR 1.0
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.43

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 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
horizontal	0	1:30	388.276									
1	3	1:33	388.4	.28	1.15	1.15	58	48	50	3.75	250°	40°
2	6	1:36	390.5	.35	1.45	1.45	65	49	50	4.5	250°	40°
3	9	1:39	392.4	.35	1.45	1.45	64	54	52	4.5	250°	40°
4	12	1:42	394.2	.35	1.45	1.45	58	56	52	4.5	250	40
5	15	1:45	396.1	.35	1.45	1.45	57	58	52	4.5	250	40
6	18	1:48	398.1	.35	1.45	1.45	63	60	53	4.5	250	40
7	21	1:51	400.1	.35	1.45	1.45	65	61	54	4.5	250	40
8	24	1:54	401.9	.35	1.45	1.45	62	60	54	4.5	250	40
9	27	1:57	403.8	.35	1.45	1.45	63	62	55	4.5	250	40
10	30	2:00	405.712	.31	1.35	1.35	54	60	55	4.25	250	40
vertical	0	2.16	405.712									
1	33	2:19	407.4	.22	.96	.96	47	52	52	3.25	250	40
2	36	2:22	408.9	.29	1.40	1.40	48	52	52	4.5	250	40
3	39	2:25	410.5	.30	1.5	1.5	46	55	53	5.0	250	40
4	42	2:28	412.6	.31	1.55	1.55	47	56	53	5.25	250	40
5	45	2:31	414.5	.33	1.60	1.60	61	58	54	5.5	250	40
6	48	2:34	417.5	.35	1.75	1.75	53	60	54	6.25	250	40
7	51	2:37	419.7	.34	1.70	1.70	56	60	54	5.25	250	40
8	54	2:40	421.8	.32	1.55	1.55	63	62	54	4.75	250	40
9	57	2:43	423.5	.30	1.5	1.5	59	63	55	4.5	250	40
10	60	2:46	425.439	.30	1.5	1.5	60	64	55	4.5	250	40
				.32				58	53			
	60		39.1630	.156	1.46		57	55.6				

COMMENTS: LEAK CHECK BEFORE TEST < .02 CFM @ 15 psi
LEAK CHECK AFTER TEST < .02 CFM @ 10 psi

EPA (Dur) 235

FIELD DATA

PLANT ASARCO
DATE 1/24/78
SAMPLING LOCATION Calcine Fug.
SAMPLE TYPE Metal
RUN NUMBER DME-3
OPERATOR T. ROONEY
AMBIENT TEMPERATURE 40
BAROMETRIC PRESSURE 26.05
STATIC PRESSURE, (P_s) -.750
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' glass
NOZZLE I.D. 0.245
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER 2010
METER $\Delta H_@$ 1.80
C FACTOR 1.0
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.48

SCHEMATIC OF TRAVERSE POINT LAYOUT Pre-Leak check L .01 at 5" Hg Post
READ AND RECORD ALL DATA EVERY 3 MINUTES MID-Leak check L .01 at 5" Hg

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
	1514	426.896									
H 1	1517	428.301	.34	1.55	1.50	53	50	56	2	300	50
2	1520	429.900	.30	1.30	1.30	63	50	56	2	300	50
3	1523	431.902	.33	1.45	1.45	57	58	58	2	300	50
4	1526	433.890	.33	1.45	1.45	58	58	62	2	300	50
5	1529	435.720	.33	1.45	1.45	57	60	58	2	300	50
6	1532	437.320	.34	1.55	1.55	55	60	58	2	300	50
7	1535	439.210	.34	1.55	1.55	55	62	58	2	300	50
8	1538	441.220	.33	1.50	1.50	64	62	58	2	300	50
9	1541	443.200	.32	1.40	1.40	64	62	58	2	300	50
10	1544	445.105	.32	1.40	1.40	59	64	60	2	300	50
	1556	445.225									
V 1	1559	446.555	.21	.89	.89	47	64	60	2	300	50
2	1602	447.978	.19	.82	.82	49	60	58	2	300	50
3	1605	449.300	.25	1.1	1.1	70	60	60	2	300	50
4	1608	451.500	.26	1.1	1.1	62	58	58	2	300	50
5	1611	453.415	.32	1.35	1.35	63	58	58	2	300	50
6	1614	455.100	.34	1.50	1.50	60	58	58	2	300	50
7	1617	457.40	.34	1.50	1.50	60	60	58	2	300	50
8	1620	459.38	.32	1.35	1.35	66	60	58	2	300	50
9	1623	461.300	.30	1.30	1.30	63	62	60	2	300	50
10	1626	463.090	.28	1.25	1.25	58	62	60	2	300	50
			.30				59.4	58.5			
	60	36.0740	.532	1.34		60.55	58.95				

COMMENTS:

EPA (Dur) 235

FIELD DATA

PLANT ASARCO
DATE 1/24/78
SAMPLING LOCATION CALCINE FUR
SAMPLE TYPE PARTICULATE
RUN NUMBER DBE/DSE-1
OPERATOR Scheyer
AMBIENT TEMPERATURE 40
BAROMETRIC PRESSURE 26.05
STATIC PRESSURE, (P_s) -.75
FILTER NUMBER (s)

PROBE LENGTH AND TYPE SS-3'
NOZZLE I.D. .251
ASSUMED MOISTURE, % 2%
SAMPLE BOX NUMBER 2
METER BOX NUMBER 2010
METER $\Delta H_@$ 1.80
C FACTOR 1.0
PROBE HEATER SETTING 90
HEATER BOX SETTING 300°
REFERENCE Δp .42

at end of test ΔH returned to 0.1

SCHEMATIC OF TRAVERSE POINT LAYOUT

leak check 0.02 cfm at 15" Hg

READ AND RECORD ALL DATA EVERY 3 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	4:57	463.407									
1	3	5:00	465.23	0.24	1.01	1.01	65°F	50	54	3.5	300	45
2	6	5:03	467.01	0.28	1.19	1.19	59°	55	54	4.0		
3	9	5:06	468.86	0.28	1.19	1.19	60	58	54	4.0		
4	12	5:09	470.72	0.29	1.25	1.25	61°	60	55	4.0		
5	15	5:12	472.72	0.34	1.50	1.50	60	62	55	4.8		
6	18	5:15	474.81	0.36	1.55	1.55	58	62	55	5.0		
7	21	5:18	477.14	0.36	1.55	1.55	58	62	55	1.5		
8	24	5:21	479.15	0.36	1.55	1.55	58	62	55	1.5		
9	27	5:24	479.824	~~0.33~~	~~1.45~~	~~1.45~~						
10	30	5:27										
	0	5:37	479.824									
1	3	5:40	482.47	0.32	1.40	1.40	59	56	56	4.5	300	45
2	6	5:43	484.48	0.33	1.45	1.45	58	60	58	4.5		
3	9	5:46	486.49	0.33	1.45	1.45	55	62	59	4.5		
4	12	5:49	488.56	0.33	1.45	1.45	57	62	60	5.0		
5	15	6:03	490.63	0.33	1.45	1.45	62	62	60	5.0		
6	18	6:06	492.41	0.34	1.50	1.50	52	60	60	1.0		
7	21	6:09	493.98	0.34	1.50	1.50	50	62	60	3.0		
8	24	6:12	495.78	0.34	1.50	1.50	51	62	60	3.5		
9	27	6:15	497.70	0.33	1.45	1.45	50	62	60	4.0		
10	30	6:18	499.60	0.32	1.40	1.40	53	62	60	4.5		
			leak rate to	0.02 cfm		at 15" Hg		60	57			
AVG	57		36.20	.568	1.41		57	58				

COMMENTS: ΔH change significantly at point 7 to 25 adjustment was made back to 1.55

EPA (Dur) 235

shut down at 5:23 due to broken cyclone bypass at probe connection, switched to horizontal traverse

Stopped at 5:52 umbilical came undone restart at 6:03

1-63 >25

FIELD DATA

PLANT ASARCO
DATE 1/25/78
SAMPLING LOCATION Matte Tapping
SAMPLE TYPE Metals
RUN NUMBER CME-3
OPERATOR JONGLEUX
AMBIENT TEMPERATURE 34
BAROMETRIC PRESSURE 26.21
STATIC PRESSURE, (P_s) +6.00 H_2O
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' glass
NOZZLE I.D. 0.185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.8
C FACTOR 1.0
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 1.6

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES Leak check Pres 4.0 cfm

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	8:00	155.437									
1	5	8:05	159.8	1.7	2.05	2.05	67	58	50	3.75	250	45
	10	8:10	163.4	2.0	2.4	2.4	68	64	50	4.0	250	45
	15	8:15	168.0	2.0	2.4	2.4	67	72	54	4.0	250	45
2	20	8:20	172.4	2.2	2.6	2.6	66	82	56	4.5	250	45
	25	8:25	176.5	2.2	2.6	2.6	66	84	57	4.5	250	45
	30	8:30	181.1	2.2	2.6	2.6	65	88	60	4.5	250	45
3	35	8:35	186.00	2.2	2.6	2.6	64	91	63	4.5	250	45
	40	8:40	190.6	2.2	2.6	2.6	64	92	65	4.5	250	45
	45	8:45	194.9	2.3	2.75	2.75	63	94	68	5.0	250	45
4	50	8:50	199.35	2.3	2.75	2.75	63	95	70	5.0	250	45
	55	8:55	205.94	2.3	2.75	2.75	63	97	71	5.0	250	45
	60	9:00	209.0	2.2	2.6	2.6	62	98	72	4.75	250	45
5	65	9:05	213.82	2.4	2.85	2.85	61	99	74	5.0	250	45
	70	9:10	218.7	2.3	2.75	2.75	62	100	74	5.0	250	45
	75	9:15	223.8	2.4	2.85	2.85	62	102	70	5.0	250	45
6	80	9:20	228.3	2.3	2.75	2.75	61	101	76	5.0	250	55
	85	9:25	233.2	2.35	2.8	2.8	61	100	77	5.0	250	52
	90	9:30	238.0	2.35	2.8	2.8	61	101	78	5.0	250	52
7	95	9:35	243.95	2.6	3.05	3.0	61	102	82	5.25	250	55
	100	9:40	248.4	2.6	3.05	3.0	61	102	78	5.25	250	55
	105	9:45	252.6	2.6	3.05	3.0	61	102	79	5.25	250	55
8	110	9:50	258.8	2.55	3.0	3.0	61	104	80	5.25	250	55
	115	9:55	262.9	2.6	3.05	3.05	61	104	81	5.25	250	55

COMMENTS:

EPA (Dun 235

2-13 325

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
			262.9									
	120	10:00	268.25	2.6	3.05	3.05	62	105	80	5.25	250	55
9	125	10:05	273.3	2.35	2.8	2.8	61	105	82	4.8	250	55
	130	10:10	278.2	2.35	2.8	2.8	61	105	82	4.8	250	55
	135	10:15	283.04	2.3	2.75	2.75	61	106	82	5	250	55
10	140	10:20	287.81	2.0	2.4	2.40	62	106	82	5	250	55
	145	10:25	292.42	2.1	2.5	2.5	62	104	82	4.5	250	55
	150	10:30	297.1	2.1	2.5	2.5	62	104	82	4.5	250	55
11	155	10:35	301.5	1.7	2.05	2.05	62	105	82	3.5	250	55
	160	10:40	307.1	1.7	2.05	2.05	62	105	82	3.75	250	55
	165	10:45	310.1	1.7	2.05	2.05	63	105	82	3.75	250	55
12	170	10:50	314.9	1.75	2.1	2.1	63	105	82	4.0	250	55
	175	10:55	319.7	1.7	2.05	2.05	63	105	82	3.75	250	55
	180	11:00	323.252	1.7	2.05	2.05	63	101	83	3.75	250	55
1		12:10	327.37	2.3	2.75	2.75	66	65	65	5.0	250	50
	185	12:15	332.1	2.2	2.6	2.6	66	75	66	4.75	250	50
	190	12:20	336.9	2.2	2.6	2.6	66	82	66	4.75	250	50
2	195	12:25	341.51	2.4	2.85	2.85	66	92	68	5.0	250	50
	200	12:30	346.43	2.45	2.9	2.9	66	94	69	5.1	250	50
	205	12:35	351.35	2.45	2.9	2.9	66	95	71	5.1	250	50
3	210	12:40	356.32	2.45	2.9	2.9	67	100	74	5.1	250	50
	215	12:45	361.36	2.5	2.95	2.95	67	101	75	5.25	250	50
	220	12:50	[illegible]	2.5	2.95	2.95	67	102	76	5.25	250	50
4	225	12:55	366.49								250	56
	230	1:00	371.49	2.45	2.9	2.9	67	104	78	5		
	235	1:05	376.70	2.55	3.0	3.0	67	106	80	5		
5	240	1:10	381.555	2.6	3.	3.0	68	106	80	5		
	245	1:15	386.785	2.6	3	3	68	106	82	5		
	250	1:20	391.8	2.6	3	3	68	106.5	82	5		
6	255	1:25	397.19	2.75	3.2	3.2	68	108	84	5.5		
	260	1:30	402.43	2.75	3.2	3.2	68.5	108	84	6		
	265	1:35	407.89	2.8	3.3	3.3	68	108	84	6		
7	270	1:40	413.14	2.75	3.2	3.2	69	110	86	6		
	275	1:45	418.3	2.4	2.8	2.8	68	110	86	5		
	280	1:50	423.22	2.4	2.8	2.8	68	110	86	5		
8	285	1:55	428.22	2.35	2.8	2.8	69	110	86.5	5		
	290	2:00	433.23	2.25	2.7	2.7	69	110	88	5		
	295	2:05	438.2	2.3	2.7	2.7	69	110	88	5		

EPA (Dur) 236
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Leak Test Post - < .01 CFM

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
9	300	210	443.75	2.3	2.7	2.7	70	110	90	5.0	300	50
	315	215	447.845	2.0	2.4	2.4	72	110	90	5.0		
	330	220	453.100	1.95	2.35	2.35	98	110	88	4.5		
10	335	225	457.312	1.95	2.35	2.35	99	110	90	4		
	350	230	462.400	1.95	2.40	2.40	91	110	90	4		
	355	235	466.350	2.00	2.40	2.40	89	110	90	4		
11	340	240	470.715	2.00	2.400	2.400	88	110	90	4		
	345	245	476.120	1.95	2.35	2.35	87	110	90	4		
	350	250	479.850	1.70	2.00	2.00	105	110	95	4		
12	360	255	485.100	1.70	2.00	2.00	105	110	95	4		
	365	300	489.100	1.700	2.00	2.00	93	110	92	4		
	370	305	493.250	1.80	2.20	2.20	95	110	95	4		
12	372	307	494.900	1.80	2.20	2.20	92	110	95	4		
11	374	309	496.500	1.70	2.10	2.10	91	110	95	4		
10	376	311	498.700	2.00	2.40	2.40	92	110	95	4		
9	378	313	500.300	2.00	2.40	2.40	91	110	95	4		
8	380	315	502.750	1.90	2.35	2.35	106	110	90	4		
7	382	317	505.750	2.10	2.50	2.50	123	112	92	4		
6	384	319	507.650	2.50	2.95	2.95	104	112	92	4		
5	386	321	509.821	2.00	2.4	2.40	101	110	92	4		
4	388	323	510.980	2.20	2.60	2.60	95	110	92	4		
3	390	325	512.341	2.00	2.40	2.40	97	110	92	4		
2	394	329	514.350	2.00	2.40	2.40	97	110	92	4		
1	396	331	516.615	1.90	2.30	2.30	90	110	92	4		
							$\sqrt{\Delta P} = 0.19$					
							$\bar{\Delta P} = 1.48$					
								102	80.2			
AVG	396		361.1780	1.48	2.30		73.19	91.1				

$\sqrt{\Delta P}$

EPA (Dur) 236
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FIELD DATA

PLANT ASARCO
DATE 1/25/78
SAMPLING LOCATION Matte Tapping
SAMPLE TYPE Part /SO2
RUN NUMBER CPE-1
OPERATOR Schuyler
AMBIENT TEMPERATURE 35
BAROMETRIC PRESSURE 26.21
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 6' SS
NOZZLE I.D. 0.185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.8
C FACTOR 1.0
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 1.6

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 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	8:20	779.658									
1	5	8:25	783.91	2.0	2.35	2.35	66	60	50	5	300	50
	10	8:30	788.30	2.1	2.50	2.50	65	74	55	6		
	15	8:35	792.8	2.0	2.35	2.35	65	80	58	5.5		
2	20	8:40	797.13	2.0	2.35	2.35	65	82	62	5.5		
	25	8:45	801.65	2.0	2.35	2.35	64	84	65	5.5		
	30	8:50	806.00	2.0	2.35	2.35	63	84	66	5.5		
3	35	8:55	811.08	2.1	2.50	2.50	62	86	68	6.0		
	40	9:00	815.00	2.1	2.50	2.50	63	87	70	6.0		
	45	9:05	819.95	2.6	3.10	3.10	62	88	72	8.0		
4	50	9:10	825.10	2.6	3.10	3.10	62	90	72	8.0		
	55	9:15	830.29	2.6	3.10	3.10	62	90	74	8.0		
	60	9:20	835.30	2.6	3.10	3.10	61	90	74	8.0		66
5	65	9:25	840.50	2.75	3.30	3.30	61	92	76	8.0		
	70	9:30	845.75	2.75	3.30	3.30	61	92	76	8.0		
	75	9:35	851.00	2.75	3.30	3.30	61	94	77	8.0		
6	80	9:40	856.78	2.80	3.30	3.30	61	94	78	8.0		
	85	9:45	861.3	2.80	3.30	3.30	61	96	78	9.0		
	90	9:50	870.87	2.80	3.30	3.30	61	95	78	9.0		
7	95	9:55	871.85	2.4	2.85	2.85	62	96	80	7		
	100	10:00	876.79	2.2	2.65	2.65	61	94	80	7		
	105	10:05	881.49	2.3	2.7	2.7	61	94	80	7		
8	110	10:10	886.07	2.1	2.50	2.50	62	94	80	7		
	115	10:15	890.77	2.1	2.50	2.50	62	94	80	7		

COMMENTS:

EPA (Dur) 235

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
	120	10:15	895.42	2.1	2.50	2.50	62	94	80	7	300	65
9	125	10:25	900.00	2.0	2.35	2.35	62	94	80	6		
	130	10:30	904.55	2.0	2.35	2.35	62	94	80	6		
	135	10:35	909.01	2.0	2.35	2.35	62	94	80	6		
10	140	10:40	914.675	1.8	2.15	2.15	63	95	81	6		
	145	11:11	102.78	1.8	2.15	2.15	63	44	42	4		
	150	11:16	106.47	1.8	2.15	2.15	63	58	43	4		
11	155	11:21	110.84	1.8	2.15	2.15	63	78	45	4		
	160	11:26	115.19	1.7	2.05	2.05	63	76	48	4		
	165	11:31	119.71	1.7	2.05	2.05	63	82	52	4		
12	170	11:36	123.90	1.7	2.05	2.05	63	88	56	4		
	175	11:41	128.28	1.7	2.05	2.05	63	90	60	3		
	180	11:46	132.66	1.7	2.05	2.05	63	93	62	3		
1	0	12:00										
1	185	12:05	138.55	1.9	2.30	2.30	65	70	65	3	300	65
	190	12:10	143.95	1.9	2.30	2.30	66	86	67	3		
	195	12:15	146.90	1.9	2.30	2.30	65	90	68	3.5		
2	200	12:20	151.56	2.0	2.35	2.35	66	93	69	4.0		
	205	12:25	156.40	2.0	2.35	2.35	66	94	70	4.0		
	210	12:30	161.10	2.0	2.35	2.35	65	95	72	4.0		
3	215	12:35	165.92	2.0	2.35	2.35	67	98	72	4.0		
	220	:40	170.78	2.05	2.45	2.45	67	100	74	4		
	225	:45	175.42	2.2	2.6	2.6	67	98	76	4		
4	230	:50	180.665	2.2	2.6	2.6	67	100	76	4		
	235	:55	185.16	2.15	2.55	2.55	68	100	76	4		
	240	1:00	190.94	2.1	2.50	2.50	67	102	76	4		
5	245	:05	195.65	2.1	2.50	2.50	68	102	76	4		
	250	:10	200.65	2.1	2.50	2.50	68	102	79	4		
	255	:15	205.64	2.1	2.50	2.50	68	103	80	4		
6	260	:20	210.60	2.05	2.45	2.45	68	105	80	4		
	265	:25	215.58	2.10	2.50	2.50	68	106	81	4		
	270	:30	220.56	2.10	2.5	2.5	69	104	81	4		
7	275	:35	225.59	2.2	2.6	2.6	69	106	82	4		
	280	:40	230.65	2.2	2.6	2.6	69	108	82	4		
	285	:45	235.82	2.3	2.75	2.75	68	108	84	4		
8	290	:50	241.02	2.3	2.75	2.75	69	108	84	4		
	295	:55	246.23	2.3	2.75	2.75	69	110	85	4		

