OAR Box 1874

Prepped by Keeia Richards

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FINAL TEST REPORT

MERCURY FUME SCRUBBER EMISSION EVALUATION

prepared for

WESTLAKE CA & O CORPORATION
CALVERT CITY, KENTUCKY

by

FBT ENGINEERING, INC.
6860 Stonepoint Court
Paducah, Kentucky 42003
(502) 898-8782

Prepared by:
Chris Gottschalk
Project Manager

Reviewed by:
David K. Wetmore
Director, Environmental Services

December 15, 1998

FBT

FINAL REPORT
MERCURY FUME SCRUBBER
EMISSION EVALUATION
WESTLAKE CA & O CORPORATION
CALVERT CITY, KENTUCKY

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FBT

Westlake CA&O

Terry M. Stapleton
Westlake CA&O Corporation
2468 Industrial Parkway
Calvert City, KY 42029
(270) 395-3805

July 8, 1999

Ms. Kavita Bhatia
EC/R Incorporated
2327 Englert Drive
Suite 100
Durham, NC 27713

Dear Ms. Bhatia,

Enclosed is the stack test reports you requested. The Mercury Fume Scrubber (End box ventilation scrubber) was tested in December 1998. The Hydrogen Vent (or No. 4 Boiler) was tested in 1993. The tests are coming in separate packages. If you need any additional information please call.

Sincerely,

Terry M. Stapleton

Terry M. Stapleton
Chlor-Alkali Technical Manager

FINAL TEST REPORT
MERCURY FUME SCRUBBER
EMISSION EVALUATION
WESTLAKE CA & O CORPORATION
CALVERT CITY, KENTUCKY

1.0 INTRODUCTION

FBT Engineering, Inc. (FBT), was retained by Westlake CA & O Corporation to perform an evaluation of mercury (Hg) emissions on the mercury fume scrubber at their Calvert City, Kentucky, chlor-alkali plant. This scrubber controls Hg emissions from the chlorine cells' end box ventilation system. The purpose of the evaluation was to demonstrate that the Hg emission contribution of the fume scrubber exhaust did not cause the plant's total Hg emissions to exceed the applicable limit. This requirement is specified in Title 40 Part 61, Subpart E of the National Emission Standards for Hazardous Air Pollutants (NESHAP).

The FBT test team consisted of Chris Gottschalk and James Roberts. Bob Gold and Will Woods, Westlake Monomers, coordinated testing with plant operations. The test was observed by three representatives of the Kentucky Division of Air Quality. They were Gerald Slucher, Chief of Source Test Section, Stan Cook and Kevin Usher, Environmental Inspectors, Paducah Regional Office.

2.0 SUMMARY OF RESULTS

The average mercury emission rate from the mercury fume scrubber was 8.65 grams per day. Mercury emission results and stack gas conditions are summarized in Table 2.1. Scrubber process operating parameters, including facility production rate, are summarized in Table 2.2.

Process rate for the chlor-akali plant is defined as kilo amperes of electrical current to the cells. This current is proportional to the chlorine gas produced. The current to the cells during sampling of the Hg fume scrubber stack was 303 kilo amperes. A current of 303 kilo amperes is equal to a chlorine gas production rate of 370 tons per day.

Test data and results are presented in Appendices A through H. Sample calculations are presented in Appendix A. Sampling and laboratory procedures are described in Appendix B. Field data sheets are presented in Appendix C. Sampling site data is given in Appendix D. Calibration data is contained in Appendix E. Analytical laboratory data and results are presented in Appendix F. Process operating and rate data during sampling is contained in Appendix G. Hg sampling data and results are given in Appendix H.

TABLE 2-1
RESULTS SUMMARY
MERCURY FUME SCRUBBER
WESTLAKE CA & O CORPORATION
CALVERT CITY, KY

STACK CONDITIONS AND EMISSIONS:

DATE: TIME: RUN #:	12/15/98 0847-1055 hrs 1	12/15/98 1148-1354 hrs 2	12/15/98 1454-1700 hrs 3	AVERAGES
Avg Gas Temp, °F	88	92	95	91
H_2O, %	4.6	4.8	5.2	4.9
Gas Velocity, fps	40.0	41.1	41.8	40.9
Gas Flow, acfm	2,563	2,634	2,680	2,626
Gas Flow, dscfm	2,364	2,409	2,425	2,399
Mercury Emissions:				
grams/hour	0.371	0.366	0.344	0.361
grams/day	8.91	8.79	8.26	8.65
% Isokinetic	97	98	99	

KEY:
fps = feet per second
acfm = actual cubic feet per minute
dscfm = dry standard cubic feet per minute