10:42
914.675
New meter Box start 98058 at 11:06

EPA (Dur) 236
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Shutdown at 10:42 due to smoke escaping from meter box

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
	300	2:00	251.158	2.3	2.75	2.75	69	110	85	4	300	65
9	305	:05	256.65	2.3	2.75	2.75	69	108	86	4		
	310	:10	262.37	2.2	2.60	2.60	69	108	86	4		
	315	:15	266.82	2.2	2.60	2.60	69	106	86	4		
10	320	:20	272.200	2.1	2.50	2.50	98	104	85	4		
	325	:25	276.510	2.1	2.50	2.50	98	104	85	4		
	330	:30	282.200	2.1	2.50	2.50	93	104	85	4		
11	335	:35	286.400	1.95	2.35	2.35	90	103	82	4		
	340	:40	291.612	1.90	2.35	2.35	87	105	84	4		
	345	:45	295.905	1.90	2.35	2.35	92	110	84	4		
12	350	:50	300.210	1.90	2.35	2.35	100	108	86	4		
	355	:55	305.720	1.70	2.00	2.00	109	108	86	4		
	360	:60	310.300	1.70	2.00	2.00	94	109	88	4		
12	362	302	312.300	1.70	2.00	2.00	96	109	88	4		
11	364	304	314.200	2.00	2.40	2.40	94	108	90	4		
10	366	306	316.300	2.10	2.50	2.50	91	108	90	4		
9	368	308	318.000	2.10	2.50	2.50	91	108	90	4		
8	370	310	320.350	2.20	2.60	2.60	90	108	88	4		
7	372	312	322.300	2.20	2.60	2.60	92	108	88	4		
6	374	314	324.700	2.20	2.60	2.60	91	108	88	4		
5	376	316	327.500	2.50	3.00	3.00	121	108	90	4		
4	378	318	330.210	2.20	2.60	2.60	107	110	92	4		
3	380	320	334.22	2.20	2.60	2.60	102	110	92	4		
2	382	322	337.210	2.20	2.60	2.60	97	110	92	4		
1	384	324	339.771	1.60	1.95	1.95	95	110	92	4		
		leak rate < .02 cfm at 15" Hg										
									$\sqrt{\Delta P} = 1.46$			
									$\Delta P = 2.13$			
								96	77			
	389		372.08	1.46	2.52		73	87				

EPA (Dur) 236
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FIELD DATA

PLANT ASARCO
DATE 1/25/78
SAMPLING LOCATION Calcine Fugitive
SAMPLE TYPE Part. Igor
RUN NUMBER DPE 105E-2
OPERATOR
AMBIENT TEMPERATURE 40
BAROMETRIC PRESSURE 26.21
STATIC PRESSURE, (P_s) -0.75 in. H_2O
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' glass
NOZZLE I.D. 0.245
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER 2010
METER $\Delta H_@$ 1.8
C FACTOR 1.0
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.43

SCHEMATIC OF TRAVERSE POINT LAYOUT

Leak check post test <.01 CFM
Leak check at 1" Hg <.01 CFM

READ AND RECORD ALL DATA EVERY 3 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
	849 60	501.042									
H 1	852	502.150	.28	1.2	1.2	80	45	45	1	300	50
2	855	504.450	.34	1.5	1.5	76	46	46	1	300	50
3	858	506.821	.34	1.5	1.5	79	48	50	1	300	50
4	901	509.210	.34	1.5	1.5	79	52	54	1	300	50
5	904	511.750	.34	1.5	1.5	84	52	54	1	300	50
6	907	514.125	.33	1.45	1.45	87	52	54	1	300	50
7	910	516.720	.34	1.5	1.5	87	60	55	1	300	50
8	913	518.915	.34	1.5	1.5	88	60	58	1	300	50
9	916	520.900	.34	1.45	1.45	91	60	56	1	300	50
10	919	522.742	.32	1.40	1.40	90	60	56	1	300	50
	935	523.7860									
V 1	937	524.650	.34	1.50	1.50	90	60	56	1	300	50
2	941	526.410	.29	1.2	1.2	94	60	58	1	300	50
3	944	528.300	.29	1.2	1.2	93	62	60	1	300	50
4	948	529.895	.30	1.25	1.25	94	62	60	1	300	50
5	951	532.720	.31	1.30	1.30	93	62	60	1	300	50
6	954	534.490	.34	1.5	1.5	96	64	62	1	300	50
7	957	536.520	.34	1.5	1.5	93	64	60	1	300	50
8	1000	538.610	.33	1.4	1.4	93	64	60	1	300	50
9	1003	540.600	.31	1.4	1.4	91	64	60	1	300	50
10	1006	541.831	.32	1.4	1.4	86	64	60	1	300	50
							58	56			
	60	39.7450	.569	1.41		88	57				

COMMENTS:

$\sqrt{\Delta P} = .569$

$\bar{\Delta P} = .323$

EPA (Dur) 235

FIELD DATA

PLANT ASARCO
DATE 1/25/78
SAMPLING LOCATION CALCINE FUGITIVE
SAMPLE TYPE PART / SO2
RUN NUMBER DPE / DSE -3
OPERATOR T. Rogers
AMBIENT TEMPERATURE 50
BAROMETRIC PRESSURE 26.21
STATIC PRESSURE, (P_s) -.75 IN H_2O
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' GLASS
NOZZLE I.D. .245
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER 2010
METER $\Delta H_@$ 1.8
C FACTOR 1.0
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.465

SCHEMATIC OF TRAVERSE POINT LAYOUT Pre-run Leak Check - < .01 CFM

READ AND RECORD ALL DATA EVERY 3 MINUTES Mid - Leak check < .01 CFM

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
	1117	542.368									
1	1120	544.420	.26	1.0	1.0	98	60	60	1.0	300	50
2	1123	545.900	.26	1.0	1.0	102	60	60	1.0	300	50
3	1126	547.510	.28	1.0	1.0	103	62	60	3.0	300	50
4	1129	549.420	.30	1.1	1.1	102	62	60	3.0	300	50
5	1132	551.321	.30	1.1	1.1	102	62	60	3.0	300	50
6	1135	553.221	.32	1.15	1.15	98	62	62	4.0	300	50
7	1138	555.300	.34	1.25	1.25	99	62	62	4.0	300	50
8	1141	557.290	.34	1.25	1.25	99	64	63	5.0	300	50
9	1144	559.295	.34	1.25	1.25	102	64	63	5.0	300	50
10	1147	561.245	.34	1.26	1.26	101	64	63	5.0	300	50
	1227	561.305									
1	1230	562.850	.20	.75	.75	95	56	58	4.0	300	50
2	1233	564.600	.22	.80	.80	96	56	58	4	300	50
3	1236	566.210	.22	.80	.80	90	56	58	4	300	50
4	1239	568.200	.28	1.0	1.0	84	58	60	4	300	50
5	1242	570.215	.32	1.2	1.2	89	59	60	5	300	50
6	1245	572.318	.39	1.4	1.4	89	63	60	6	300	50
7	1248	574.225	.34	1.25	1.25	92	63	60	5	300	50
8	1251	576.100	.33	1.20	1.20	93	63	60	5	300	50
9	1254	578.154	.31	1.20	1.20	94	65	66	5	300	50
10	1257	579.625	.30	1.1	1.1	95	66	66	5	300	50
							61	61			
	60	37.1970	.5473	1.10		96	61				

COMMENTS: Post Leak Check < .01 CFM

$\sqrt{\Delta P} = .5473$

$\Delta P = .30$

EPA (Dur) 235

FIELD DATA

PLANT ASARCO
DATE 1/26/78
SAMPLING LOCATION Matt Kapping
SAMPLE TYPE part./SO2
RUN NUMBER CPE/CSE-2
OPERATOR Vandewalt
AMBIENT TEMPERATURE 40
BAROMETRIC PRESSURE 26.20
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' glass
NOZZLE I.D. 0.185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER 2315
METER $\Delta H_@$ 1.8
C FACTOR 1.0
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 1.6

SCHEMATIC OF TRAVERSE POINT LAYOUT

leak check < 0.01 cfm

READ AND RECORD ALL DATA EVERY 5 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	10:20	340.282									
1	5	10:25	343.65	2.1	2.4	2.4	58	47	49	3.0	300	50
1	10	10:30	348.32	2.1	2.4	2.4	58	60	50	3.0	300	50
1	15	10:35	353.07	2.15	2.45	2.45	57	73	52	3.1		
2	20	10:40	358.08	2.2	2.55	2.55	54	80	54	3.5		
2	25	10:45	363.08	2.2	2.55	2.55	54	87	58	3.3		
2	30	10:50	368.06	2.2	2.75	2.75	53	92	62	3.2		
3	35	10:55	373.22	2.5	3.1	3.1	55	96	66	3.8		
3	40	11:00	378.53	2.55	3.2	3.2	59	98	68	3.9		
3	45	11:05	384.25	2.5	3.1	3.1	56	101	70	3.9		
4	50	11:10	389.325	2.55	3.2	3.2	64	106	74	4		
4	55	11:15	394.75	2.85	3.6	3.6	56	106	76	4		
4	60	11:20	400.45	2.9	3.7	3.7	55	106	78	4.0		
5	65	11:25	406.45	3.15	4.1	4.1	55	110	81	4.8		
5	70	11:30	412.22	3.0	3.8	3.8	59	110	82	4.8		
5	75	11:35	418.11	3.0	3.8	3.8	61	112	84	4.8		
6	80	11:40	424.01	3.05	3.9	3.9	60	112	85	4.8		
6	85	11:45	429.94	3.05	3.9	3.9	58	112	86	4.7		
6	90	11:50	435.95	3.1	4.0	4.0	58	114	88	5.0		
7	95	11:55	441.62	2.65	3.4	3.4	59	115	88	4.0		
7	[illegible]	[illegible]	447.15	2.65	3.4	3.4	63	115	90	4.0		
7	[illegible]	[illegible]	452.73	2.65	3.4	3.4	64	117	90	3.9		
8	[illegible]	[illegible]	458.20	2.45	3.05	3.05	59	116	92	3.8		
8	[illegible]	[illegible]	463.63	2.5	3.1	3.1	58	116	92	3.8		

COMMENTS:

EPA (Dur) 235

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
8	120	12:20	469.08	2.5	3.1	3.1	61	116	92	3.9	300	50
9	125	12:25	474.53	2.45	3.1	3.1	63	118	93	3.9		
9	130	12:30	479.93	2.4	3.0	3.0	62	119	94	3.9		
9	135	12:35	485.31	2.35	3.0	3.0	63	119	94	3.9		
10	140	12:40	490.71	2.4	3.0	3.0	60	118	95	3.9		
10	145	12:45	496.16	2.45	3.1	3.1	60	118	95	3.9		
10	150	12:50	501.53	2.4	3.0	3.0	60	117	95	3.9		
11	155	12:55	506.93	2.35	3.0	3.0	66	117	95	3.9		
11	160	1:00	512.32	2.4	3.0	3.0	60	117	96	3.9		
11	165	1:05	517.73	2.35	3.0	3.0	62	116	96	3.9		
12	170	1:10	523.08	2.25	2.85	2.85	60	117	96	3.9		
12	175	1:15	528.39	2.25	2.85	2.85	60	118	95	3.9		
12	180	1:20	534.713	2.25	2.85	2.85	63	118	96	3.9		
	0	2:00	534.855									
1	5	2:05	539.26	2.0	2.5	2.5	101	77	78	3.0	300	55
1	10	2:10	544.17	2.05	2.55	2.55	103	92	80	2.9		
1	15	2:15	549.17	2.05	2.55	2.55	100	100	80	2.9		
2	20	2:20	554.02	2.0	2.5	2.5	96	104	82	2.9		
2	25	2:25	559.03	2.1	2.65	2.65	96	108	84	2.9		
2	30	2:30	564.10	2.05	2.6	2.6	94	111	85	2.9		
3	35	2:35	569.30	2.40	2.96	2.96	94	112	90	3		
3	40	2:40	574.30	2.2	2.71	2.71	93	112	90	3		
3	45	2:45	579.35	2.1	2.59	2.59	94	114	92	3		
4	50	2:50	584.31	2.0	2.5	2.5	111	114	92	2.9		
4	55	2:55	589.23	2.05	2.4	2.4	124	115	93	2.9		
4	60	3:00	594.17	1.95	2.3	2.3	116	118	94	2.8		
5	65	3:05	599.35	2.15	2.6	2.6	107	119	95	3.0		
5	70	3:10	604.95	2.1	2.55	2.55	104	119	96	3.0		
5	75	[illegible]	609.58	1.9	2.3	2.3	100	120	97	2.8		
6	80	[illegible]	613.90	1.25	1.55	1.55	86	120	98	1.8		
6	85	[illegible]	618.49	1.8	2.25	2.25	86	117	98	2.5		
6	90	[illegible]	623.28	1.8	2.25	2.25	91	118	98	2.3		
7	95	[illegible]	628.17	2.25	2.65	2.65	115	121	99	3.0		
7	100	[illegible]	633.18	2.15	2.5	2.5	122	122	100	3.0		
7	105	[illegible]	638.05	2.1	2.4	2.4	130	122	100	2.9		
8	110	[illegible]	642.87	1.9	2.3	2.3	106	121	101	2.9		
8	115	[illegible]	647.95	2.2	2.65	2.65	107	121	101	3.1		

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Leak check < .01 CFM

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
8	120	4:00	653.06	2.15	2.6	2.6	106	124	101	3.0	300	55
9	125	4:05	657.95	1.9	2.3	2.3	101	125	102	3.0		
9	130	4:10	662.80	1.9	2.3	2.3	100	125	103	2.9		
9	135	4:15	667.510	2.0	2.48	2.48	99	125	104	3.0		
10	140	4:20	672.610	2.0	2.49	2.41	98	122	100	3.0		
10	145	4:35	677.750	2.0	2.50	2.50	95	123	100	3.0		
10	150	4:30	682.820	1.90	2.37	2.37	96	125	104	3.0		
11	155	4:35	687.19	1.80	2.19	2.19	110	125	106	3.0		
11	160	4:40	691.75	1.7	2.05	2.05	123	123	104	2.9		
11	165	4:45	696.10	1.6	1.9	1.9	120	121	105	2.3		
12	170	4:50	700.25	1.45	1.8	1.8	107	120	103	2.2		
12	175	4:55	704.38	1.4	1.7	1.7	106	120	103	2.1		
12	180	5:00	708.425	1.45	1.8	1.8	108	121	103	2.0		
					Leak Test after Test							
						≤ .01 cfm						
						$\sqrt{\Delta p} = 1.49$						
						$\Delta p = .222$						
								111	99			
	360		368.001	1.49	2.76		82	100				

EPA (Dur) 236
4 72

FIELD DATA

PLANT ASARCO
DATE 1/26/78
SAMPLING LOCATION Matte Tapping
SAMPLE TYPE part./SO2
RUN NUMBER CPE/CSE-3
OPERATOR T. ROONEY
AMBIENT TEMPERATURE 40
BAROMETRIC PRESSURE 26.20
STATIC PRESSURE, (P_s) -.6 H_2O
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' glass
NOZZLE I.D. 0.185
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER
METER BOX NUMBER 22-35
METER $\Delta H_@$ 1.8
C FACTOR 1.0
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 1.6"
Pump leak check < .01CFM

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 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
	1020	516.878									
1	1025	521.0950	2.0	2.50	2.50	58	50	50	7	300	50
	1030	524.69	2.1	2.20	2.20	59	65	65	7	300	50
	1035	529.50	2.05	2.3	2.3	57°	76	58	7.5	300	50
2	1040	533.615	2.1	2.4	2.4	54	84	60	7	300	50
	1045	538.95	2.15	2.45	2.45	54°	92	64	7	300	50
	1050	543.100	2.15	2.80	2.80	53°	98	64	10	300	50
3	1055	547.650	2.20	2.82	2.82	54	100	70	9	300	50
	1100	552.710	2.20	2.82	2.82	55	104	70	9	300	50
	1105	557.700	2.20	2.82	2.82	56	104	72	9	300	50
4	1110	562.910	2.10	2.67	2.67	68	110	78	9	300	50
	1115	567.210	2.30	2.99	2.99	55	110	80	9	300	50
	1120	572.000	2.20	2.86	2.86	55	112	82	9	300	50
5	1125	578.222	2.40	3.12	3.12	50	112	82	9	300	50
	1130	582.215	2.20	2.75	2.75	59	116	86	9	300	50
	1135	587.50	2.30	2.9	2.9	61	116	86	9	300	50
4	1140	594.00	2.2	2.75	2.75	62	118	88	9	300	50
6	1145	597.89	2.4	3.12	3.12	57°	118	90	10	300	50
	1150	503.05	2.65	3.30	3.3	58°	120	92	10	300	50
7	1155	608.77	3.20	4.2	4.0	59	120	92	13.5	300	50
	1200	614.98	3.20	4.2	4.0	64°	120	92	13.5	300	50
	1205	620.9	3.20	4.2	4.0	63	122	94	13.5	300	50
8	1210	626.75	3.15	4.1	4.05	61	122.5	94.5	13.5	300	50
	1215	632.79	3.1	4.0	4.0	58	124	96	13	300	50

COMMENTS:

EPA (Dur) 235

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
8	12:20	638.67	3.2	4.2	4.05	60	126	96	13.5	300	55
9	12:25	644.48	2.95	3.7	3.7	63	126	98	12		
	12:30	650.18	2.9	3.6	3.6	62	128	98	11.5		
	12:35	655.925	3.0	3.75	3.75	64	128.5	98.5	12.0		
10	12:40	661.47	2.6	3.25	3.25	59	128.5	100	10		
	12:45	666.935	2.6	3.25	3.25	60	128.5	100	10		
	12:50	672.33	2.55	3.2	3.2	60	128	100	10		
11	12:55	677.51	2.25	2.85	2.85	60	126	100	9		
	13:00	682.54	2.2	2.75	2.75	60	126	100.5	8.5		
	13:05	687.55	2.15	2.7	2.7	62	124.5	100	8		
12	13:10	692.185	1.7	2.15	2.15	60	124	100	6.5		
	13:15	696.62	1.75	2.2	2.2	60	122	100	7		
	13:20	702.02	1.75	2.2	2.2	64	122	100	7		
	leak chk	702.141									
	1400	702.149									
1	1405	706.765	2.15	2.7	2.7	101°F	86	84	2.8	300	55
	1410	711.82	2.7	3.35	2.95	103°F	102	86	9		
	1415	716.85	2.85	3.6	2.9	101°	108	86	9		
2	1420	721.85	1.9	2.4	2.4	97	NH	88.5	7.5		
	1425	726.46	1.9	2.4	2.4	96	118	90	7.5		
	1430	731.17	1.9	2.4	2.4	94	122	92	7.5		
3	1435	736.03	2.2	2.7	2.7	94	124	94	8		
	1440	740.935	2.2	2.7	2.7	92	124.5	94.5	8		
	1445	745.84	2.15	2.7	2.7	94	126	96	8		
4	1450	750.945	2.45	3.1	3.0	110	126.5	98	9		
	1455	756.06	2.45	3.1	2.9	124	126	98	9		
	1500	761.295	2.45	3.1	2.9	116	126	100	9		
5	1505	766.93	2.55	3.2	2.9	108	128	102	9		
	1510	771.53	2.5	3.1	3	103	128	102	9		
	1515	776.10	2.1	2.6	2.6	97	128	102	8		
6	1520	780.44	1.6	2	2	86	130	102.5	6.5		
	1525	785.43	2.3	2.9	2.9	86	130	104	9		
	1530	790.93	2.35	2.9	2.9	91	130	104	9		
7	1535	795.28	1.7	2.15	2.15	114	132	104	7		
	1540	799.53	1.6	2	2	123	132	106	6.5		
	1545	803.835	1.6	2	2	130	130.5	106	6.5		
8	1550	807.96	1.35	1.7	1.7	108	130	106	6		

EPA (Dur) 236
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leak chk at port change <0.02 @ 15 in Hg
lost power @ 15:44 FOR 30 SEC

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
8	1555	812.3	1.6	2	2	109	130	106	7		
	1600	817	1.55	1.95	1.95	106	130	106	6.5		
9	1605	820.71	1.4	1.75	1.75	103	130	106.5	6		
	1610	824.88	1.4	1.75	1.75	99	130	108	6		
	1615	830.8	1.55	1.95	1.95	99	130	108	6		
10	1620	833.49	1.65	2.1	2.1	96	130	108	7		
	1625	837.83	1.65	2.1	2.1	95	128.5	108	7		
	1630	842.39	1.7	2.15	2.15	95	132	108	7		
11	1635	846.675	1.5	1.9	1.9	114	132	108	6		
	1640	850.	1.4	1.75	1.75	127	132	108	6		
	1645	854.9	1.4	1.75	1.75	121	130.5	108	6		
12	1650	859.09	1.5	1.9	1.9	106	130	108	6		
	1655	863.17	1.4	1.75	1.75	107	130	108	6		
	1700	867.65	1.5	1.9	1.9	108	130	108	6		
				leak check			2.01	CFM	after test		
						$\sqrt{\Delta P}$ =	1.46				
						$\bar{\Delta P}$ =	2.13				
							121	99			
	360	350.6430	1.46	3.28		82	110				

EPA (Dur) 236
4 72

FIELD DATA

PLANT ASARCO
DATE 1/26/78
SAMPLING LOCATION Balloon Flue
SAMPLE TYPE Particulate
RUN NUMBER BPE-1
OPERATOR Schayer
AMBIENT TEMPERATURE 40
BAROMETRIC PRESSURE 26.2
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 20' SS
NOZZLE I.D. 0.309
ASSUMED MOISTURE, % 8
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.8
C FACTOR 0.9
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.29

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 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	11:05 / ~~12:00~~	603.648 / ~~607.145~~	0.03								
1	3	~~11:08~~	604.50	~~0.02~~	0.185	0.185	223	58	54	<1	300	50
2	6	11:11	605.31	0.03	0.185	0.185	223	58	54	<1	300	50
3	9	11:14	606.37	0.07	0.44	0.44	224	62	56	1.2	300	50
4	12	11:17	607.61	0.08	0.52	0.52	224	63	58	3.8	300	50
5	15	11:20	608.92	0.07	0.44	0.44	224	68	59	4.0	300	50
6	18	11:23	609.87	0.04	0.25	0.25	227	68	60	2.0	300	50
~~7~~	~~21~~			0.01	0.07	0.07	208	70	62	<1	300	50
~~1~~	~~0~~			~~0.02~~	~~0.12~~	~~0.12~~	~~95~~					
3	3	11:33	611.93	0.16	1.03	1.03	212	74	70	1	300	50
4	6	11:36	614.38	0.17	1.10	1.10	228	74	70	1	300	50
5	9	11:39	617.42	0.22	1.40	1.40	228	78	70	2	300	50
6	12	11:42		0.22	1.40	1.40	226	80	70	3	300	50
7	15	11:45	619.50									
8	18	11:48	621.61	0.23	1.45	1.45	230	82	70	3	300	50
9	21	11:51	623.93	0.32	2.05	2.05	226	82	70	4.5	300	50
10	24	11:54	626.60	0.38	2.45	2.45	230	84	74	5.5	300	50
11	27	11:57	629.12	0.35	2.27	2.27	230	89	75	5.5	300	50
12	30	12:00	631.57	0.31	2.00	2.00	228	90	75	4.5	300	50
13	33	12:03	633.79	0.24	1.55	1.55	229	90	76	3.5	300	60
14	36	12:06	634.93	0.12	0.77	0.77	226	90	76	1	300	60

COMMENTS: First two points were not in stack on traverse #2
3rd traverse started on point two

CO_2 by Fyrite = 3%

EPA (Dwl) 235

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
			634.94									
1	0	12:22	637.11	0.24	1.55	1.55	208	80	80	3	300	60
start → 2	3	12:25	↓	~~0.27~~	~~1.70~~	~~1.70~~	~~220~~	~~86~~	~~80~~	~~4~~	~~300~~	~~60~~
3	6	12:28	639.72	0.27	1.70	1.70	220	86	80	4	300	60
4	9	12:31	642.45	0.34	2.2	2.20	224	88	80	5.2	300	60
5	12	12:34		0.31	2.0	2.0	222	92	82	5.0	300	60
6	15	:37	646.65	-								
7	18	:40	648.90	0.28	1.81	1.81	222	92	82	4.5	300	60
8	21	:43	651.21	0.28	1.81	1.81	219	92	82	5.0	300	60
9	24	:46	653.42	0.28	1.81	1.81	221	94	82	5.0	300	60
10	27	:49	655.75	0.30	1.93	1.93	222	92	82	6.0	300	60
11	30	1:02	657.00	0.37	2.34	2.38	220	92	82	11.0	300	60
12	33	:05	660.75	0.37	2.38	2.38	221	96	84	13	300	60
13	36	:08	663.38	0.37	2.38	2.38	219	96	84	13	300	60
14	39	:12	665.94	0.31	2.0	2.0	220	96	84	13	300	~~60~~ 70
	0	1:04										
3	3	1:07	667.79	0.14	0.90	0.90	214	86	83	11	300	70
4	6	1:10	669.79	0.20	1.30	1.30	220	87	84	3	300	65
5	9	:13	672.09	0.26	1.65	1.65	224	88	84	3.5	300	65
6	12	:16	674.30	0.26	1.65	1.65	224	89	85	3.5	300	65
7	15	:19	676.50	0.27	1.72	1.72	228	90	85	3.5	300	65
8	18	:22	678.87	0.22	1.40	1.40	225	90	85	4.0	300	65
9	21	:25	681.22	0.19	1.21	1.21	226	91	85	4.0	300	65
10	24	:28	683.56	0.29	1.90	1.90	226	91	85	4.0	300	65
11	27	:31	685.80	0.25	1.60	1.60	224	89	84	3.5	300	65
12	30	:34	687.73	0.18	1.15	1.15	224	90	84	2.5	300	65
13	33	:37	688.678	0.02	0.12	0.12	225	86	84	<1	300	60
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~										
	0	1:53	688.678	0.02	0.12	0.12	213	80	80	<1	300	60
1	3	:56	689.50	0.03	.185	.185	225	80	80	<1	300	60
2	6	:59	690.32	0.03	.185	0.185	226	80	80	<1	300	60
3	9	2:02	691.22									
4	12	:05	692.25	0.03	0.185	0.185	228	80	80	<1	300	60
5	15	:09	693.11	0.05	0.31	0.31	227	80	80	<1	300	60
6	18	:12	694.28	0.06	0.38	0.38	229	80	80	<1	300	60
7	21	:15	695.043	0.02	0.12	0.12	226	80	80	<1	300	60
	144		91.3950	.43	1.10		219	83	81			

EPA (Dur) 236
4 72

leak test at end of test < 0.02 cfm @ 6 in. Hg. 82

$\sqrt{\Delta P}$ = .43

$\bar{\Delta P}$ = .73

36

33

21

-80-

FIELD DATA

PLANT ASARCO
DATE 1/26/78
SAMPLING LOCATION Baghouse Flue
SAMPLE TYPE part.
RUN NUMBER 2 BPE-2
OPERATOR JONGLEUX
AMBIENT TEMPERATURE 70
BAROMETRIC PRESSURE 26.2
STATIC PRESSURE, (P_s) -1.4
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 20' SS
NOZZLE I.D. 0.309
ASSUMED MOISTURE, % 8
SAMPLE BOX NUMBER
METER BOX NUMBER 2010
METER $\Delta H_@$ 1.8
C FACTOR 0.9
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.29

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 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
	326	0	695.598									
1	329	3	696.2	.02	.125	.125	217	68	70	<1.0	300	50
2	332	6	697.1	.04	.245	.245	225	69	71	<1.0	300	50
3	335	9	698.1	.05	.31	.31	234	71	71	<1.0	300	50
4	338	12	699.3	.06	.375	.375	234	73	71	<1.0	300	50
5	341	15	700.7	.095	.60	.60	230	75	72	<1.0	300	50
6	344	18	701.8	.05	.31	.31	231	76	73	<1.0	300	50
7	347	21	702.659	.03	.185	.185	227	77	74	<1.0	300	50
		0										
3	350	24	703.7	.07	.445	.445	164	76	73	<1.0	300	50
4	353	27	705.4	.21	1.3	1.3	227	80	76	<1.0	300	50
5	356	30	707.65	.25	1.7	1.7	232	82	76	1.0	300	62
6	359	33	710.2	.29	1.85	1.85	230	84	77	1.2	300	62
7	402	36	712.4	.30	1.9	1.9	232	85	78	1.1	300	62
8	405	39	714.7	.23	1.45	1.45	232	87	79	<1.0	300	62
9	408	42	716.5	.23	1.45	1.45	231	87	80	<1.0	300	65
10	411	45	718.8	.29	1.85	1.85	231	87	80	1.2	300	65
11	414	48	721.0	.22	1.35	1.35	230	88	80	.8	300	65
12	417	51	722.9	.15	.95	.95	233	89	80	<1.0	300	65
13	420	54	724.475	.07	.445	.445	228	87	82	<1.0	300	65
	423											
1	438	57	726.3	.14	.91	.91	170	80	82	<1.0	300	55
2	441	60	728.5	.32	2.05	2.05	218	82	82	1.2	300	55

COMMENTS: leak check before test <0.02 cfm @ 15 in Hg

EPA (Dur) 235

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
3	63	4:44	730.4	.34	2.2	2.2	233	85	82	1.5	300	55
4	66	4:47	734.2	.34	2.2	2.2	229	86	82	1.5	300	55
5	69	4:50	736.9	.32	2.1	2.1	229	88	82	1.2	300	55
6	70	4:53	738.5	.30	1.9	1.9	230	90	82	1.0	300	55
7	73	4:56	741.3	.32	2.1	2.1	227	88	82	1.2	300	55
8	76	4:59	743.1	.31	2.0	2.0	228	88	82	1.1	300	55
9	79	5:02	745.7	.34	2.2	2.2	228	89	82	1.5	300	55
10	82	5:05	748.2	.36	2.3	2.3	226	89	82	1.7	300	60
11	85	5:08	750.8	.40	2.6	2.6	224	89	82	2.0	300	60
12	88	5:11	753.4	.40	2.6	2.6	221	89	82	2.0	300	60
13	90	5:14	756.3	.36	2.35	2.35	224	89	82	1.8	300	65
14	93	5:17	758.768	.32	2.1	2.1	223	89	82	1.2	300	65
		5:25										
3	96	5:28	759.6	.04	.245	.245	149	80	80	<1.0	300	60
4	99	5:31	761.7	.21	1.3	1.3	226	82	80	3.0	300	60
5	102	5:34	763.2	.21	1.3	1.3	223	82	80	3.0	300	60
6	105	5:37	765.1	.23	1.45	1.45	226	84	81	5.0	300	60
7	108	5:40	767.1	.195	1.25	1.25	220	85	80	5.0	300	60
8	111	5:43	769.1	.22	1.35	1.35	222	87	82	7.0	300	62
9	114	5:46	771.7	.31	2.0	2.0	223	88	80	11.5	300	65
10	117	5:49	774.7	.32	2.1	2.1	219	90	80	14.5	300	65
11	120	5:52	776.5	.34	2.2	2.2	222	91	80	16.0	300	65
12	123	5:55	777.8	.29	1.85	1.85	221	91	80	18.0	300	65
13	126	6:58	779.469	.19	1.2	.85	221	91	80	19.0	300	65
		6:07										
1	129	6:10	780.0	.03	.185	.185	213	80	80	7.0	300	60
2	132	6:13	781.0	.05	.31	.31	222	80	80	11.0	300	60
3	135	6:16	781.9	.05	.31	.31	222	80	80	15.0	300	60
4	138	6:19	782.9	.06	.37	.29	224	80	80	20.0	300	60
5	141	6:22	785.4	.05	.31	.31	224	80	80	<1.0	300	60
6	144	6:25	788.10	.04	.25	.25	223	81	80	<1.0	300	60
7	147	6:28	787.853	.04	.25	.25	216	82	80	<1.0	300	60
						$\sqrt{\Delta P} = .432$						
						$\bar{\Delta P} = .19$		77	74			
	147		91.6550	.432	1.29		205		75			

EPA (Dur) 236
4 72

nozzle partially plugged for 6 minutes on 12th & 13th traverse points of 4th sampling port.

BPE-3

333

FIELD DATA

PLANT ASARCO
DATE 1/27/78
SAMPLING LOCATION Bullion Flue
SAMPLE TYPE Part.
RUN NUMBER BPE-3
OPERATOR Scheyer
AMBIENT TEMPERATURE 40
BAROMETRIC PRESSURE 26.12
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 20' SS
NOZZLE I.D. 0.309
ASSUMED MOISTURE, % 8
SAMPLE BOX NUMBER
METER BOX NUMBER 2010
METER $\Delta H_@$ 1.8
C FACTOR 0.9
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.29

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES Post Leak Check ≤.01 CFM

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	8:00	788.~~185~~.48									
1	3	8:03	789.35	0.02	0.125	0.125	217	40	40	<1	300	50
2	6	8:06	790.61	0.05	0.315	0.215	230	41	40	<1	300	50
3	9	8:09	791.62	0.06	0.375	0.375	232	46	42	<1	300	50
4	12	8:12	792.91	0.07	0.44	0.44	229	48	44	1	300	50
5	15	8:15	794.08	0.07	0.44	0.44	229	50	44	<1	300	50
6	18	8:18	795.31	0.06	0.375	0.44	229	52	44	<1	300	50
7	21	8:21	796.075	0.03	0.185	0.44	234	52	48	<1	300	50
	0	8:26										
3	24	8:29	797.88	0.15	0.96	0.96	243	54	49	2	300	50
4	27	8:32	799.76	0.17	1.10	0.10	247	58	50	3	300	50
5	30	8:35	801.67	0.19	1.22	1.22	248	62	52	3.5	300	50
6	33	8:38	803.69	0.21	1.32	1.32	253	64	54	4.3	300	50
7	36	8:41	805.90	0.25	1.60	1.60	248	66	54	5.5	300	50
8	39	8:44	808.10	0.24	1.55	1.55	249	68	56	5.5	300	50
9	42	8:47	810.42	0.29	1.88	1.88	245	70	57	7	300	50
10	45	8:50	812.95	0.37	2.35	2.35	250	72	58	10	300	50
11	48	8:53	815.46	0.35	2.25	2.25	244	74	60	10	300	50
12	51	8:56	817.82	0.30	1.90	1.90	246	75	60	8	300	50
13	54	8:59	819.80	0.21	1.32	1.32	243	75	61	5.5	300	50
		9:05										
1	57	9:08	822.30	0.25	1.60	1.60	222	66	60	5.5	300	50
2	60	9:11	824.25	0.22	1.40	1.40	233	68	60	5.0	300	50
3	63	9:14	826.92	0.32	2.05	2.05	247	70	62	7.0	300	50

COMMENTS:

EPA (Dur) 235

333 2.12

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
4	66	9:17	829.08	0.30	1.90	1.90	245	74	62	7.0	300	60
5	69	9:20	831.55	0.32	2.05	2.05	242	74	63	7.2	300	60
6	72	:23	834.05	0.30	1.90	1.90	244	76	64	7.0	300	60
7	75	:26	836.42	0.20	1.90	1.90	239	78	65	7.0	300	60
8	78	:29	838.90	0.31	2.0	2.00	240	78	65	8.0	300	60
9	81	:32	841.36	0.30	1.90	1.90	236	79	65	8.0	300	60
10	84	:35	843.99	0.37	2.35	2.35	236	80	66	10.5	300	60
11	87	:38	846.64	0.35	2.25	2.25	233	80	66	10.5	300	65
12	90	:41	849.50	0.33	2.15	2.15	234	82	66	10.0	300	65
13	93	:44	851.88	0.35	2.25	2.25	233	82	67	10.0	300	65
14	96	:47	854.637	0.37	2.35	2.35	232	82	68	10.0	300	65
		9:53										
3	99	:56	856.77	0.22	1.40	1.40	226	72	68	5.5	300	65
4	102	:59	859.00	0.25	1.60	1.60	230	74	68	7.0	300	65
5	105	10:02	861.70	0.31	2.0	2.0	237	76	68	9.0	300	65
6	108	:05	863.93	0.28	1.80	1.80	239	80	69	7.0	300	65
7	111	:08	866.31	0.28	1.80	1.80	242	80	69	8.5	300	65
8	114	:01	868.51	0.24	1.55	1.55	235	82	70	7.0	300	65
9	117	:14	870.66	0.23	1.50	1.50	240	82	70	6.5	300	65
10	120	817	873.99	0.29	1.85	1.85	236	82	70	9.0	300	65
11	123	:20	875.27	0.26	1.65	1.65	236	82	70	8.4	300	65
12	126	:23	877.02	0.15	0.96	0.96	235	80	72	4.0	300	65
13	129	:26	878.038	0.05	0.315	0.315	235	80	72	<1	300	65
		10:29										
1	132	10:32	879.97	0.02	0.125	0.125	223	75	70	<1	300	65
2	135	10:35	880.98	0.02	0.125	0.125	231	78	70	<1	300	65
3	138	10:38	881.15	0.04	0.25	0.25	241	76	72	1	300	65
4	141	10:41	882.40	0.05	0.315	0.315	241	76	72	1	300	65
5	144	10:44	883.85	0.08	0.52	0.52	236	76	72	1.5	300	65
6	147	:47	884.90	0.05	0.315	0.315	242	76	72	<1	300	65
7	150	:50	885.865	0.05	0.315	0.315	240	76	72	<1	300	65
							ΔP	=.19				
								65	58			
	150		97.385	.437	1.22		220	61				

EPA (Dur) 236
4 72

TRW

GAS SAMPLING FIELD DATA

Material Sampled for SO_2
Date 1/27/78
Plant ASARCO
Bar. Pressure 26.2 "Hg.
Ambient Temp. 60 °F
Run No. BSE-1
Power Stat Setting
Filter Used: Yes X No
Operator

Location Balloon flue
Comments:

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFH)	METER TEMPERATURE IN	
11:07	886.064	0.3	70	71
11:12	887.35	0.3	72	72
11:17	888.70	0.3	73	73
11:22	889.738	0.3	74	73
	3.674		72.25	

Comments:

Impinger Bucket No.
Meter Box No.

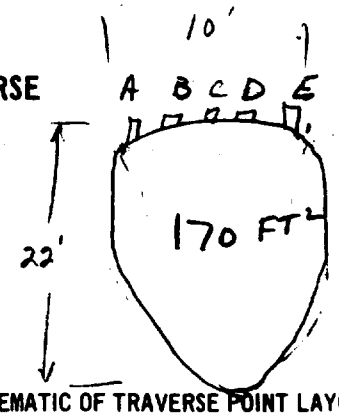
ENVIRONMENTAL ENGINEERING OPERATIONS OF TRW INC. • ONE SPACE PARK, REDONDO BEACH, CALIFORNIA 90278 •
(213) 536-3894

PRELIMINARY VELOCITY DATA SHEETS

pg 1 of 2

PRELIMINARY VELOCITY TRAVERSE

PLANT ASARCO
DATE 1/16/78
LOCATION Ballon flue
STACK I.D. see sketch
BAROMETRIC PRESSURE, in. Hg 26.25
STACK GAUGE PRESSURE, in. H_2O
OPERATORS



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A - 1	0.04	150
2	0.06	230
3		
4		
5		
6		
7		
B - 1	0.05	180
2	0.24	241
3	0.28	244
4	0.29	245
5		
6		
7		
8		
9		
10		
11		
C 1	0.09	120
2	0.29	238
3	0.29	244
4	0.28	243
5	0.26	243
6		
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
7		
8		
9		
10		
11		
12		
13		
14		
15		
D - 1	0.06	172
2	0.20	243
3	0.22	242
4	0.2	245
5		
6		
7		
8		
9		
10		
11		
AVERAGE		

EPA (Dur) 233
4/72

PRELIMINARY VELOCITY TRAVERSE

Boiler flue (cont.)

PLANT ASARCO

DATE

LOCATION

STACK I.D.