TABLE 2-2
OPERATING CONDITIONS
MERCURY FUME SCRUBBER
WESTLAKE CA & O CORPORATION
CALVERT CITY, KY

	pH	ORP (mv)	Water Flow (gpm)	Inlet Air Temp (°F)
PARAMETER	8.9	549.2	3.8	98.2

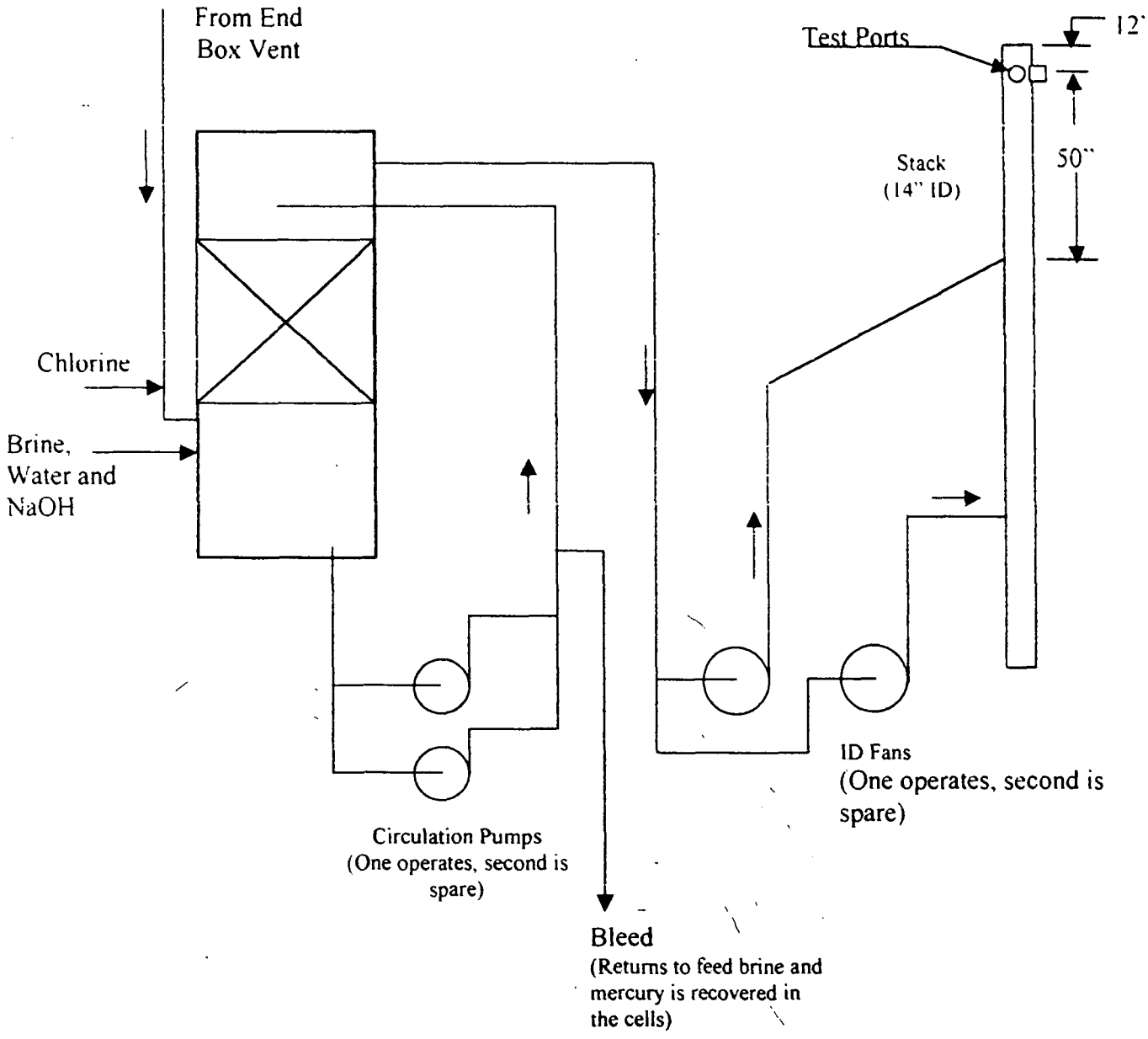
Notes:
1. These are average operating conditions during six hours of stack sampling. See Appendix G.
2. Process rate of Chlor Akali Plant during sampling was 303 kilo ampheres (equivalent to 370 tons chlorine production per day).

KEY:
ORP = oxidation reduction potential
mv = milivolts
gpm = gallons per minute

3.0 PROCESS DESCRIPTION

Figure 3.1 is a flow diagram of the chlor-alkali plant's end box ventilation system Hg fume scrubber. The scrubber is a packed tower design and the scrubbing liquor is a sodium hypochlorite solution. Sodium hypochlorite combines with Hg to form mercuric chloride. A bleed stream of the circulating liquor removes Hg from the scrubbing process and returns it to the feed brine going to the cells. Chlorine and sodium hydroxide are added and react to form the makeup sodium hypochlorite. The chlor-alkali plant and the Hg fume scrubber operate continuously, 24 hours per day, seven days per week.