BAROMETRIC PRESSURE, in. Hg

STACK GAUGE PRESSURE, in. H_2O

OPERATORS

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
E-1		
2		
3		
4		
5		
6		
7		
AVERAGE		

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
	0.01	138
	0.02	210
	0.06	229
AVERAGE		

EPA (Dur) 233
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT ASARCO
DATE 1/26/78
LOCATION BALLON FLUE
STACK I.D.
BAROMETRIC PRESSURE, in. Hg 26.20
STACK GAUGE PRESSURE, in. H_2O
OPERATORS

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.25	235
2	25	233
3	.26	234
4	.24	235
	23	235
	.21	235
	.19	235
	.21	236
	.23	236
	.23	237
	.24	238
	.20	238
	.10	229
		~~235~~
	~~.08~~	~~121~~
AVERAGE	.22	235

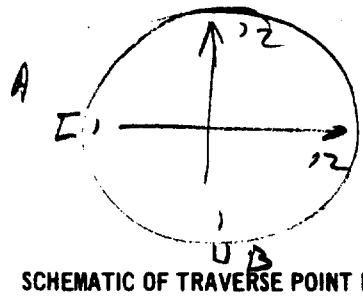
SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

EPA (Dur) 233
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT ASARCO
DATE 1/20/78
LOCATION MATTE TAPPING - OFF DUCT
STACK I.D. 26.5"
BAROMETRIC PRESSURE, in. Hg 26.10
STACK GAUGE PRESSURE, in. H_2O +6.0 in. H_2O
OPERATORS



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-1	1.7	93
2	.65	93
3	.61	93
4	.65	95
5	.60	93
6	.58	93
7	.6	93
8	.62	92
9	.66	93
10	.69	93
11	.70	92
12	.64	92
AVERAGE		

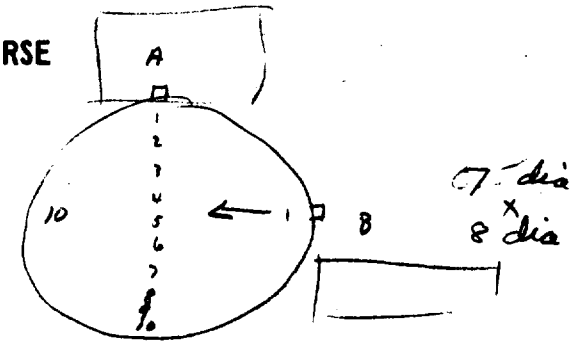
TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
B-1	.25	91
2	.31	90
3	.45	90
4	.50	90
5	.50	90
6	.55	91
7	.60	90
8	.68	89
9	.85	90
10	.89	90
11	.92	89
12	.74	89
AVERAGE		

EPA (Dur) 233
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT ASARCO
DATE 1/16/78
LOCATION BAGHOUSE INLET
STACK I.D. 12'8" (152")
BAROMETRIC PRESSURE, in. Hg 26.25
STACK GAUGE PRESSURE, in. H_2O
OPERATORS

20 pts
x 5 min



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
B-1	1.7	109
2	2.0	109
3	2.0	112
4	1.9	113
5	1.8	115
6	1.8	118
7	1.7	119
8		
9		
10		
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
B-1		
2	1.6	
3	1.8	
4	1.9	
5	1.9	
6	1.85	
7	1.8	
8		
9		
10		
AVERAGE		

EPA (Dur) 233
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT AMESCO
DATE 1/24/77
LOCATION ~~[illegible]~~ Calcinder 1
STACK I.D. 28 1/2
BAROMETRIC PRESSURE, in. Hg 26.05
STACK GAUGE PRESSURE, in. H_2O -.76
OPERATORS

SCHEMATIC OF TRAVERSE POINT LAYOUT

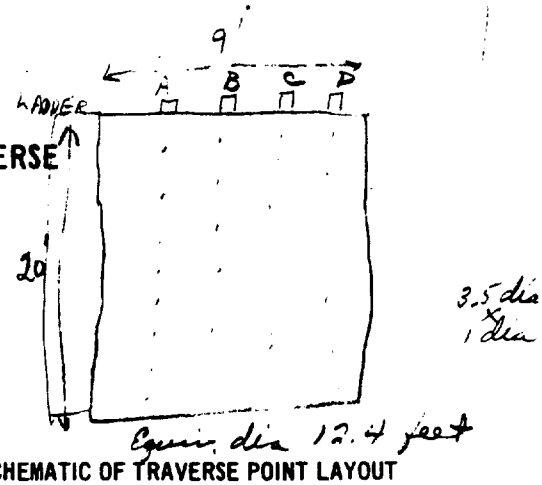
TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
H 1	.22	95
2	.31	95
3	.30	95
4	.26	95
5	.24	90
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.30	43
2	.27	45
3	.29	46
4	.26	44
5	.24	43
AVERAGE		

EPA (Dur) 233
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT ASARCO
DATE 1/16/78
LOCATION Outlet Baghouse
STACK I.D. 9'x20'
BAROMETRIC PRESSURE, in. Hg 26.25
STACK GAUGE PRESSURE, in. H_2O
OPERATORS



SCHEMATIC OF TRAVERSE POINT LAYOUT

	TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
10	A-1	.75	111
	2	.91	113
	3	1.01	114
	4	1.01	116
	5	1.0	116
	6		All
	7		
	8		
	9		
	10		
9.5	B-1	.75	114
	2	.92	114
	3	.96	114
	4	1.01	114
	5	1.0	113
	6		
	7		
	8		
	9		
	10		
	AVERAGE		

	TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
10	C-1	.77	111
	2	.85	112
	3	.87	112
	4	.88	111
	5	.91	111
	6		
	7		
	8		
	9		
	10		
9.25	D-1	.63	109
	2	.62	108
	3	.60	108
	4	.60	108
	5	.66	107
	6		
	7		
	8		
	9		
	10		
	AVERAGE		

EPA (Dur) 233
4/72

NOMOGRAPH DATA

NOMOGRAPH DATA

PLANT ASARCO - EL PASO

DATE 1/17/78

SAMPLING LOCATION BAGHOUSE OUTLET

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.83
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	75
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	3
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	26.5
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	26.3
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	.99
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	115
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.85
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	1.01
C FACTOR	.99	
CALCULATED NOZZLE DIAMETER, in.		
ACTUAL NOZZLE DIAMETER, in.		
REFERENCE Δp, in. H_2O		

EPA (Dur) 234
4 72

NOMOGRAPH DATA

PLANT ASARCO - El Paso

DATE 1/23/78

SAMPLING LOCATION Baghouse outlet

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.83
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m_{avg.}}$	75 ~~55~~
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	26.05
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	25.75
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	0.99
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	115
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.85
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	1.01
C FACTOR	1.0	
CALCULATED NOZZLE DIAMETER, in.	3/16	
ACTUAL NOZZLE DIAMETER, in.	3/16	
REFERENCE Δp, in. H_2O	1.55	

EPA (Dur) 234
4 72

NOMOGRAPH DATA

PLANT ASARCO

DATE 1/24/78

SAMPLING LOCATION Calcining

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.80
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	60
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	26.05
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	26.00
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	45
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.25
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.31
C FACTOR	1.0	
CALCULATED NOZZLE DIAMETER, in.	.28	
ACTUAL NOZZLE DIAMETER, in.	.25	
REFERENCE Δp, in. H_2O	0.43	

EPA (Dur) 234
4 72

NOMOGRAPH DATA

PLANT ASARCO EL PASO

DATE 1/17/78

SAMPLING LOCATION Baghouse Inlet

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.75
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	75
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	3
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	26.5
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	26.3
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	0.99
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	115
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	1.85
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	2.0
C FACTOR	.96	
CALCULATED NOZZLE DIAMETER, in.		
ACTUAL NOZZLE DIAMETER, in.		
REFERENCE Δp, in. H_2O		

EPA (Dur) 234
4 72

NOMOGRAPH DATA

PLANT ASARCO

DATE 1/20/78

SAMPLING LOCATION Motte Tapping

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.80
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	70
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2%
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	26.10
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	+6" .438 P_s	26.538
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.02
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	105
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	1.4
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	1.6
C FACTOR		1.0
CALCULATED NOZZLE DIAMETER, in.		.185
ACTUAL NOZZLE DIAMETER, in.		.185
REFERENCE Δp, in. H_2O		1.6

EPA (Dur) 234
4 72

NOMOGRAPH DATA

PLANT ASARCO

DATE 1/26/78

SAMPLING LOCATION Balloon flue

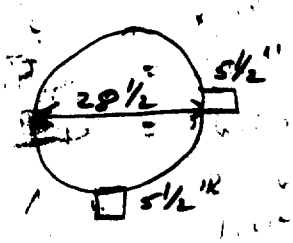
CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.8
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	60
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	8
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	26.2
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	26.2
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	235
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.22
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	0.26
C FACTOR	0.90	
CALCULATED NOZZLE DIAMETER, in.	0.34	
ACTUAL NOZZLE DIAMETER, in.	0.309	
REFERENCE Δp, in. H_2O	0.29	

EPA (Dur) 234
4 72

TRAVERSE POINT LOCATION

TRW / ENVIRONMENTAL ENGINEERING DIVISION

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS



PLANT AARSCO
DATE 1/24/77
SAMPLING LOCATION CALCINE
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 34"
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 5 1/2
STACK I.D., (DISTANCE A - DISTANCE B) 28.5
NEAREST UPSTREAM DISTURBANCE > 8 DUCT DIA
NEAREST DOWNSTREAM DISTURBANCE > 2 DUCT DIA
CALCULATOR

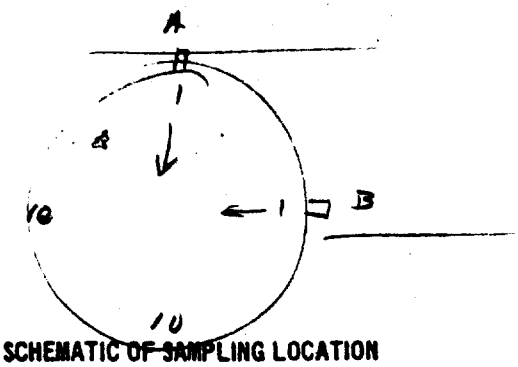
SCHEMATIC OF SAMPLING LOCATION

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 NIPPLE (SUM OF COLUMNS 4 & 5)
H 1	2.6	28.5	1.0	5 1/2	6 1/2
2	8.2		2 1/4		7 3/4
3	14.6		4 1/4		9 3/4
4	22.6		6.5		12
5	34.2		9 3/4		15 1/4
6	65.8		18 3/4		24 1/4
7	77.4		22.0		27 1/2
8	85.4		24 1/4		29 3/4
9	91.8		26 1/4		31 3/4
10	97.4		27 3/4		33 1/4
V 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

TRW / ENVIRONMENTAL ENGINEERING DIVISION

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT ASARCO EL PASO
DATE 1/16/78
SAMPLING LOCATION Inlet Baghouse
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A)
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B)
STACK I.D., (DISTANCE A - DISTANCE B) 152"
NEAREST UPSTREAM DISTURBANCE 7 dia (app 90')
NEAREST DOWNSTREAM DISTURBANCE 8+ dia (over 100')
CALCULATOR Eggleston



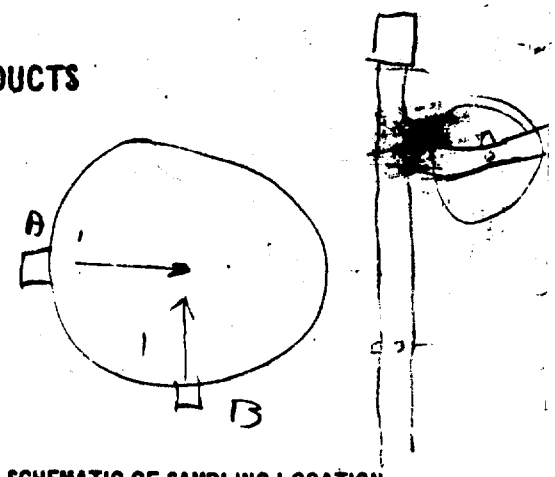
SCHEMATIC OF SAMPLING LOCATION

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 NIPPLE (SUM OF COLUMNS 4 & 5)
1	.026	152"	4.0	6	10.0
2	.082		12.5	6	18.5
3	.146		22.2		28.2
4	.226		34.4		40.4
5	.342		52.0		58.0
6	.658		100.0		106.0
7	.774		117.6		123.6
8	.854		129.8		135.8
9	.918		139.5		145.5
10	.974		148.0		154.0

TRW / ENVIRONMENTAL ENGINEERING DIVISION

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT ASARCO
DATE 1/20/78
SAMPLING LOCATION [illegible] TAPPING - offstream
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 31.5"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 5"
STACK I.D., (DISTANCE A - DISTANCE B) 26.5"
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE 4
CALCULATOR Eggleston



SCHEMATIC OF SAMPLING LOCATION

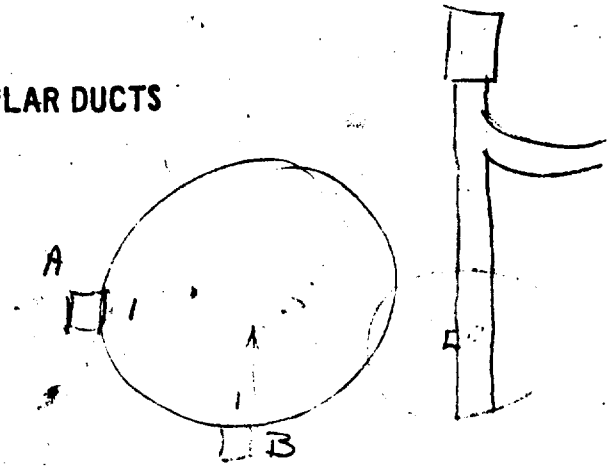
TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
A-1	.021	26.5	1.0 *	5"	6.0
2	.067		1.8		6.8
3	.118		3.1		8.1
4	.177		4.7		9.7
5	.250		6.6		11.6
6	.356		9.4		16.4
7	.646		17.1		22.1
8	.750		19.9		24.9
9	.823		21.8		26.8
10	.882		23.4		28.4
11	.933		24.7		29.7
12	.979		25.5 *		30.5

* 1" from wall

TRW / ENVIRONMENTAL ENGINEERING DIVISION

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT ASARCO
DATE 1/20/78
SAMPLING LOCATION MATTE TAPPING
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 37.75
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 5
STACK I.D., (DISTANCE A - DISTANCE B) 32.75
NEAREST UPSTREAM DISTURBANCE 6 dia
NEAREST DOWNSTREAM DISTURBANCE 4 dia
CALCULATOR [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 NIPPLE (SUM OF COLUMNS 4 & 5)
A-1	.021	32.75	1.0	5	6.0
2	.067		2.2		7.2
3	.118		3.9		8.9
4	.177		5.8		10.8
	.250		8.2		13.2
6	.356		11.7		16.7
7	.796		21.1		26.1
8	.750		24.6		29.6
9	.823		27.0		32.0
10	.882		28.9		33.9
11	.932		30.6		35.6
12	.979		31.7		36.7

ANALYTICAL DATA SHEETS

TRW

300

ANALYTICAL DATA

PLANT ASARCO

DATE 1/17/78

SAMPLING LOCATION Baghouse Outlet

SAMPLE TYPE PART./SO_2

RUN NUMBER APE-1

SAMPLE BOX NUMBER

CLEAN-UP MAN Van[illegible]/ROSARIO

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ 21.5 mg

FILTER NUMBER 302 — CONTAINER _____ ~~10.60~~ mg

FRONT HALF SUBTOTAL 21.5 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ 3.0 mg

ETHER-CHLOROFORM EXTRACTION 849.7 mg

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ 2.3 mg

BACK HALF SUBTOTAL 855.0 mg

TOTAL WEIGHT _____ mg

SO_2 — 403.4

TOTAL WEIGHT = 473.1

MOISTURE

IMPINGERS

FINAL VOLUME 201 ml

INITIAL VOLUME 200 ml

NET VOLUME 1 ml

SILICA GEL

FINAL WEIGHT [illegible] g

INITIAL WEIGHT [illegible] g

NET WEIGHT 13.3 g

TOTAL MOISTURE 14.4 g

TRANSPORTATION AND ENVIRONMENTAL OPERATIONS OF TRW INC.
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TRW

301

ANALYTICAL DATA

PLANT ASARCO

DATE 1/12/78

SAMPLING LOCATION Baghouse Inlet

SAMPLE TYPE PART/SO_2

RUN NUMBER API-1

SAMPLE BOX NUMBER

CLEAN-UP MAN

COMMENTS:

FRONT HALF

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

FILTER NUMBER 301 303

LABORATORY RESULTS

CONTAINER 31.0 mg

~~97.8 + 52.3~~ =

CONTAINER 98.1 mg

FRONT HALF SUBTOTAL 129.1 mg

BACK HALF

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

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

CONTAINER 9.4 mg

ETHER-CHLOROFORM EXTRACTION 2218.2 mg

CONTAINER 3.8 mg

BACK HALF SUBTOTAL 2231.4 mg

TOTAL WEIGHT mg

SO_2 - 982.8

TOTAL WEIGHT = 1377.7

MOISTURE

IMPINGERS

FINAL VOLUME 201 ml

INITIAL VOLUME 200 ml

NET VOLUME 1.0 ml

SILICA GEL

FINAL WEIGHT 268.0 g

INITIAL WEIGHT 250.0 g

NET WEIGHT 18.0 g

TOTAL MOISTURE 19.0 g

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TRW

305

ANALYTICAL DATA

PLANT ASARCO

DATE 1/18/78

SAMPLING LOCATION Outlet Baghouse

SAMPLE TYPE PART/SO_2

RUN NUMBER APE-2

SAMPLE BOX NUMBER

CLEAN-UP MAN Vanderwall

COMMENTS:

FRONT HALF

LABORATORY RESULTS

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

CONTAINER 5.8 mg

FILTER NUMBER 306

CONTAINER ~~10.50~~ mg

FRONT HALF SUBTOTAL 5.8 mg

BACK HALF

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

CONTAINER 8.2 mg

ETHER-CHLOROFORM EXTRACTION 1321.9 mg

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

CONTAINER 5.8 mg

BACK HALF SUBTOTAL 1335.9 mg

TOTAL WEIGHT mg

SO_2 603.3

TOTAL WEIGHT = 738.4

MOISTURE

IMPINGERS

FINAL VOLUME 197 ml

INITIAL VOLUME 200 ml

NET VOLUME -3.0 ml

SILICA GEL

FINAL WEIGHT 269.1 g

INITIAL WEIGHT 250.0 g

NET WEIGHT 19.1 g

TOTAL MOISTURE 16.0 g

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TRW

306

ANALYTICAL DATA

PLANT ASARCO

DATE 1/18/78

SAMPLING LOCATION Inlet Baghouse

SAMPLE TYPE Part SO_2

RUN NUMBER ABI-2

SAMPLE BOX NUMBER

CLEAN-UP MAN Vandewalle

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ 38.8 mg

FILTER NUMBER 308 — CONTAINER _____ 71.0 ~~83.0~~ mg

FRONT HALF SUBTOTAL 109.8 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ .2 mg

ETHER-CHLOROFORM EXTRACTION 1228.7 mg

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ .6 mg

BACK HALF SUBTOTAL 1229.5 mg

TOTAL WEIGHT _____ mg

SO_2 = 66.2

TOTAL WEIGHT = 1273.1

MOISTURE

IMPINGERS

FINAL VOLUME 200 ml

INITIAL VOLUME 200 ml

NET VOLUME 0 ml

SILICA GEL

FINAL WEIGHT 272.4 g

INITIAL WEIGHT 250.0 g

NET WEIGHT 22.4 g

TOTAL MOISTURE 22 g

TRANSPORTATION AND ENVIRONMENTAL OPERATIONS OF TRW INC.
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TRW

AME-1
307

ANALYTICAL DATA

PLANT ASARCO
DATE 1/18/78
SAMPLING LOCATION Outlet
SAMPLE TYPE Arsenic
RUN NUMBER AME-1
SAMPLE BOX NUMBER
CLEAN-UP MAN

COMMENTS: Titration for SO_2
Imp # 4,5 & 6 Vt
Vt_b

FRONT HALF

LABORATORY RESULTS

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

FILTER NUMBER 312

CONTAINER _____ mg

CONTAINER _____ 31.9 mg

.6939
.6620
.0319

FRONT HALF SUBTOTAL _____ mg

BACK HALF

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

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

CONTAINER _____ mg
ETHER-CHLOROFORM EXTRACTION _____ mg
CONTAINER _____ mg

BACK HALF SUBTOTAL _____ mg

TOTAL WEIGHT _____ mg

MOISTURE

	H_2O	H_2O_2
IMPINGERS		
FINAL VOLUME	199.5 ml	605
INITIAL VOLUME	300 ml	600
NET VOLUME	— ml	

147.5 201
152.0 202
202

SILICA GEL			
FINAL WEIGHT	258.5 g	g	g
INITIAL WEIGHT	250 g	g	g
NET WEIGHT	8.5 g	g	g

TOTAL MOISTURE 0 g

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TRW

308

ANALYTICAL DATA

PLANT ASARCO

DATE 1/18/78

SAMPLING LOCATION Inlet

SAMPLE TYPE Arsenic

RUN NUMBER AMI-1

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 _____ _____ mg

FILTER NUMBER 310 _____

CONTAINER _____ 138.6 mg

FRONT HALF SUBTOTAL _____ 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

2 impingers - 1&2 - 296.5 ml

9,5&6 - 603 ml

BACK HALF SUBTOTAL _____ mg

TOTAL WEIGHT _____ mg

MOISTURE

	H_2O	H_2O
IMPINGERS		
FINAL VOLUME	296.5 ml	603
INITIAL VOLUME	300 ml	600
NET VOLUME	— ml	-4

SILICA GEL			
FINAL WEIGHT	269.75 g	g	g
INITIAL WEIGHT	250 g	g	g
NET WEIGHT	19.75 g	g	g

TOTAL MOISTURE 16 g

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TRW

311

ANALYTICAL DATA

PLANT ASARCO

DATE 1/19/78

SAMPLING LOCATION Outlet Baghouse

SAMPLE TYPE Metal

RUN NUMBER AME-2

SAMPLE BOX NUMBER

CLEAN-UP MAN

COMMENTS:

FRONT HALF

LABORATORY RESULTS

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

FILTER NUMBER 315

CONTAINER _____ _____ mg

CONTAINER _____ 14.9 mg

FRONT HALF SUBTOTAL _____ 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

	142	4,576	144	151
FINAL VOLUME	299 ml	453.5	155	152
INITIAL VOLUME	300 ml	450	299	150.5
NET VOLUME	-1 ml			

SILICA GEL

FINAL WEIGHT	265.5 g	_____ g	_____ g
INITIAL WEIGHT	250 g	_____ g	_____ g
NET WEIGHT	+15 g	_____ g	_____ g

TOTAL MOISTURE +14 g

TRANSPORTATION AND ENVIRONMENTAL OPERATIONS OF TRW INC.
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TRW

312

ANALYTICAL DATA

PLANT ASARCO

DATE 1/19/78

SAMPLING LOCATION Inlet Baghouse

SAMPLE TYPE Metal

RUN NUMBER AMJ-2

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 _____ _____ mg

FILTER NUMBER 314 _____

CONTAINER _____ 14.9 mg

FRONT HALF SUBTOTAL _____ 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

	1 & 2	4, 5 & 6
IMPINGERS		
FINAL VOLUME	289.0 ml	451.5
INITIAL VOLUME	300 ml	450
NET VOLUME	-11 ml	

	1	2
139.5	151	
249.5	150.5	
289.0	150	
	451.5	

SILICA GEL			
FINAL WEIGHT	262.72 g	_____ g	_____ g
INITIAL WEIGHT	250 g	_____ g	_____ g
NET WEIGHT	17 g	_____ g	_____ g

TOTAL MOISTURE +6 g

TRANSPORTATION AND ENVIRONMENTAL OPERATIONS OF TRW INC.
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TRW

ANALYTICAL DATA

PLANT ASARCO
DATE 1/20/78
SAMPLING LOCATION Matte Tapping
SAMPLE TYPE Metal
RUN NUMBER CME-2
SAMPLE BOX NUMBER
CLEAN-UP MAN Vanderwall

COMMENTS:

FRONT HALF

LABORATORY RESULTS

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

CONTAINER _____ _____ mg

FILTER NUMBER 313 _____

CONTAINER _____ 303.7 mg

FRONT HALF SUBTOTAL _____ 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	1+2	4,5,+6
FINAL VOLUME	766 ml	455
INITIAL VOLUME	300 ml	455
NET VOLUME	34 ml	

SILICA GEL			
FINAL WEIGHT	189 g	_____ g	_____ g
INITIAL WEIGHT	259 g	_____ g	_____ g
NET WEIGHT	_____ g	_____ g	_____ g

TOTAL MOISTURE ~~0.9~~ 1 g

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TRW

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ANALYTICAL DATA

PLANT ASARCO

DATE 1/20/78

SAMPLING LOCATION MATTE TAPPING

SAMPLE TYPE metal

RUN NUMBER CME-1

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 ~~29~~ mg

FILTER NUMBER 317

CONTAINER ~~303~~ 291.7 mg

FRONT HALF SUBTOTAL 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

	1+2	4,5,+6
IMPINGERS		
FINAL VOLUME	271 ml	450
INITIAL VOLUME	300 ml	450
NET VOLUME	-29 ml	0
SILICA GEL		
FINAL WEIGHT	288.5 g	g g
INITIAL WEIGHT	250 g	g g
NET WEIGHT	38.5 g	g g

TOTAL MOISTURE 9.5 g

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ANALYTICAL DATA

PLANT ASARCO

DATE 1/21/78

SAMPLING LOCATION Outlet Baghouse

SAMPLE TYPE Particulate

RUN NUMBER APE-3

SAMPLE BOX NUMBER

CLEAN-UP MAN Vandewall

COMMENTS:

FRONT HALF

LABORATORY RESULTS

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

CONTAINER _____ 2.6 mg

FILTER NUMBER 319

CONTAINER _____ ~~11.4~~ 0 mg

FRONT HALF SUBTOTAL 2.6 mg

BACK HALF

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

CONTAINER _____ 1.8 mg

ETHER-CHLOROFORM EXTRACTION 68.6 mg

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

CONTAINER _____ 2.5 mg

BACK HALF SUBTOTAL 72.9 mg

TOTAL WEIGHT _____ mg

SO_2 – 30.0

TOTAL WEIGHT = 45.5

MOISTURE

IMPINGERS

FINAL VOLUME 203 ml

INITIAL VOLUME 200 ml

NET VOLUME 3 ml

SILICA GEL

FINAL WEIGHT 268.25 g

INITIAL WEIGHT 250 g

NET WEIGHT 18.25 g

TOTAL MOISTURE 21.25 g

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ANALYTICAL DATA

PLANT ASARCO

DATE 1/21/78

SAMPLING LOCATION Inlet Baghouse

SAMPLE TYPE Part

RUN NUMBER API-3

SAMPLE BOX NUMBER

CLEAN-UP MAN

COMMENTS:

FRONT HALF

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

FILTER NUMBER 318

	LABORATORY RESULTS
CONTAINER	51.1 mg
	~~94~~ 96.7
CONTAINER	~~96.7~~ mg
	147.8
FRONT HALF SUBTOTAL	~~135.8~~ mg

BACK HALF

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

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

CONTAINER	0 mg
ETHER-CHLOROFORM EXTRACTION	37.6 mg
CONTAINER	2.3 mg
BACK HALF SUBTOTAL	39.9 mg
TOTAL WEIGHT	mg

SO_2 - 43.1

TOTAL WEIGHT 147.8

MOISTURE

IMPINGERS

FINAL VOLUME	202 ml
INITIAL VOLUME	200 ml
NET VOLUME	2 ml

SILICA GEL

FINAL WEIGHT	269.7 g	g	g
INITIAL WEIGHT	250 g	g	g
NET WEIGHT	19.7 g	g	g

TOTAL MOISTURE 21.7 g

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ANALYTICAL DATA

PLANT ASARCO

DATE 1/23/78

SAMPLING LOCATION Baghouse Outlet

SAMPLE TYPE Metals

RUN NUMBER AME-3

SAMPLE BOX NUMBER

CLEAN-UP MAN VanderWall

COMMENTS:

FRONT HALF

LABORATORY RESULTS

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

CONTAINER _____ _____ mg

FILTER NUMBER 321

CONTAINER _____ 72.3 mg

FRONT HALF SUBTOTAL _____ 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	1+2	4,5,+6
FINAL VOLUME	313 ml	447 ml
INITIAL VOLUME	300 ml	450 ml
NET VOLUME	13 ml	-3 ml

SILICA GEL			
FINAL WEIGHT	2672 g	g	g
INITIAL WEIGHT	2500 g	g	g
NET WEIGHT	172 g	g	g

TOTAL MOISTURE 30.2 g

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242 ml

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318

ANALYTICAL DATA

PLANT ASARCO

DATE 1/23/78

SAMPLING LOCATION Baghouse Inlet

SAMPLE TYPE Metals

RUN NUMBER AIII-3

SAMPLE BOX NUMBER

CLEAN-UP MAN Vandewall

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER 320 _____ — CONTAINER _____ 13.3 mg

FRONT HALF SUBTOTAL _____ 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

	1+2	4,5,+6
IMPINGERS		
FINAL VOLUME	297 ml	443 ml
INITIAL VOLUME	300 ml	450 ml
NET VOLUME	-3 ml	-7 ml

SILICA GEL			
FINAL WEIGHT	269.6 g	_____ g	_____ g
INITIAL WEIGHT	250 g	_____ g	_____ g
NET WEIGHT	19.6 g	_____ g	_____ g

TOTAL MOISTURE 16.6 g

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ANALYTICAL DATA

PLANT ASARCO

DATE 1/24/78

SAMPLING LOCATION Calcine Fugitive

SAMPLE TYPE Metals

RUN NUMBER DMF-1

SAMPLE BOX NUMBER

CLEAN-UP MAN Vanderwall

COMMENTS:

FRONT HALF

LABORATORY RESULTS

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

CONTAINER _____ _____ mg

FILTER NUMBER 325

CONTAINER _____ 120.0 mg

FRONT HALF SUBTOTAL _____ 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

	1+2	4,5,+6
IMPINGERS		
FINAL VOLUME	298 ml	450 ml
INITIAL VOLUME	300 ml	450 ml
NET VOLUME	-2 ml	0 ml

SILICA GEL			
FINAL WEIGHT	253.4 g	_____ g	_____ g
INITIAL WEIGHT	250 g	_____ g	_____ g
NET WEIGHT	3.4 g	_____ g	_____ g

TOTAL MOISTURE 1.4 g

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TRW

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ANALYTICAL DATA

PLANT ASARCO

DATE 1/24/78

SAMPLING LOCATION Calcine Fugitive

SAMPLE TYPE Metals

RUN NUMBER DM-2

SAMPLE BOX NUMBER

CLEAN-UP MAN Vanderwall

COMMENTS:

FRONT HALF

LABORATORY RESULTS

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

CONTAINER _____ _____ mg

FILTER NUMBER 3216 _____

CONTAINER _____ 203.5 mg

FRONT HALF SUBTOTAL _____ 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

	1+2	4,5+6
IMPINGERS		
FINAL VOLUME	294 ml	452 ml
INITIAL VOLUME	300 ml	450 ml
NET VOLUME	-6 ml	2 ml
SILICA GEL		
FINAL WEIGHT	259.0 g	_____ g _____ g
INITIAL WEIGHT	250 g	_____ g _____ g
NET WEIGHT	9.0 g	_____ g _____ g

TOTAL MOISTURE 3 g

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ANALYTICAL DATA

PLANT ASARCO

DATE 1/24/78

SAMPLING LOCATION Calcine Fugitive

SAMPLE TYPE Metals

RUN NUMBER DME-3

SAMPLE BOX NUMBER

CLEAN-UP [redacted] Vandewall

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER 327 _____ — CONTAINER _____ 243.4 mg

FRONT HALF SUBTOTAL _____ 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	1+2	3	4
FINAL VOLUME	294 ml	452 ml	
INITIAL VOLUME	300 ml	450 ml	
NET VOLUME	-6 ml	2 ml	

SILICA GEL			
FINAL WEIGHT	207.6 g	g	g
INITIAL WEIGHT	206 g	g	g
NET WEIGHT	1.6 g	g	g

TOTAL MOISTURE 1.6 g

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ANALYTICAL DATA

PLANT ASARCO
DATE 1/25/78
SAMPLING LOCATION Calcine Furnace
SAMPLE TYPE H3PO4/SO2
RUN NUMBER P/DSE-1
SAMPLE BOX NUMBER
CLEAN-UP MAN Vandewall

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER ____ 80.4 mg

FILTER NUMBER 328 — CONTAINER ____ 27.4 mg

.7527
.6133
.1394

FRONT HALF SUBTOTAL 107.8 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER ____ 2.7 mg

ETHER-CHLOROFORM EXTRACTION 622.1 mg

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER ____ 0 mg

BACK HALF SUBTOTAL 624.8 mg

TOTAL WEIGHT ____ mg

SO_2 = - 340.5

TOTAL ~~WEIGHT~~ WEIGHT = 392.1

MOISTURE

IMPINGERS
FINAL VOLUME 196 ml
INITIAL VOLUME 200 ml
NET VOLUME -4 ml

SILICA GEL
FINAL WEIGHT 252.7 g
INITIAL WEIGHT 250 g
NET WEIGHT 2.7 g

TOTAL MOISTURE 2.7 g

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ANALYTICAL DATA

PLANT ASARCO

DATE 1/25/78

SAMPLING LOCATION Matte tapping

SAMPLE TYPE Metals

RUN NUMBER ~~OME-3~~ CME-3

SAMPLE BOX NUMBER

CLEAN-UP MAN Vanderwall

COMMENTS:

FRONT HALF

LABORATORY RESULTS

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

CONTAINER _____ _____ mg

FILTER NUMBER 330

CONTAINER _____ 119.3 mg

FRONT HALF SUBTOTAL _____ 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

	1+2	4,5,+6
IMPINGERS		
FINAL VOLUME	248 ml	462 ml
INITIAL VOLUME	300 ml	450 ml
NET VOLUME	-52 ml	12 ml

SILICA GEL			
FINAL WEIGHT	299.1 g	_____ g	_____ g
INITIAL WEIGHT	250 g	_____ g	_____ g
NET WEIGHT	49.1 g	_____ g	_____ g

TOTAL MOISTURE 0 g

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TRW

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ANALYTICAL DATA

PLANT ASARCO

DATE 1/25/78

SAMPLING LOCATION matte tapping

SAMPLE TYPE part./SO_2

RUN NUMBER CPE-1

SAMPLE BOX NUMBER

CLEAN-UP MAN Vandenwall/Shaw/Sanglex

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER 12.8 mg

FILTER NUMBER 329 — CONTAINER ~~112.2~~ 100.2 mg

FRONT HALF SUBTOTAL 113.0 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER 10.3 mg; ETHER-CHLOROFORM EXTRACTION 3589.9 mg

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER 30.1 mg

BACK HALF SUBTOTAL 3630.3 mg

TOTAL WEIGHT ____ mg

SO_2 — 1728.4

TOTAL WEIGHT = 2014.9

MOISTURE

IMPINGERS
- FINAL VOLUME 128 ml
- INITIAL VOLUME 200 ml
- NET VOLUME -72 ml

SILICA GEL
- FINAL WEIGHT 209.15 g
- INITIAL WEIGHT 250 g
- NET WEIGHT 59.15 g

TOTAL MOISTURE 52 g

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ANALYTICAL DATA

PLANT ASARCO
DATE 1/25/78
SAMPLING LOCATION coking fugitive
SAMPLE TYPE Part./SO_2
RUN NUMBER DPE/DSE-2
SAMPLE BOX NUMBER
CLEAN-UP MAN Vanderwall

COMMENTS:

FRONT HALF

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

FILTER NUMBER 324

	LABORATORY RESULTS
CONTAINER	58.1 mg
CONTAINER	~~32.1~~ 20.1 mg
FRONT HALF SUBTOTAL	78.2 mg

BACK HALF

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

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

CONTAINER	1.3 mg
ETHER-CHLOROFORM EXTRACTION	393.0 mg
CONTAINER	4.0 mg
BACK HALF SUBTOTAL	398.4 mg
TOTAL WEIGHT	mg

SO_2 — 134.1

TOTAL WEIGHT = 342.5

MOISTURE

IMPINGERS

FINAL VOLUME	194 ml
INITIAL VOLUME	200 ml
NET VOLUME	-6 ml

SILICA GEL

FINAL WEIGHT	258.3 g	g	g
INITIAL WEIGHT	250 g	g	g
NET WEIGHT	8.3 g	g	g

TOTAL MOISTURE 2 g

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ANALYTICAL DATA

PLANT ASARCO

DATE 1/25/78

SAMPLING LOCATION Calcine Fugitive

SAMPLE TYPE [illegible] SO2

RUN NUMBER DPE/LSE-3

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 14.6 mg

FILTER NUMBER 331

CONTAINER 4.7 ~~16.7~~ mg

FRONT HALF SUBTOTAL 183 mg

BACK HALF

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

CONTAINER 0 mg

ETHER-CHLOROFORM EXTRACTION 695.1 mg

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

CONTAINER 1.8 mg

BACK HALF SUBTOTAL 696.9 mg

~~TOTAL WEIGHT~~ mg

SO_2 = 28.4

TOTAL WEIGHT = 687.8

MOISTURE

IMPINGERS

FINAL VOLUME 200 ml

INITIAL VOLUME 200 ml

NET VOLUME ~~0~~ ml

SILICA GEL

FINAL WEIGHT 257.1 g

INITIAL WEIGHT 250 g

NET WEIGHT 7.1 g

TOTAL MOISTURE 7 g

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TRW

ANALYTICAL DATA

PLANT ASARCO

DATE 1/26/78

SAMPLING LOCATION Matte Tapping

SAMPLE TYPE Particulate / SO2

RUN NUMBER CPE/CSE - 2

SAMPLE BOX NUMBER

CLEAN-UP MAN Sharon Vanderwall

COMMENTS:

FRONT HALF

		LABORATORY RESULTS
ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER	CONTAINER	48.4 mg
FILTER NUMBER 5332	CONTAINER	335.9 ~~347.9~~ mg
	FRONT HALF SUBTOTAL	384.3 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER	20.2 mg
	ETHER-CHLOROFORM EXTRACTION	5338.8 mg
ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER	27.7 mg
	BACK HALF SUBTOTAL	5386.7 mg
	~~TOTAL WEIGHT~~	mg

SO_2 = 2500.8

TOTAL WEIGHT = 3270.2

MOISTURE

IMPINGERS

FINAL VOLUME	[redacted] ml	130 ml
INITIAL VOLUME	[redacted] ml	200 ml
NET VOLUME	ml	-70 ml

SILICA GEL

FINAL WEIGHT	306.2 g	g	g
INITIAL WEIGHT	250 g	g	g
NET WEIGHT	56.2 g	g	g

TOTAL MOISTURE 0 g

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TRW

ANALYTICAL DATA

PLANT ASARCO

DATE 1/26/78

SAMPLING LOCATION Matte Tapping

SAMPLE TYPE particulate / SO_2

RUN NUMBER CPE / CSE - 3

SAMPLE BOX NUMBER

CLEAN-UP MAN Sharon Vanderwall

COMMENTS:

FRONT HALF

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

FILTER NUMBER 333

LABORATORY RESULTS

CONTAINER 32.2 mg

CONTAINER 273.7 ~~285.7~~ mg

FRONT HALF SUBTOTAL 305.9 mg

BACK HALF

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

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

CONTAINER 19.5 mg

ETHER-CHLOROFORM EXTRACTION 5295.7 mg

CONTAINER 15.8 mg

BACK HALF SUBTOTAL 5331.0 mg

TOTAL WEIGHT ~~3194.0~~ mg

SO_2 — 2442.9

TOTAL WEIGHT 31940.0

MOISTURE

IMPINGERS

FINAL VOLUME ~~[illegible]~~ ml 148 ml

INITIAL VOLUME ~~200~~ ml 200 ml

NET VOLUME ml -52 ml

SILICA GEL

FINAL WEIGHT 304.3 g

INITIAL WEIGHT 250 g

NET WEIGHT 54.3 g

TOTAL MOISTURE 2.3 g

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TRW

ANALYTICAL DATA

PLANT ASARCO
DATE 1/26/78
SAMPLING LOCATION Balloon Flue
SAMPLE TYPE Particulate
RUN NUMBER BPE-1
SAMPLE BOX NUMBER
CLEAN-UP MAN Powell

COMMENTS:

FRONT HALF

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

FILTER NUMBER 334

	LABORATORY RESULTS
CONTAINER	81.6 mg
CONTAINER	226.5 ~~238.5~~ mg
FRONT HALF SUBTOTAL	308.1 mg

BACK HALF

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

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

CONTAINER	0 mg
ETHER-CHLOROFORM EXTRACTION	190.4 mg
CONTAINER	35.2 mg
BACK HALF SUBTOTAL	225.6 mg
TOTAL WEIGHT	533.7 mg

MOISTURE

IMPINGERS
FINAL VOLUME 284 ml
INITIAL VOLUME 200 ml
NET VOLUME 84 ml

SILICA GEL
FINAL WEIGHT 272.5 g
INITIAL WEIGHT 250.0 g
NET WEIGHT 22.5 g

TOTAL MOISTURE 106.5 g

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TRW

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ANALYTICAL DATA

PLANT ASARCO
DATE 1/26/78
SAMPLING LOCATION Balloon Flue
SAMPLE TYPE Particulate
RUN NUMBER BPE-2
SAMPLE BOX NUMBER
CLEAN-UP MAN Vanderwall

COMMENTS:

FRONT HALF

		LABORATORY RESULTS
ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER	CONTAINER	59.3 mg
FILTER NUMBER 335	CONTAINER	408.4 ~~420.4~~ mg
	FRONT HALF SUBTOTAL	467.7 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER	1.2 mg
	ETHER-CHLOROFORM EXTRACTION	96.4 mg
ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER	CONTAINER	10.0 mg
	BACK HALF SUBTOTAL	107.6 mg
	TOTAL WEIGHT	575.3 mg

MOISTURE

IMPINGERS
FINAL VOLUME 286 ml
INITIAL VOLUME 200 ml
NET VOLUME 86 ml

SILICA GEL
FINAL WEIGHT 276.0 g
INITIAL WEIGHT 250 g
NET WEIGHT 26.0 g

TOTAL MOISTURE 112 g

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ANALYTICAL DATA

PLANT ASARCO

DATE 1/27/78

SAMPLING LOCATION Balloon Flue

SAMPLE TYPE Particulate

RUN NUMBER BPE-3

SAMPLE BOX NUMBER

CLEAN-UP MAN Vanderwall

COMMENTS:

FRONT HALF

LABORATORY RESULTS

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

FILTER NUMBER 336

CONTAINER 28.0 mg

202.2

CONTAINER ~~214.2~~ mg

FRONT HALF SUBTOTAL 230.2 mg

BACK HALF

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

CONTAINER 0 mg

ETHER-CHLOROFORM EXTRACTION 71.3 mg

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

CONTAINER 8.4 mg

BACK HALF SUBTOTAL 79.7 mg

TOTAL WEIGHT 309.9 mg

MOISTURE

IMPINGERS

FINAL VOLUME 318 ml

INITIAL VOLUME 200 ml

NET VOLUME 118 ml

SILICA GEL

FINAL WEIGHT 278 g

INITIAL WEIGHT 250 g

NET WEIGHT 28 g

TOTAL MOISTURE 146 g

TRANSPORTATION AND ENVIRONMENTAL OPERATIONS OF TRW INC.
McLEAN OFFICE • 7600 COLSHIRE DRIVE, McLEAN, VIRGINIA 22101 (703) 893-2000