Figure 3.1
Flow Diagram
Chlorine Plant Mercury Fume Scrubber
Westlake CA&O Corporation
Calvert City, KY



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4.0 TEST METHODS

The sampling and analytical procedures used during this test were United States Environmental Protection Agency (USEPA) Reference Methods described in the *Code of Federal Regulations 40 Part 60* Appendix A and *Part 61* Appendix B. Following is a list of these Methods. Sampling, analytical, and laboratory procedures are described in more detail in Appendix B.

- Measurement Sites (Method 1)
  The location of measurement sites and the number of sample points were determined as specified in **USEPA Reference Method 1**, "Sample and Velocity Traverses for Stationary Sources."

- Velocity and Volumetric Flow Rates (Method 2)
  The duct/stack gas velocities and volumetric flow rates were determined using **USEPA Reference Method 2**, "Determination of Stack Gas Velocity and Volumetric Flow Rate."

- Dry Molecular Weight (Methods 3)
  Dry molecular weight of the duct/stack gases was determined using **USEPA Reference Method 3**, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight." Grab samples were analyzed for carbon dioxide and oxygen with a Fyirite Gas Analyzer for molecular weight determination.

- Moisture (Method 4)
  The moisture content of the stack gas was determined using **USEPA Reference Method 4**, "Determination of Moisture Content in Stack Gases."

- Mercury Emissions (Method 101)
  Mercury emission rate was determined using **USEPA Reference Method 101**, "Determination of Particulate and Gaseous Mercury Emissions from Chlor-Alkali Plants (Air Streams)."

5.0 APPENDICES

A Sample Calculations

B Sampling and Laboratory Procedures

C Field Data Sheets

D Sampling Site Data

E Calibration Data

F Analytical Data

G - Process Data

H Mercury Sampling Data and Results

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APPENDIX A

SAMPLE CALCULATIONS

EXAMPLE CALCULATION

CLIENT/PROJECT:	**Westlake CA & O/461**
PROCESS	**Chlor Alkali Plant**
SAMPLE LOCATION:	**Hg Fume Scrubber Stack**
DATE:	**12/15/98**
TIME:	**0847-1055 hrs**
RUN #:	**1**

METER CORRECTIONS:

Vmc = Vm-(Lp-La) x Time = Vm-(Lp-0.02) x Time =	126.47
Vm(std) = 17.647 x Vmc x Γ ς (Pbar+ΔH/13.6)/Tm(°R) =	137.63

STACK GAS CONDITIONS

MOISTURE CONCENTRATION:

Vw(scf) = Vwc x 0.04707 =	6.684
Bws = Vw(scf)/(Vw(scf)+Vm(std)) =	0.046
$\%H_2O$ = Bws x 100 =	4.632

MOLECULAR WEIGHT:

Md = 0.44 x (%CO2)+0.32 x (%O2)+0.28 x (%N2+%CO) =	29.04
Ms = Md x (1-Bws)+(18.0 x Bws) =	28.53

STACK GAS VELOCITY:

Vs(fps) = 85.49 x Cp x Avg($\Delta P^{0.5}$) x [Ts(°R)/(Ps x Ms)]$^{0.5}$ =	39.97

STACK GAS VOLUMETRIC FLOW RATE:

Qa(acfm) = Vs x 60 x As(ft^2) =	2,563
Qstd(dscfm) = Qa x 17.647 x (1-$\%H_2O$) x Ps/Ts(°R) =	2,364

ISOKINETIC SAMPLING RATE:

%I = 0.0945 x Ts(°R) x Vm(std)/[Ps x Vs x An x Time x (1-Bws)] =	97.10

EMISSIONS CALCULATIONS:

Hg CONCENTRATION:

Cs_1 (µg Hg/sample) = Hg in probe rinse and impinger sample	360.0
Cs(lb/dscf) = 2.205 x 10-9 x Cs_1 (µg Hg/ml sample) / Vms=	5.7678E-09

Hg EMISSION RATE:

Er(lb/hr) = Cs(lb/dscf) x Qstd x 60 =	0.0008183
Er(g/day) = Er(lb/hr) x 24/0.002205	8.906

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APPENDIX B

SAMPLING AND LABORATORY PROCEDURES

APPENDIX B
SAMPLING AND LABORATORY PROCEDURES

Sampling and analytical procedures used during this test were USEPA Reference Methods 1, 2, 3, 4, and 101. These methods were published in the *Code of Federal Regulations 40 Part 60*, Appendix A, and *Part 61*, Appendix B, Revised July 1, 1998. Following is a summary description of these procedures.

B.1 Measurement Sites (Method 1)

The location of measurement sites and the number of sample points were determined as specified in **USEPA Reference Method 1**, "Sample and Velocity Traverses for Stationary Sources."

Method 1 recommends that sampling sites be located in straight runs of duct or stack eight diameters downstream and two diameters upstream from flow disturbances. As a minimum sampling sites may be located two diameters downstream and one half diameter upstream from disturbances. The mercury fume scrubber stack had a straight run of 4.5 diameters. Thus, two sample ports were cut 3.6 diameters downstream from the closest disturbance. This left 0.9 diameters from the ports to the stack discharge. The number of traverse points selected was 24, 12 on each of two diameters.