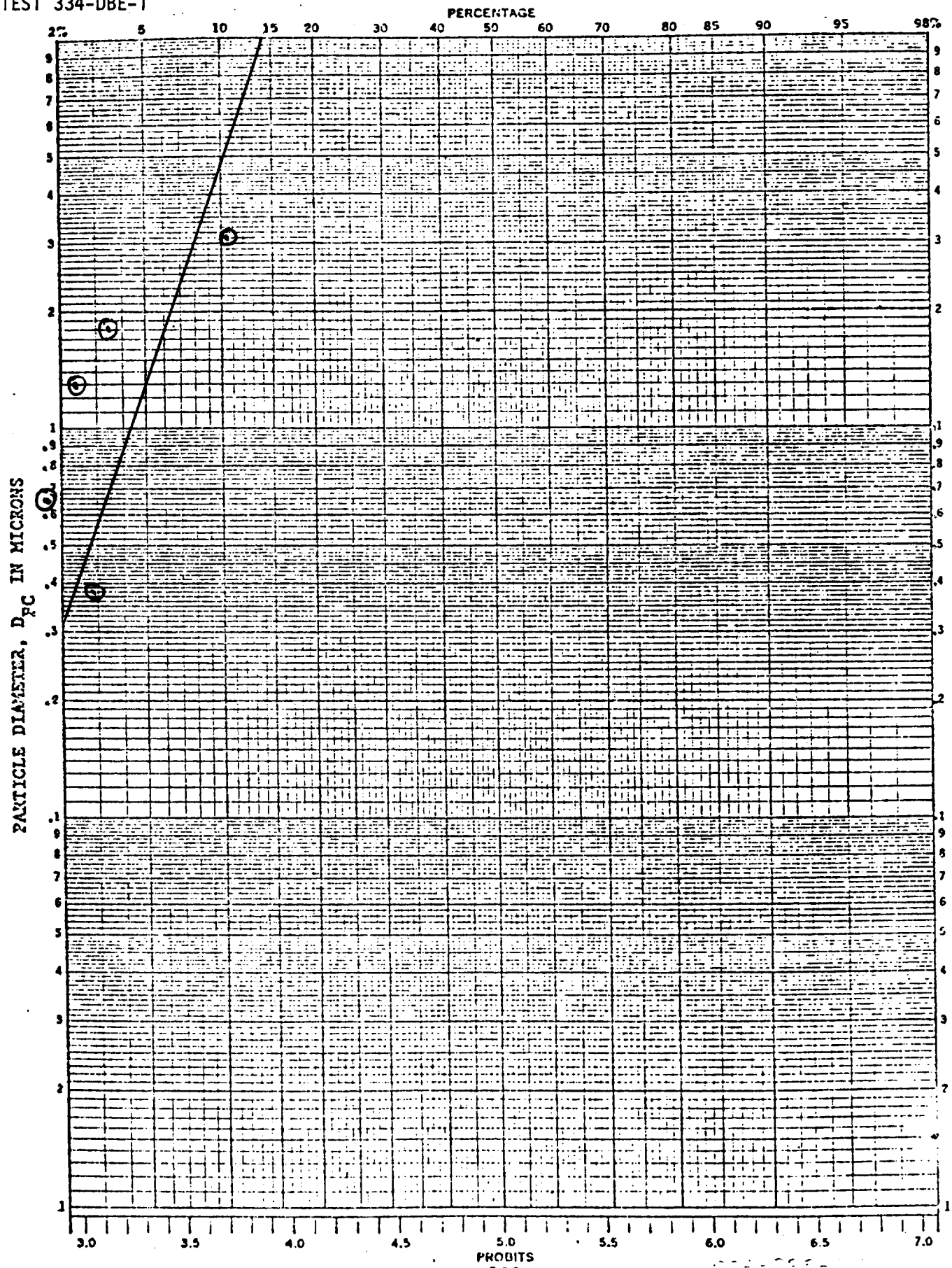
PARTICLE SIZING ANALYSIS

CALCINING DUCT

CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

Jan. 27, 1978

TEST 334-DBE-1

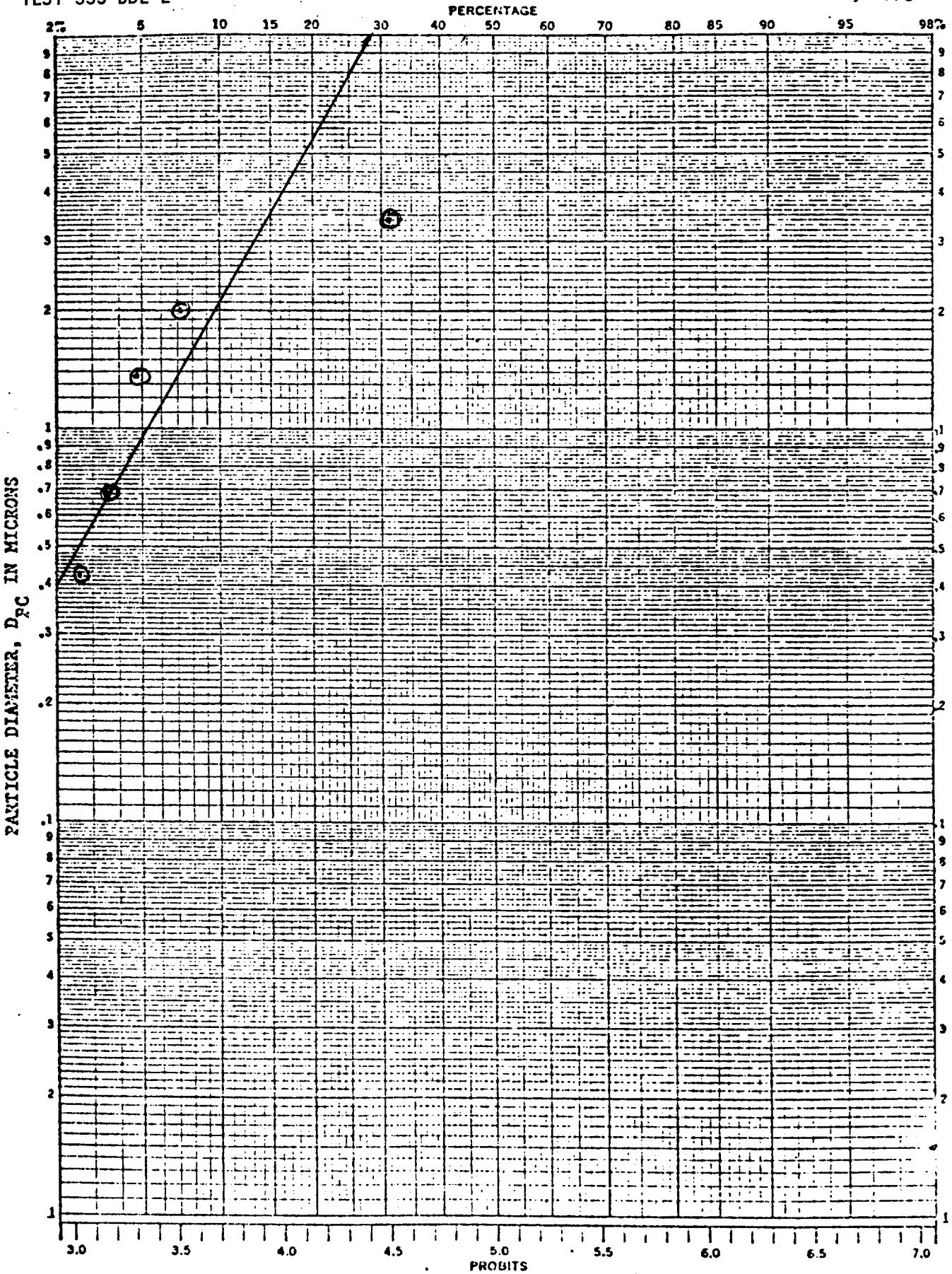


CALCINING DUCT

CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

TEST 335-DBE-2

Jan. 27, 1978

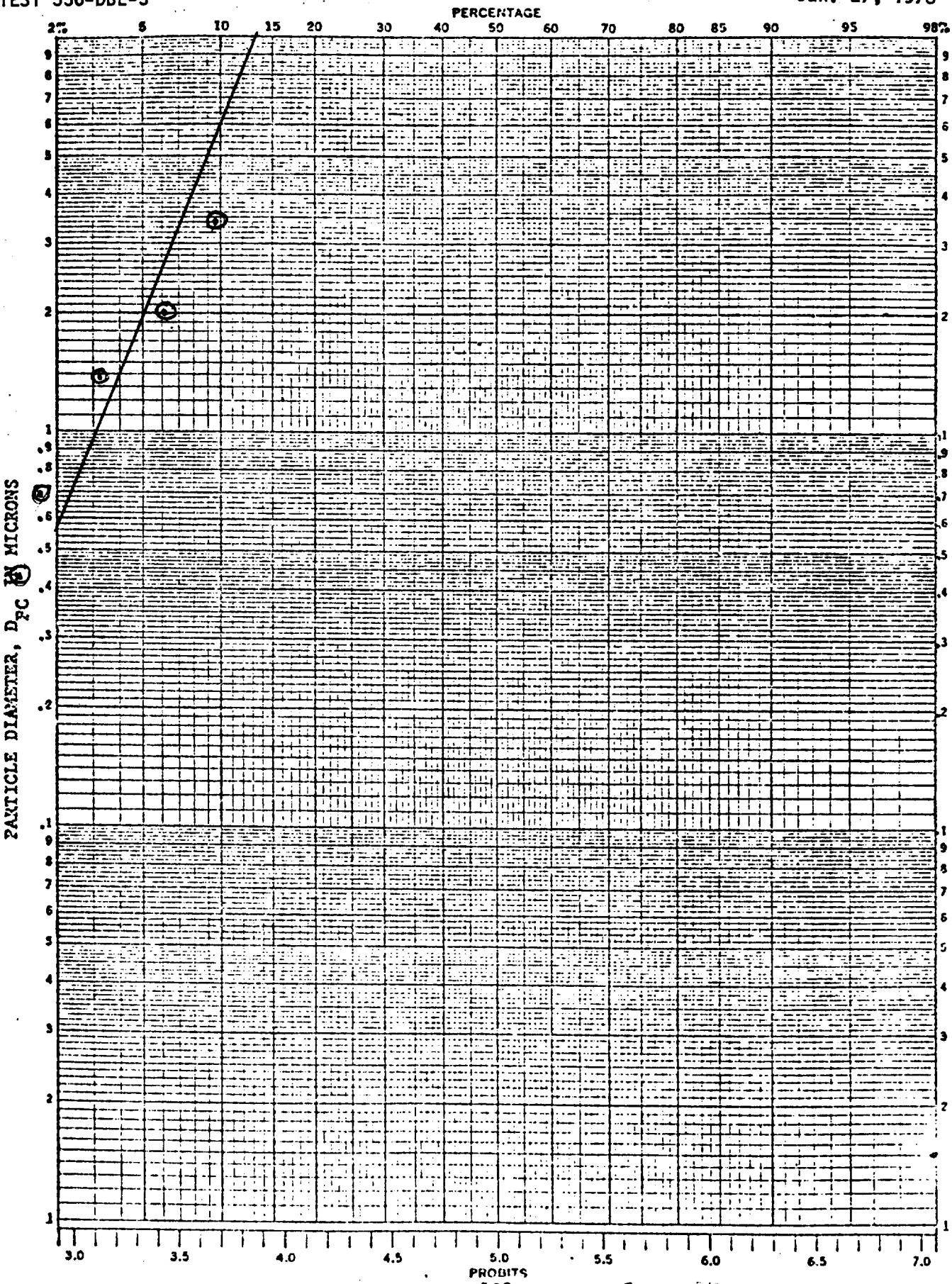


CALCINING DUCT

CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

TEST 336-DBE-3

Jan. 27, 1978

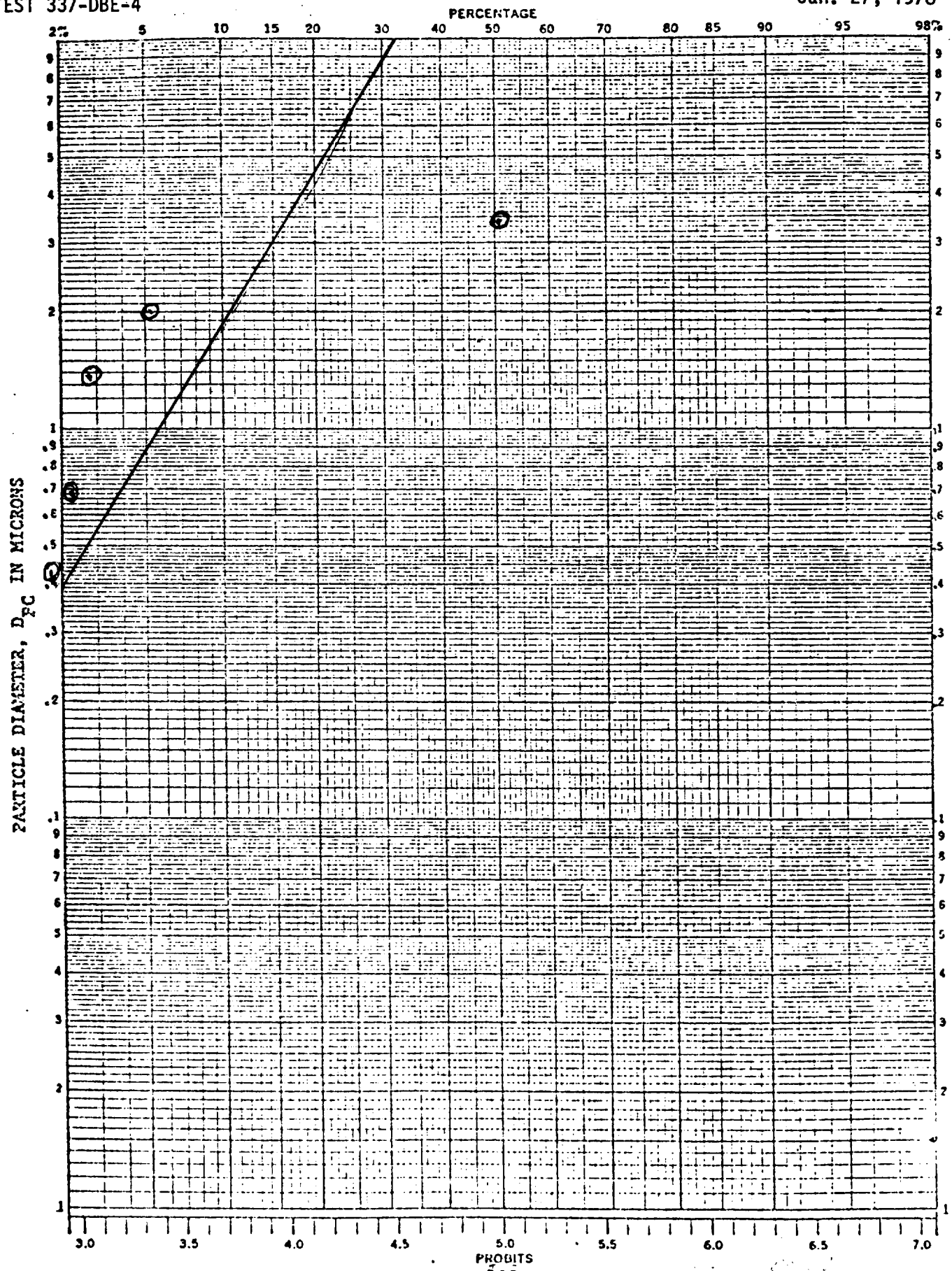


CALCINING DUCT

CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

TEST 337-DBE-4

Jan. 27, 1978

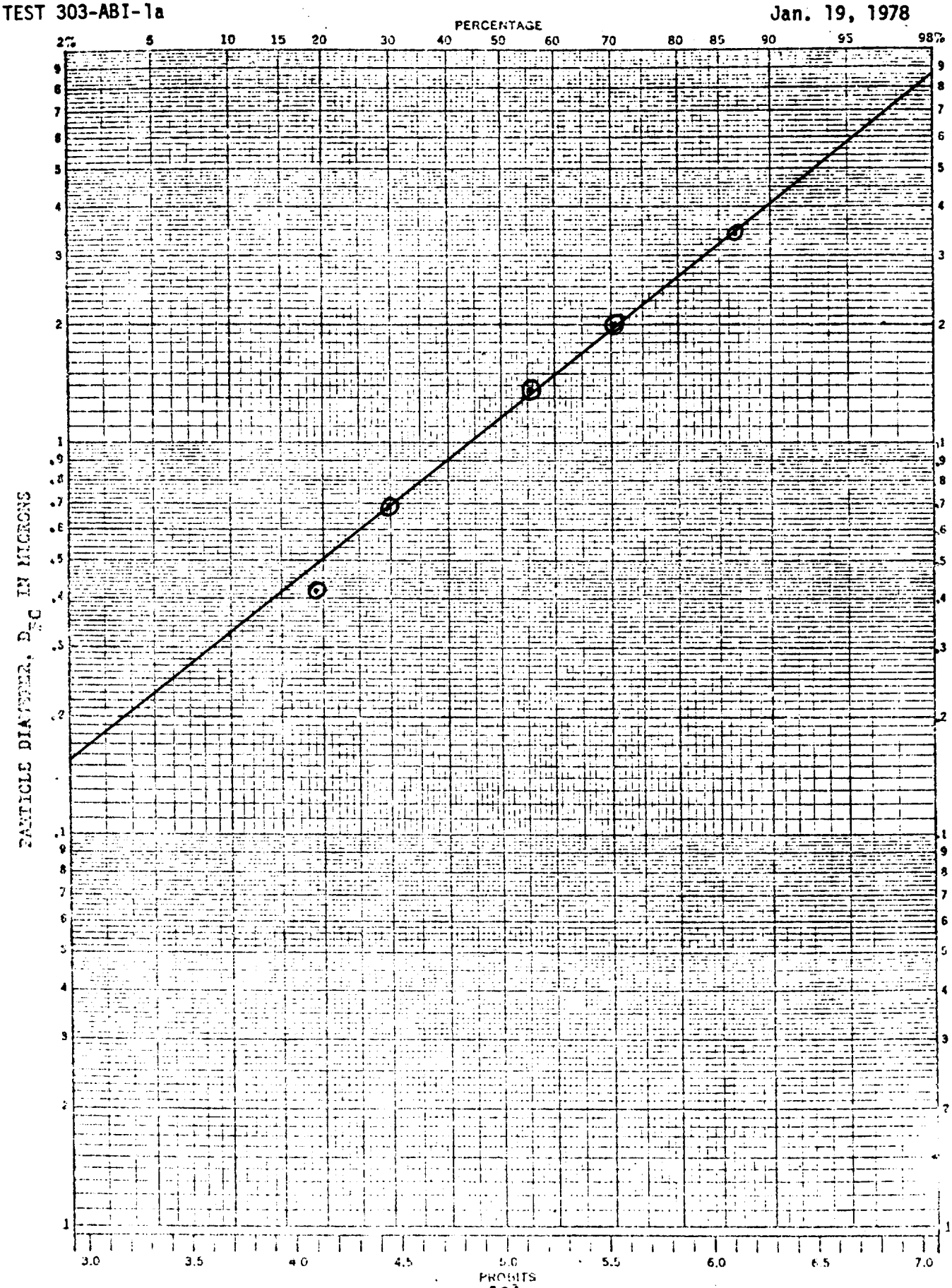


BAGHOUSE INLET

CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

TEST 303-ABI-1a

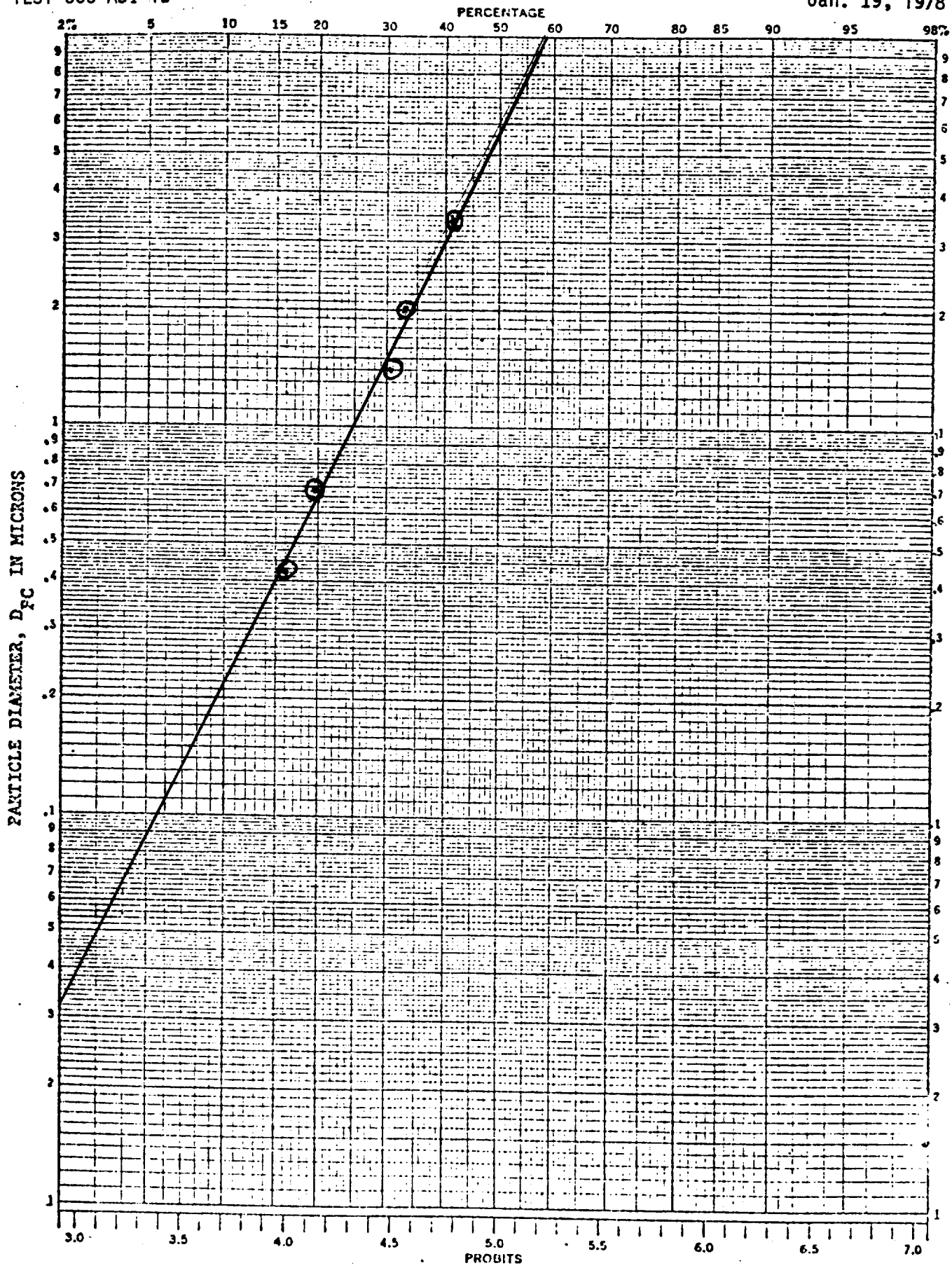
Jan. 19, 1978



BAGHOUSE INLET
CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

TEST 303-ABI-1b

Jan. 19, 1978

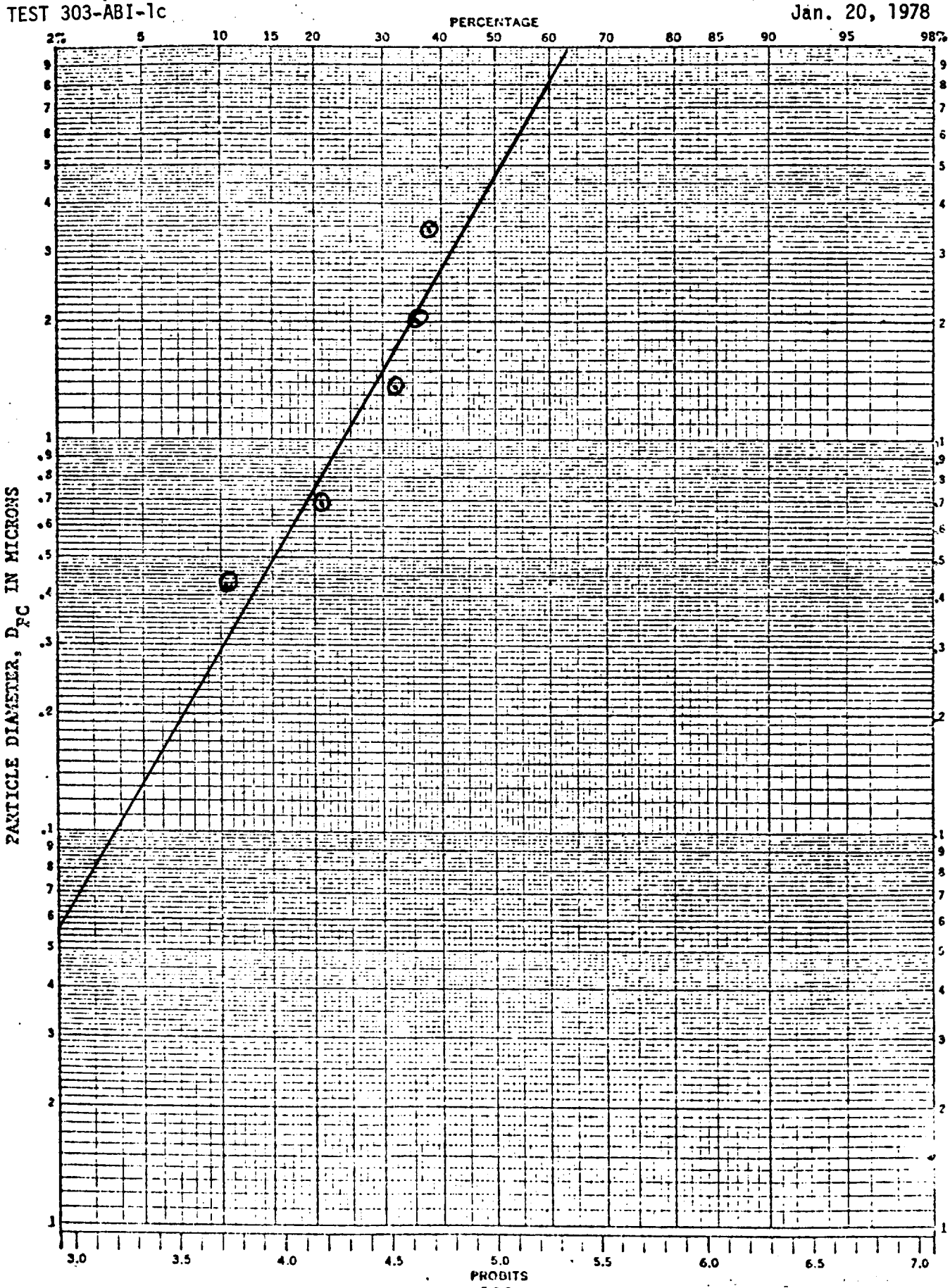


BAGHOUSE INLET

CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

TEST 303-ABI-1c

Jan. 20, 1978

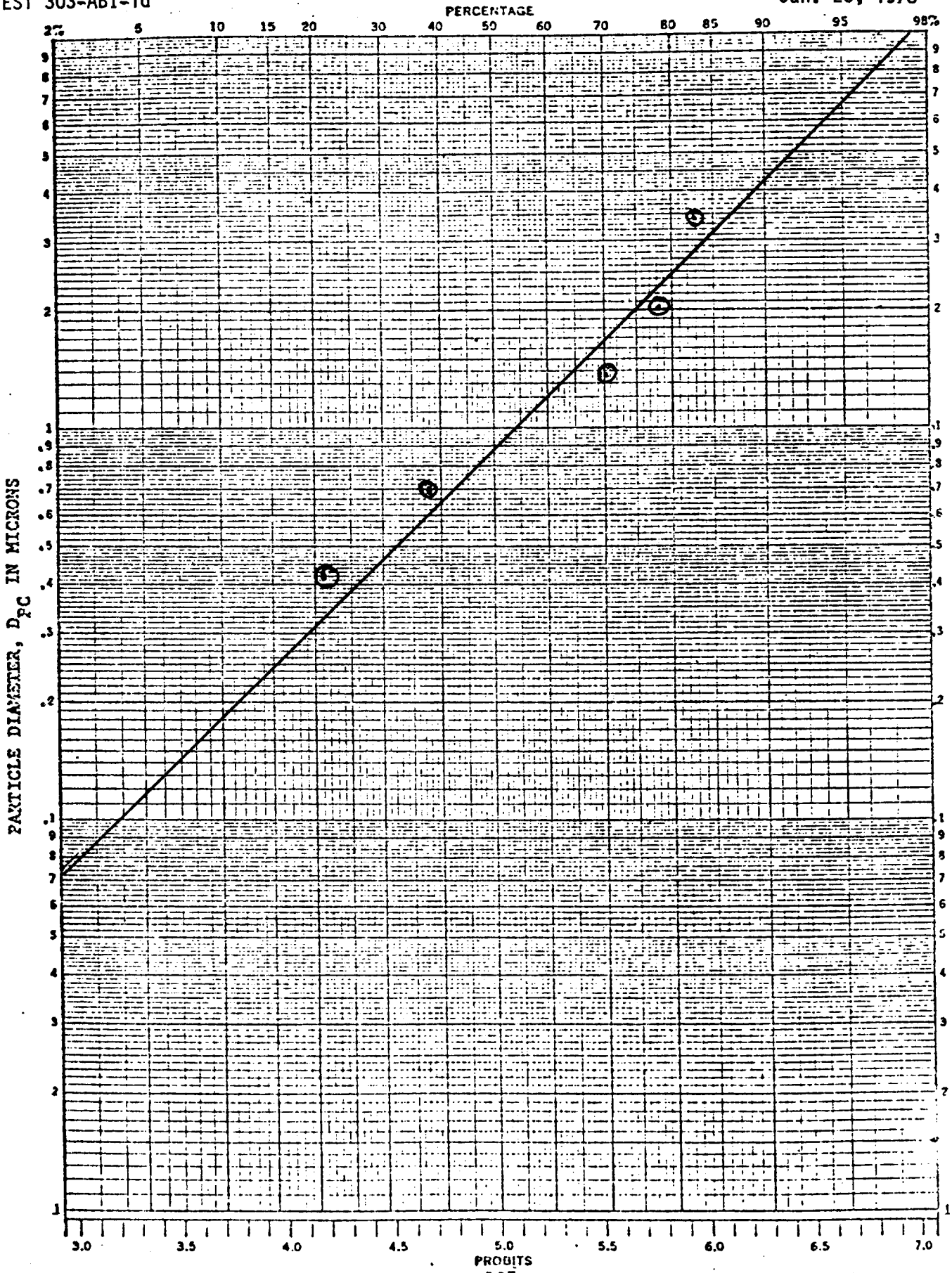


BAGHOUSE INLET

CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

TEST 303-ABI-1d

Jan. 20, 1978

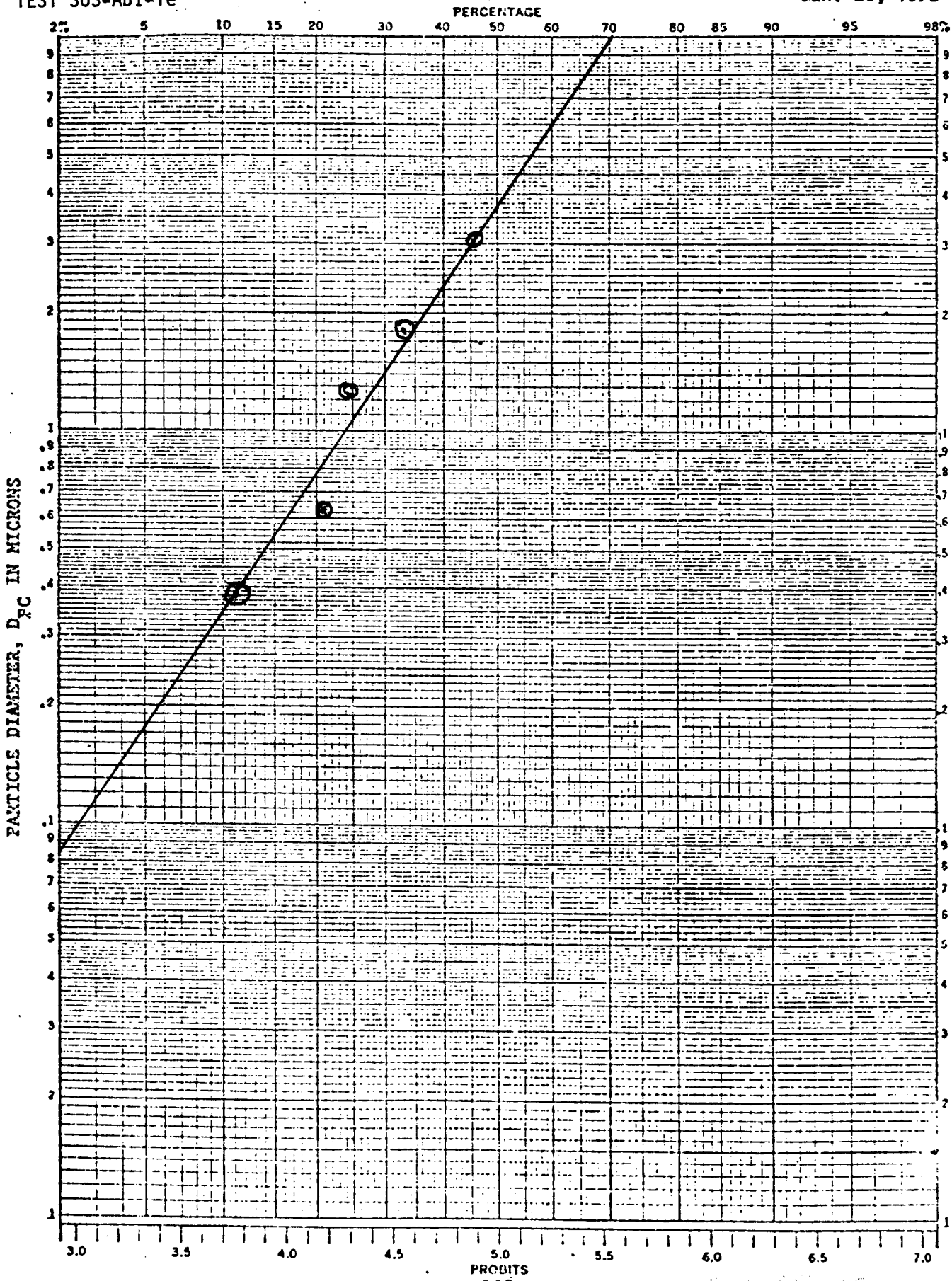


BAGHOUSE INLET

CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

TEST 303-ABI-1e

Jan. 20, 1978

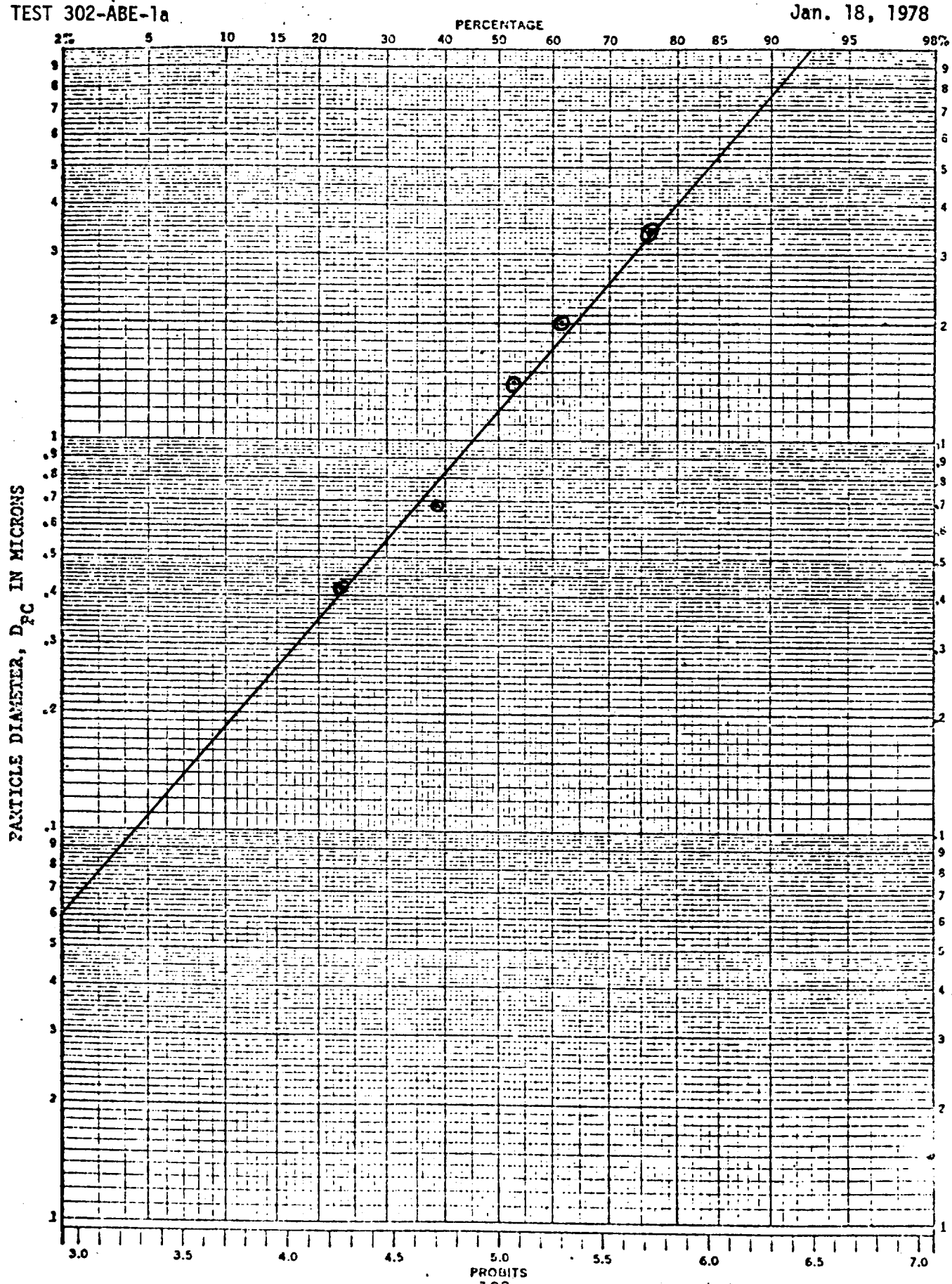


BAGHOUSE OUTLET

CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

TEST 302-ABE-1a

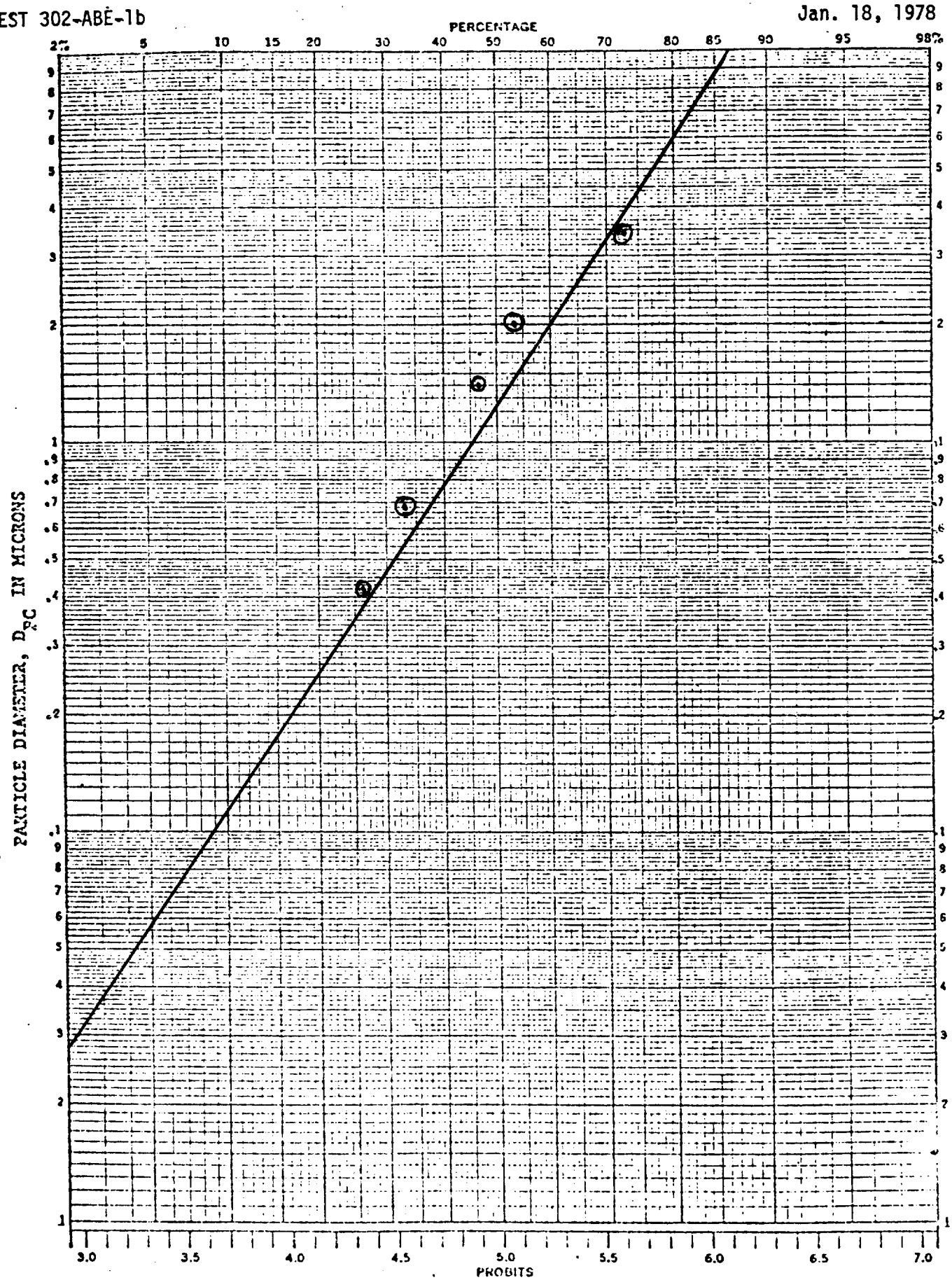
Jan. 18, 1978



BAGHOUSE OUTLET
CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

TEST 302-ABE-1b

Jan. 18, 1978

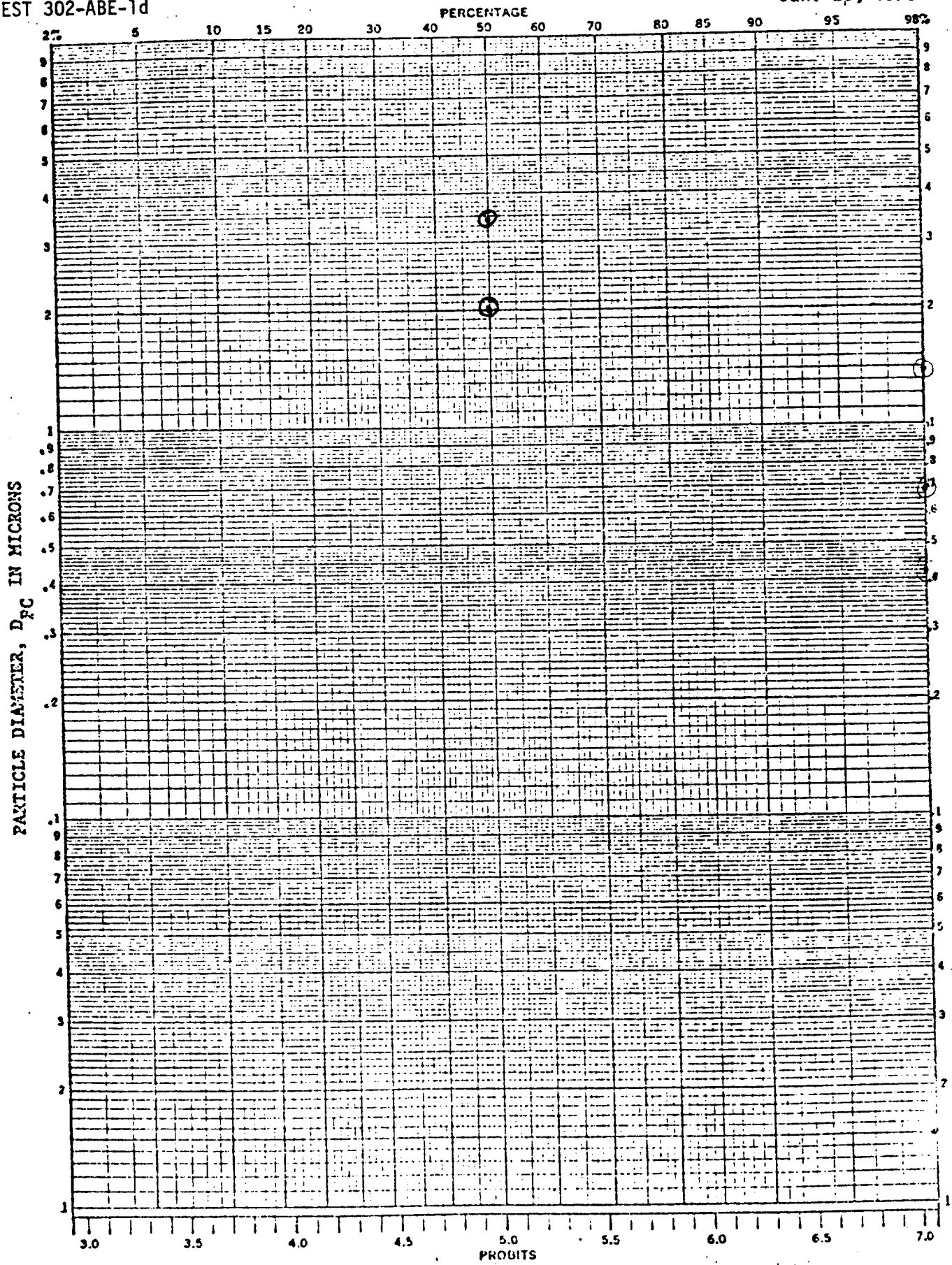


BAGHOUSE OUTLET

CUMULATIVE PERCENT LESS THAN STATED MICRON SIZE

TEST 302-ABE-1d

Jan. 20, 1978



METER BOX CALIBRATION DATA SHEETS

KAC

DATE MARCH 2, 1978 BOX # 2010

BAROMETRIC PRESSURE P_b 29.87 in. Hg DRY GASMETER # 2010

BY TOM ROONEY

Orifice Manometer Settling H (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 Td (°F)	Temperature: Dry Gas Meter Outlet T_{do} (°F)	Temperature: Dry Gas Meter Average T_d (°F)	Time θ (min.)	Y	ΔH@
0.5	5.00	5.180	71	82	82	82	12.45	.984	1.711
~~1.0~~ .5	5.00	5.08	71	86	86	86	12.72	1.010	1.773
~~2.0~~ 1.0	5.00	5.13	71	88	88	88	9.10	1.000	1.808
~~4.0~~ 1.0	5.001	5.14	71	88	88	88	9.18	1.00	1.839
~~6.0~~ 2.0	10.005	10.374	71	88	88	88	13.45	.99	1.97
~~8.0~~ 2.0	10.00	10.426	71	88	88	88	13.52	.985	1.99
							Average	.99	1.85

Calculations

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

RAC

DATE MARCH 2, 1978

BOX # 2188

BAROMETRIC PRESSURE P_b 29.87 in. Hg

DRY GASMETER # 2188

BY TOM ROONEY

Orifice Manometer Settling H (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 Td (°F)	Temperature: Dry Gas Meter: Outlet T_{do} (°F)	Temperature: Dry Gas Meter: Average T_d (°F)	Time θ (min.)	Y	ΔHθ
0.5	5.99	6.17	71	74	74	74	15.21	.975	1.806
~~1.0~~ .5	4.99	4.952	71	83	83	83	12.10	1.029	1.620
~~2.0~~ 1.0	5.25	5.287	71	90	90	90	9.15	1.026	1.652
~~4.0~~ 1.0	5.00	5.053	71	95	95	95	8.96	1.031	1.731
~~6.0~~ 2.0	10.01	10.77	71	96	96	96	13.85	.968	2.06
~~8.0~~ 2.0	9.99	10.81	71	98	98	98	13.85	.966	2.06
							Average	.999	1.82

Calculations

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

RAC

DATE MARCH 1, 1978 BOX # 2235

BAROMETRIC PRESSURE P_b 29.52 in. Hg (TIME 1300) DRY GASMETER # 2235

BY TOM ROONEY

Orifice Manometer Settling H (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 Td (°F)	Temperature: Dry Gas Meter Outlet T_{do} (°F)	Temperature: Dry Gas Meter Average T_d (°F)	Time θ (min.)	Y	ΔH@
0.5	5.000	4.99	72	90	90	90	12.08	1.03	1.61
~~1.0~~ .5	5.00	5.03	71	95	95	95	12.13	1.04	1.61
~~2.0~~ 1.0	5.05	5.11	71	102	102	102	8.88	1.04	1.67
~~4.0~~ 1.0	5.01	5.13	71	110	110	110	8.90	1.05	1.68
~~6.0~~ 2.0	9.99	10.15	71	110	110	110	12.72	1.05	1.72
~~8.0~~ 2.0	10.00	10.46	71	110	110	110	13.07	1.02	1.81
							Average	1.04	1.68

Calculations

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

RAC

DATE MARCH 2, 1978 BOX # 2315

BAROMETRIC PRESSURE P_b 29.87 in. Hg DRY GASMETER # 2315

BY TOM ROONEY

Orifice Manometer Settling H (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 Td (°F)	Temperature: Dry Gas Meter Outlet T_{do} (°F)	Temperature: Dry Gas Meter Average T_d (°F)	Time θ (min.)	Y	ΔH@
0.5	4.995	5.123	72	90	80	85	13.18	.942	1.92
~~1.0~~ .5	5.00	5.222	72	102	96	94	12.48	1.000	1.70
~~2.0~~ 1.0	5.00	5.298	72	113	92	97.5	9.03	.987	1.76
~~4.0~~ 1.0	5.00	5.318	72	108	94	101	9.06	.989	1.76
~~6.0~~ 2.0	5.00	5.385	72	112	96	104	6.20	.978	1.64
~~8.0~~ 2.0	5.00	5.395	72	112	96	104	6.68	.978	1.90
							Average	.979	1.78

Calculations

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

DATE 1/9/78 BOX # 2235

BAROMETRIC PRESSURE P_b ____ in. Hg DRY GASMETER # ____

$P_b = 29.846$