B.2 Velocity and Volumetric Flow Rates (Method 2)

The duct stack gas velocities and volumetric flow rates were determined using **USEPA Reference Method 2**, "Determination of Stack Gas Velocity and Volumetric Flow Rate." Velocity pressures were measured with "S" type pitot tubes and temperatures with calibrated type "K" thermocouples. Pressure differentials and static pressures were measured with inclined manometers.

B.3 Dry Molecular Weight (Method 3)

The dry molecular weight of the stack gas was determined using **USEPA Reference Method 3**, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight." A grab sample of gas was collected and analyzed for oxygen and carbon dioxide during each run with a Fyrite Gas Analyzer.

B.4 Moisture (Method 4)

The moisture content of the stack gas was determined using **USEPA Reference Method 4**, "Determination of Moisture Content in Stack Gases." A time integrated sample of gas was withdrawn during each Method 101 run. Moisture in the gas was condensed in impingers immersed in an ice bath and determined gravimetrically. Residual moisture was then removed in a column containing a known amount of silica gel and determined gravimetrically. Dry gas

volume was measured with a dry gas meter. See Figure B-1.

B.5 Mercury Emissions (Method 101)

Mercury emission rate was determined using **USEPA Reference Method 101**, "Determination of Particulate and Gaseous Mercury Emissions from Chlor-Alkali Plants (Air Streams)." Method 101 is a modification of USEPA Reference Method 5, in which the filter is removed and water in the impingers is replaced with 0.1 Molar (M) iodine monochloride to absorb mercury.

A sample of stack gas was withdrawn isokinetically through a heated glass probe and a set of four impingers. The first three impingers each contained 100 ml of 0.1M iodine monochloride (ICl) and the fourth one was empty. The impingers were immersed in an ice bath. Volume of gas sampled was measured with a dry gas meter. A schematic of the sampling train is shown in Figure B-1.

Prior to sampling all glassware, including probe and nozzle were rinsed with 50% nitric acid, tap water, 0.1 M ICl, tap water, and finally deionized distilled water. After each sampling run, the probe and nozzle were rinsed with 100 ml of 0.1 M ICl into a labeled glass container. Impinger contents were recovered into the container with the probe and nozzle rinse. Finally, the probe, nozzle, impingers and connecting glassware were rinsed with 400 ml of deionized water into the same glass container. Mercury concentration of the impinger solution and a blank sample of the 0.1 M ICl were measured by atomic absorption spectrophotometry in the laboratory.