Orifice Manometer Settling H (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 Td (°F)	Temperature: Dry Gas Meter Outlet T_{do} (°F)	Temperature: Dry Gas Meter Average T_d (°F)	Time θ (min.)	Y	ΔH@
0.5	5.001	4.07	70°	96°	84.5°	90.25°	12.55	1.27	1.71
1.0	4.996	4.89	70°	108.5°	90°	99.25°	8.42	1.08	1.51
2.0	10.01	10.5	70°	116.5°	95.5°	106°	13.13	1.01	1.82
4.0	10.010	10.68	70.5°	114°	97°	105.5°	9.60	0.99	1.94
~~0.8~~ 0.5	4.999	5.19	71°	107.5°	98	102.75	12.08	1.02	1.55
8.0									
						Average		1.025	

Calculations

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

APPENDIX B

SAMPLE CALCULATIONS

Nomenclature

P_b	Barometric Pressure, mm. Hg.
P_m	Average Orifice Pressure Drop, mm. H_2O
T_m	Average Dry Gas Meter Temperature, °C
V_m	Volume of Dry Gas Sampled at Meter Conditions, Am^3
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions(1), Nm^3
V_w	Total H_2O Collected in Impingers and Silica Gel, ml
$V_{w_{std}}$	Volume of Water Vapor Collected at Standard Conditions(1), Nm^3
%M	Percent Moisture in Stack Gas, by Volume
M_d	Mole Fraction Dry Stack Gas
$\%CO_2$	Percent CO_2 by volume, dry
$\%O_2$	Percent O_2 by volume, dry
%CO	Percent CO by volume, dry
$\%N_2$	Percent N_2 by volume, dry
MW_d	Molecular Weight of Dry Stack Gas, gm/gm-mole
MW	Molecular Weight of Wet Stack Gas, gm/gm-mole
C_p	Pitot Tube Coefficient
P_s	Stack Gas Pressure, mm. Hg., absolute
T_s	Stack Gas Temperature, °C
$\overline{T}_s$	Average Stack Gas Temperature, °C
ΔP_s	Velocity head, mm. H_2O
V_s	Average Stack Gas Velocity, Stack Conditions, Am/s
A_s	Stack Area, m^2
Q_s	Stack Gas Flow Rate at Standard Conditions(1), dry Nm^3/min

Q_a	Stack Gas Flow Rate at Stack Conditions, Am^3/min
T_t	Net Time of Test, min.
D_n	Sampling Nozzle Diameter, mm.
%I	Percent Isokinetic
m_f	Particulate Collected in Probe, cyclone and filter, mg.
m_t	Total Particulate Collected, mg.
I_c	Percent of Particulate Caught in Impingers
C_{sf}	Particulate Concentrations at Standard Conditions(1), dry, based on probe, cyclone and filter catch, mg/Nm^3
C_{st}	Particulate Concentration at Standard Conditions(1), dry, based on total catch, mg/Nm^3
C_{af}	Particulate Concentration at Stack Conditions, based on probe, cyclone and filter catch, mg/Am^3
C_{at}	Particulate Concentration at Stack Conditions, based on total catch, mg/Am^3
E_f	Particulate Emission Rate, based on probe, cyclone and filter catch, kg/hr
E_t	Particulate Emission Rate, based on total particulate catch, kg/hr
P_u	Unit Process Rate, _____
PE_f	Particulate Emission Rate on a Process Basis, probe, cyclone and filter catch, kg/_____
PE_t	Particulate Emission Rate on a Process Basis, total catch kg/_____
%EA	Percent Excess Air in Stack Gas

Calculations

1. Volume of Dry Gas Sampled at Standard Conditions[1]

$$V_{m_{std}} = \frac{0.3855 \times V_m \times (P_b + P_m/13.6)}{(T_m + 273)} = \frac{0.3855 \times \quad \times (\quad + 13.6)}{(\quad + 273)}$$

$$= \quad Nm^3.$$

2. Volume of Water Vapor at Standard Conditions[1]

$$V_{w_{gas}} = 0.0013 \times V_w = 0.0013 \times \quad = \quad Nm^3$$

3. Percent Moisture in Stack Gas by Volume

$$\%M = \frac{100 \times V_{w_{gas}}}{V_{w_{gas}} + V_{m_{std}}} = \frac{100 \times}{+} = \quad \%$$

4. Mole Fraction Dry Stack Gas

$$M_d = \frac{100 - \quad \%M}{100} = \frac{100 - \quad}{100} =$$

5. Molecular Weight of Dry Stack Gas

$$MW_d = (\%CO \times \frac{44}{100}) + (\%O_2 \times \frac{32}{100}) + [(\%CO + \%N_2) \times \frac{28}{100}] =$$

$$(\quad \times .44) + (\quad \times 0.32) + [(\quad + \quad) \times .28]$$

$$= \quad gm/gm\text{-}mole$$

6. Molecular Weight of Wet Stack Gas

$$MW = MW_d \times M_d + 18(1-M_d) = \quad \times \quad + 18(1- \quad)$$

$$= \quad gm/gm\text{-}mole$$

7. Stack Gas Velocity at Stack Conditions[2]

$$V_s = 34.97 \times C_p \times \sqrt{\Delta P_s \times (T_s + 273)} \left[\frac{1}{P_s \times MW}\right]^{1/2} =$$

$$34.97 \times \quad \times \quad \left[\frac{1}{\quad \times \quad}\right]^{1/2} = \qquad \text{Am/sec}$$

8. Stack Gas Volumetric Flow Rate at Standard Conditions[1], dry

$$Q_s = \frac{2.325 \times V_s \times A_s \times M_d \times P_s}{(T_s + 273)} = \frac{2.325 \times \quad \times \quad \times \quad \times \quad}{(\quad + 273)}$$

$$= \qquad Nm^3/min$$

9. Stack Gas Volumetric Flow Rate at Stack Conditions

$$Q_a = \frac{2.59 \times Q_s(\overline{T}_s + 273)}{P_s \times M_d} = \frac{2.59 \times \quad (\quad + 273)}{\times}$$

$$= \qquad Am^3/min$$

10. Percent Isokinetic

$$\%I = \frac{54{,}120 \times (\overline{T}_s + 273) \times V_{m_{std}}}{V_s \times T_t \times P_s \times M_d \times (D_n)^2}$$

$$= \frac{54{,}120 \times (\quad + 273) \times}{\times \quad \times \quad \times \quad \times (\quad)^2} = \qquad \%$$

11. Particulate Concentration at Standard Conditions[1], dry, based on probe, cyclone and filter catch