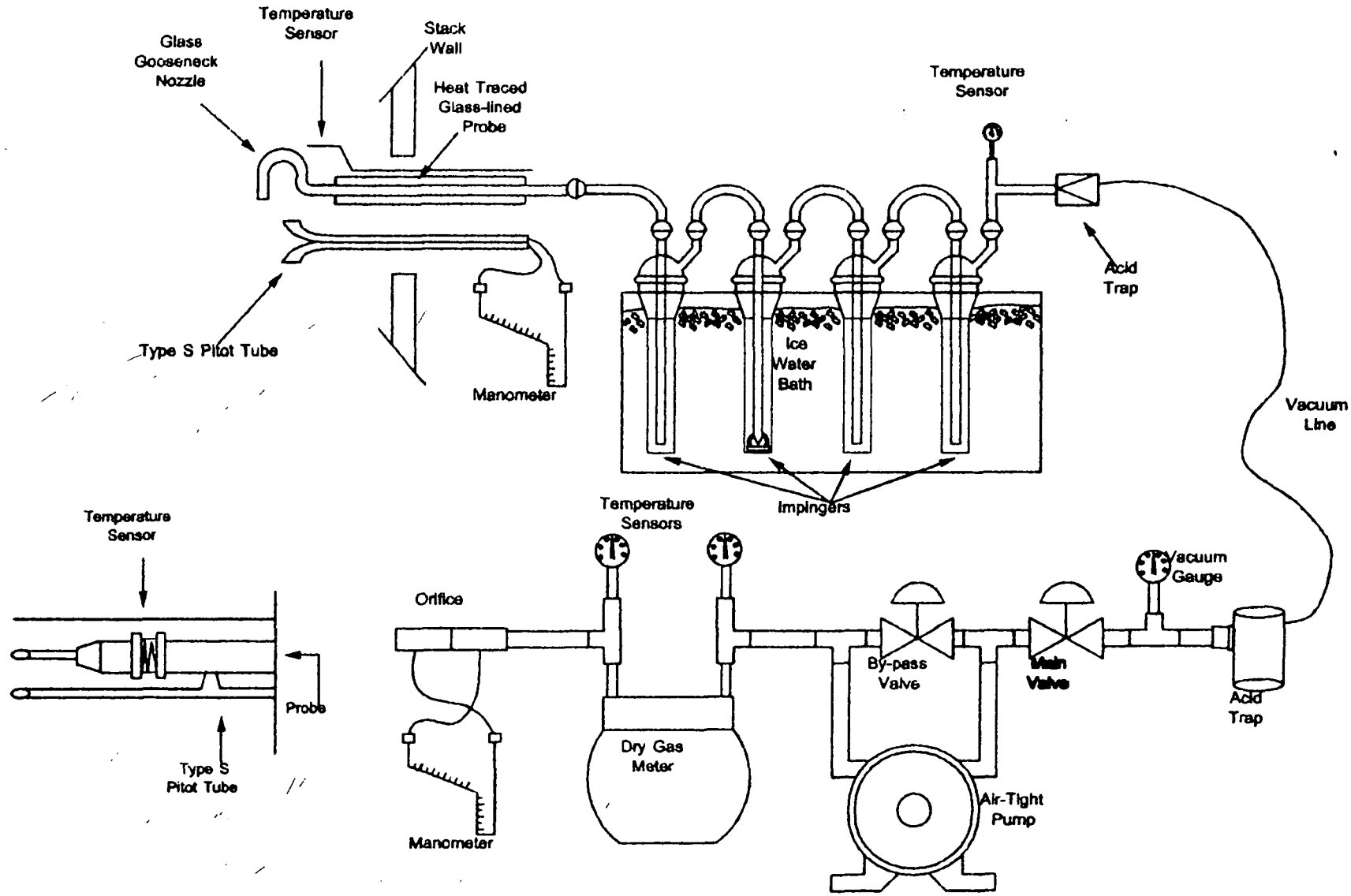


Figure B-1
USEPA Method 101 Mercury Sampling Train.

APPENDIX C

FIELD DATA SHEETS

FIELD DATA SHEET

Client / City: Westlake OA50 / Calvert City, KY Probe Length / Type: 4' Glass

Date: 12/15/98 Run #: 1 Nozzle Size: ____, ____, ____ = .313

Location: Hg Fume Scrubber Stack (Chlorine Plant) Meter Box #: DRY ΔH@: 1.793 (1.737) Y: 1.032

Sample Type: M-101/4g Operator: CG/JR Assumed H_2O: 6 % T_s: ____

P_{BAR}: 30.04 Ambient Temperature: ____ °F P_s: -0.24 Reference ΔP: ____ K-factor: 9.368

Pretest Leak Rate: 0.008 ft³ @ 12 "hg Filter #: N.A.

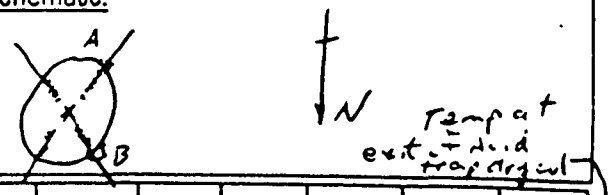
Postest Leak Rate: ____ ft³ @ ____ "hg

Pitot Leak Check: ✓ Orsat Leak Check: ✓

Comments:

Fyrite Data:	Moisture Data Total: 142	
O_2: 22	ml H_2O	g Sil. Gel
CO_2: 10		

Traverse Schematic:



Page 1 of 1 Record data every 5 minutes

Trav. #	Sample Time	Clock Time	Meter Reading	Pitot #: ____ ΔP	ΔH(calc)	TC #'s: ΔH(act)	Probe	Stack	Tm In	Tm Out	Filter	Exit	Pump Vac.
A-1	0	0847	345.480	.68	5.7	5.7	243	87	34	34	243	35	11
2	5		—	.69	5.8	5.8	223	87	39	35	242	36	13
3	10		357.6	.69	5.8	5.8	214	86	42	35	245	41	12.5
4	15		363.70	.66	5.6	5.6	225	87	45	37	244	43	12
5	20		369.73	.66	5.6	5.6	227	87	47	38	247	44	12
6	25		—	.60	5.1	5.1	230	88	49	39	241	46	10
7	30		381.49	.50	4.2	4.2	242	88	51	41	240	46	8
8	35		386.77	.46	4.0	4.0	254	88	54	42	240	47	8
9	40		—	.40	3.5	3.5	251	88	57	43	233	46	7
10	45		396.73	.37	3.2	3.2	244	89	57	44	232	46	7
11	50		401.425	.33	2.9	2.9	243	74	59	45	236	46	6
12	55		405.91	.33	2.9	2.9	242	82	59	46	236	46	6
B-1	60	0955	410.4	.32	2.9	2.9	253	89	49	48	238	48	6
2	1.05		—	.52	4.5	4.5	251	89	56	48	238	50	9
3	10		420.125	.51	4.4	4.4	236	89	59	48	236	51	9
4	15		425.595	.50	4.3	4.3	232	89	59	49	234	51	8
5	20		430.85	.50	4.3	4.3	232	89	60	50	238	51	8.5
6	25		436.2	.49	4.3	4.3	229	90	61	51	237	51	8.5
7	30		441.68	.51	4.5	4.5	233	90	63	52	237	51	8.5
8	35		447.13	.48	4.2	4.2	228	90	62	53	236	51	8
9	40		452.44	.45	3.9	3.9	229	90	64	53	237	51	8
10	45		458.	.43	3.8	3.8	240	91	64	54	238	52	7.5
11	50		462.685	.36	3.2	3.2	243	90	66	55	239	52	6
12	55		467.32	.35	3.1	3.1	228	90	66	56	239	52	6
End	60	1055	471.947										

Θ: 120 min V_m: 126.467 avg $\sqrt{\Delta P}$: .6959 avg ΔH: 4.2375 T_s: 87.8 T_m: 50.4 Calculated By: CG Checked By: ____

FBT

SAMPLE RECOVERY DATA

Date: 12-15-98

Client: WESTLAKE CA #0 PN: _____

Location: #4 FUME SCRUBBER TOWER

Site: Stack

Run #: 1

Filter No: NA Glassware Set No: 1 Sample Box No: 1

IMPINGER DATA

Gravimetric: ✓ Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents	100 ml IC1	100 ml IC1	100 ml IC1	MT	SG	
Final	634	692	595	573	949	
Initial	562	659	587	568	925	
Net	72	33	8	5	24	142

RECOVERED SAMPLE

Description of Particulate on Filter: N.A.

Color of Silica Gel: blue

Recovered By: J Roberts

Date: 12/15/98

FBT

FIELD DATA SHEET

Client / City: Westlake CA30 / Calvert City, Ky Probe Length / Type: 4' Glass

Date: 12/15/98 Run #: 2 Nozzle Size: ____, ____, ____ = .313

Location: Hg Fume Scrubber Stack Meter Box #: Apex ΔH@: 1.793 Y: 1.037

Sample Type: M-101 / Hg Operator: CG/JR Assumed H_2O: ____% T_s: ____

P_{BAR}: 30.04 Ambient Temperature: ____°F P_s: -0.24 Reference ΔP: ____ K-factor: 9.308

Pretest Leak Rate: .009 ft³ @ 12 "hg Filter #: N.A.

Postest Leak Rate: .002 ft³ @ 15 "hg

Pitot Leak Check: ✓ Orsat Leak Check: ✓

Comments:

Fyrite Data:	Moisture Data Total: 153	
O_2: 23	ml H_2O	g Sil. Gel
CO_2: 0.5		

Traverse Schematic: Acid Scrubber dry col Exit Temp °F

Page ___ of ___ Record data every ____ minutes

Trav. #	Sample Time	Clock Time	Meter Reading	Pitot #: ΔP	ΔH(calc)	TC #'s: ΔH(act)	Probe	Stack	Tm In	Tm Out	Filter	Exit	Pump Vac.
B-1	0	1148	472.317	.58	5.0	5.0	220	93	49	48	237	49	11.5
2	5		477.96	.59	5.1	5.1	248	93	57	50	235	47	12
3	10		—	.61	5.3	5.3	236	92	59	50	237	48	12
4	15		489.73	.59	5.1	5.1	239	93	61	52	237	52	12
5	20		495.62	.59	5.2	5.2	229	93	64	54	235	54	12
6	20		-	.58	5.1	5.1	232	92	64	56	240.	53	12
7	30		507.48	.55	4.8	4.8	231	92	66	56	236	54	11
8	25		513.26	.51	4.5	4.5	245	93	67	57	238	54	10
9	40		518.875	.42	3.7	3.7	255	93	68	58	239	53	8
10	45		524.055	.44	3.9	3.9	229	93	69	59	239	54	8
11	50		529.23	.38	3.4	3.4	242	93	69	59	240	54	7
12	55		534.13	.41	3.6	3.6	252	93	67	59	241	55	7.5
A 1	60	1254	539.137	.67	5.9	5.9	205	92	56	56	240	55	13
2	1:05		545.42	.67	5.8	5.8	210	92	57	55	233	54	13
3	10		551.74	.66	5.7	5.7	224	92	53	54	243	57	13
4	15		—	.63	5.5	5.5	230	92	58	54	235	51	12
5	20		564.17	.61	5.3	5.3	228	92	59	54	246	53	12
6	25		570.12	.59	5.1	5.1	232	92	59	54	250	53	12
7	30		576.045	.49	4.3	4.3	234	93	61	54	231	54	10
8	35		581.60	.43	3.8	3.8	231	91	61	54	235	53	8
9	40		586.67	.36	3.1	3.1	230	92	62	54	264	53	6
10	45		591.31	.36	3.1	3.1	232	91	62	54	254	52	6
11	50		595.855	.30	2.7	2.7	234	85	62	54	247	53	6 s
12	55		600.285	.31	2.8	2.8	230	82	62	54	246	53	6 s
End	60	1354	604.690										
.....													