$$C_{sf} = \frac{m_f}{V_{m_{std}}} = \frac{\quad}{\quad} = \qquad mg/Nm^3$$

12. Particulate Concentration at Standard Conditions[1], dry, based on total catch

$$C_{st} = \frac{m_t}{V_{m_{std}}} = \underline{\qquad\qquad} = \qquad\qquad mg/Nm^3$$

13. Particulate Concentration at Stack Conditions, based on probe, cyclone, and filter catch

$$C_{af} = \frac{0.3855 \times C_{sf} \times P_s \times M_d}{(T_s + 273)} = \frac{0.3855 \times \qquad \times \qquad \times \qquad}{(\qquad + 273)}$$

$$= \qquad\qquad mg/Am^3$$

14. Particulate Concentration at Stack Conditions, based on total catch

$$C_{at} = \frac{0.3855 \times C_{sf} \times P_s \times M_d}{(\overline{T}_s + 273)} = \frac{0.3855 \times \qquad \times \qquad \times \qquad}{(\qquad + 273)}$$

$$= \qquad\qquad mg/Am^3$$

15. Particulate Emission Rate, based on probe, cyclone, and filter catch

$$E_f = 1{,}000{,}000 \times C_{sf} \times Q_s = 1{,}000{,}000 \times \qquad \times \qquad = \qquad\qquad kg/hr$$

16. Particulate Emission Rate, based on total catch

$$E_t = 1{,}000{,}000 \times C_{st} \times Q_s = 1{,}000{,}000 \times \qquad \times \qquad = \qquad\qquad kg/hr$$

17. Particulate Emission Rate on a Process Basis, probe, cyclone, and filter catch

$$PE_f = \frac{E_f}{P_u} = \underline{\qquad\qquad} = \underline{\qquad\qquad\qquad}$$

18. Particulate Emission Rate on a Process Basis, total catch

$$PE_t = \frac{E_t}{P_u} = \underline{\qquad\qquad} = \underline{\qquad\qquad}$$

---

(1) Standard Conditions: $20^{o}C$, 760 mm. Hg.

(2) $\sqrt{\Delta P_s \times (T_s + 273)}$ is determined by averaging the square root of the product of the velocity head (ΔP_s) and the absolute stack temperature (T_s + 273) at each sampling point.

APPENDIX C

Daily Activity Log

APPENDIX C

DAILY ACTIVITY LOG

Sunday, January 15

All personnel traveled to El Paso.

Monday, January 16

Arrived on site at 8:15 AM. Proceeded to set up mobile laboratory and set up first sampling location. The rigger was completing the scaffolding at the baghouse inlet. Found out only one converter was running. Since we needed at least two running to test, we were unable to test in the afternoon. Two converters were to be operating on Tuesday afternoon. We did the preliminary velocity traverses at three locations, got set up as much as possible, and left at 4:30 PM.

Tuesday, January 17

Arrived on site at 2 PM during a light rain shower. The rain stopped at 3:30 PM. We continued to prepare for testing. Heavy rainstorms with high wind and lightning forced us to discontinue and cover up the equipment at 5 PM. Left the site at 6 PM.

Wednesday, January 18

Arrived on site at 8 AM. The plant curtailed operations due to inversion condition for a few hours. Started the first particulate run at 10 AM and ended at 1 PM. Ran two additional tests at the inlet and outlet without any significant difficulties. Left the site at 10 PM.

Thursday, January 19

Arrived on site at 8 AM. Changed to arsenic and trace metals testing on the converter building fugitive emissions baghouse. The weather was very cold. With the wind chill factor the ambient temperature was $5^{o}F$. Completed one test on the inlet and outlet at 3:45 PM. Left the site at 4 PM.

Friday, January 20

Arrived on site at 8 AM. Heavy snow flurries and extremely high sulfur dioxide levels at the baghouse locations forced us to switch over to the matte tapping location. Performed two arsenic tests at matte tapping, and four particle sizing runs at the baghouse locations. Left the site at 6 PM.

Saturday, January 21

Arrived on site at 8:15 AM. Ran a particulate run at the baghouse locations. Completed the test at 12:30, but were unable to do a second test because the plant curtailed operations.

Monday, January 23

Arrived on site at 8 AM. Plant production was curtailed until about 10 AM. Ran final particulate samples at baghouse locations. Moved equipment to the calcining test position and balloon flue.

Tuesday, January 24

Arrived on site at 8 AM. Started running a test at the matte tapping location only to be told that they would stop tapping for the day at about 10 AM. Switched to the calcining fugitive duct and ran three arsenic tests and one particulate test. Plant was only running one converter.

Wednesday, January 25

Arrived on site at 8 AM. Ran two tests at the matte tapping and two tests at the calcine fugitive duct. Left the site at 6 PM.

Thursday, January 26

Arrived on site at 8 AM. Ran two tests at the matte tapping position and two particulate tests at the exit from the roaster reverberatory ESP (balloon flue). Left the site at 6 PM.

Friday, January 27

Arrived on site at 7 AM. Ran one particulate run and one SO_2 run at the balloon flue. Ran 4 brinks particle sizing tests at the calcining fugitive duct. Packed up equipment and were ready to leave at 12 PM.