Θ: 120 V_m: 132.373 avg $\sqrt{\Delta P}$: .7119 avg ΔH: 4.492 T_m: 91.6 T_s: 58.0 Calculated By: CG Checked By: ____

FBT

SAMPLE RECOVERY DATA

Date: 12-15-98

Client: WESTLAKE CA #0 PN: _____

Location: HS FUME SCRUBBER TOWER

Site: Stack

Run #: 2

Filter No: NA Glassware Set No: 2 Sample Box No: 1

IMPINGER DATA

Gravimetric: ✓ Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents	100 mL ICL	100 mL ICL	100 mL ICL	MT	SG	
Final	784	712	613	482	921	
Initial	692	678	610	482	897	
Net	92	34	3	0	24	153

RECOVERED SAMPLE

Description of Particulate on Filter: N. A.

Color of Silica Gel: blue

Recovered By: J. Roberts

Date: 12/15/98

FBT

FIELD DATA SHEET

Client / City: Westlake
Date: 12/15/98 Run #: 3
Location: Hg FumeScrubber Stack
Sample Type: M-101/Hg Operator: CG/JR
P_{BAR}: 30.04 Ambient Temperature: ___°F P_s: -0.24

Probe Length / Type: 4' Glass
Nozzle Size: ___, ___, ___ = .313
Meter Box #: Apex ΔH@: 1.793 Y: 1.037
Assumed H_2O: ___% T_s: ___
Reference ΔP: ___ K-factor: 9.308

Pretest Leak Rate: 0.003 ft³ @ 13 "hg
Postest Leak Rate: ___ ft³ @ ___ "hg
Filter #: None
Pitot Leak Check: ✓ Orsat Leak Check: ✓

Comments:

Fyrite Data:
O_2: 22
CO_2: 0.3

Moisture Data Total: 168

	ml H_2O	g Sil. Gel

Traverse Schematic:

Acid scrubber drying col exit Temp

Page 1 of 1 Record data every 5 minutes

Trav. #	Sample Time	Clock Time	Meter Reading	Pitot #: ΔP	ΔH(calc)	TC #'s: ΔH(act)	Probe	Stack	Tm In	Tm Out	Filter	Exit	Pump Vac.
A-1	0	1454	605.433	.68	5.9	5.9	205	93	55	54	246	57	13
2	5		—	.68	5.9	5.9	224	94	61	55	245	43	13
3	10		618.24	.68	5.9	5.9	231	93	64	56	245	41	13
4	15		624.6	.67	5.8	5.9	230	94	66	57	244	41	13
5	20		630.89	.65	5.7	5.7	233	93	66	57	245	41	12
6	25		—	.61	5.4	5.4	229	94	67	58	245	42	11
7	30		643.25	.52	4.6	4.6	235	94	69	59	247	43	9
8	35		648.93	.44	3.9	3.9	254	96	71	60	239	50	7.5
9	40		654.28	.42	3.7	3.7	251	96	71	60	242	43	7
10	45		659.26	.36	3.2	3.2	228	94	71	60	241	40	6
11	50		664.02	.35	3.1	3.1	229	95	72	60	248	40	6
12	55		668.74	.35	3.1	3.1	234	94	72	60	235	40	6
3 1	60	1600	673.434	.58	5.1	5.1	226	95	60	59	237	45	10
2	1:05		679.40	.57	5.0	5.0	231	96	69	59	235	46	10
3	10		685.30	.58	5.1	5.1	238	97	70	60	235	49	10
4	15		—	.58	5.1	5.1	241	97	71	60	233	50	10
5	20		697.15	.58	5.1	5.1	229	97	70	61	232	39	10
6	25	[illegible]	703.07	.57	5.1	5.1	230	98	70	61	248	38	10.5
7	30		708.995	.55	4.8	4.8	227	96	71	61	247	39	10
8	35		714.825	.49	4.3	4.3	235	96	71	61	233	40	9
9	40		720.370	.48	4.2	4.2	239	96	70	61	243	40	8.5
10	45		725.77	.45	4.0	4.0	240	94	70	60	239	40	8
11	50		731.07	.39	3.4	3.4	236	93	69	59	239	39	7
12	55		736.10	.38	3.3	3.3	228	93	68	58	239	42	7
End	60	1700	740.833										

Θ: 120 V_m: 135.400 avg $\sqrt{\Delta P}$: .707 avg ΔH: 4.617 T_s: 94.9 T_m: 63.5 Calculated By: CG Checked By: ___

FBT

SAMPLE RECOVERY DATA

Date: 12-15-98

Client: WESTLAKE CA #0 PN: _____

Location: HS FUME SCRUBBER TOWER

Site: Stack

Run #: 3

Filter No: N.A. Glassware Set No: 1 Sample Box No: 1

IMPINGER DATA

Gravimetric: ✓ Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents	100ML ICL	100ML ICL	100ML ICL	MT	SG	
Final	670	695	592	573	971	
Initial	565	661	587	572	948	
Net	105	34	5	1	23	168

RECOVERED SAMPLE

Description of Particulate on Filter: N.A.

Color of Silica Gel: blue

Recovered By: J. Roberts

Date: 12/15/98

FBT

APPENDIX D

SAMPLING SITE DATA

Traverse Point Locator Data

Client Westlake CA&O

Calculator Chris Gotschalk Date 11/29/98

Location Hg fume scrubber Stack

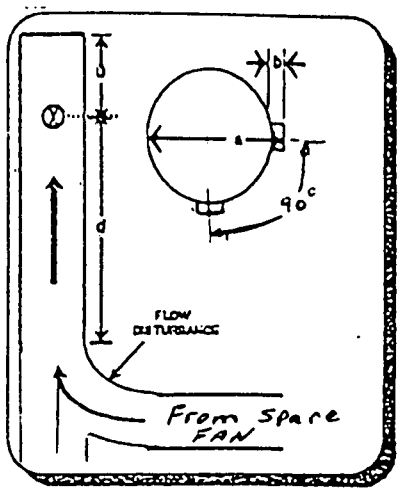
Distance from *upstream* disturbance(d) 50" (3.6 de)

Distance from *downstream* disturbance(u) 12" (0.9 de)

Outside of port to *far side* of stack(a) 14.25"

Outside of port to *near side* of stack(b) 0.25"

Inside Stack Diameter(a-b) 14"



See Figure 4.1

Point #	% from wall to point	" from wall to point(c)	Port length(b)	" from probe tip to point(b+c)
1	2.1	0.~~29~~ 0.5	0.25	0.75
2	6.7	.94		1.19
3	11.8	1.65		1.90
4	17.7	2.48		2.73
5	25.	3.50		3.75
6	35.6	4.98		5.23
7	64.4	9.02		9.27
8	75.0	10.50		10.75
9	82.3	11.52		11.77
10	88.2	12.35		12.60
11	93.3	13.06		13.31
12	97.9	~~13.71~~ 13.5		13.75

APPENDIX E

CALIBRATION DATA

APPENDIX E
CALIBRATION DATA

This appendix contains test equipment calibration documentation and describes the specific QA/QC procedures employed by FBT in performing this test. The goal of the QA/QC activities for this project was to ensure, to the highest degree possible, the accuracy of the data collected. The procedures contained in the *Quality Assurance Handbook for Air Pollution Measurement Systems: Volume I. Principles, EPA-600 9-76-005, and Volume III. Stationary Sources Specific Methods, EPA-600 77-027b* were the basis for performance for all testing and related work activities.

CALIBRATION OF APPARATUS

The preparation and calibration of source sampling equipment is essential in maintaining data quality. Brief descriptions of the calibration procedures used by FBT follow:

Barometers

FBT uses aneroid barometers, which are calibrated against a National Weather Service-type mercurial barometer.

Temperature Sensors

Bimetallic dial thermometers and Type "K" thermocouples are calibrated using the procedure described in Section 3.4.2 of the Quality Assurance Handbook. Each temperature sensor is calibrated over the expected range of use against an ASTM 3C or 3F thermometer.

Pitot Tubes

FBT uses Type "S" pitot tubes constructed according to USEPA Reference Method 2 specifications. Pitot tubes meeting these criteria are assigned a baseline coefficient of 0.84 and need not be calibrated.

Differential Pressure Gauges

FBT uses Dwyer inclined/vertical manometers to measure differential pressures. These include velocity pressures, static pressures, and orifice pressure differentials. Manometers are selected with sufficient sensitivity to accurately measure pressures over the entire range of expected values. Manometers are leveled and zeroed prior to each run and checked periodically during the run. Manometers are primary standards and require no calibration.

Dry Gas Meters and Orifices

Dry gas meters and orifices are calibrated in accordance with Section 3.3.2 of the Quality Assurance Handbook. This procedure involves direct comparison of the dry gas meter to a reference wet test meter. The reference wet test meter is routinely calibrated against a bell prover. Before its initial use in the field, the metering system is calibrated over the entire range

of operation. After each field use, the metering system calibration is checked at a single intermediate flow rate based on the previous field test. Acceptable variation for the average initial and final dry gas meter factor is 5%. Acceptable variation from the mean of individual meter and orifice calibration factors for a check is ± 0.02.

ON-SITE MEASUREMENTS

On-site QA/QC activities included:

Measurement Sites

Prior to sampling, all stack/duct dimensions are measured to determine measurement site locations, location of test ports, and stack inside dimensions. Inside dimensions were checked through all available test ports to ensure uniformity of the stack cross-sectional area.

Verification of Absence of Cyclonic Flow

In situations where the measurement site is near possible flow disturbances, the presence or absence of cyclonic flow must be determined. If required, **FBT** conducts an evaluation of the measurement sites to determine the presence or absence of cyclonic flow prior to testing. Acceptable criteria per USEPA Method 1 is an average angle of rotation required to achieve a null pitot reading of less than 20°.

Velocity Measurements

All velocity measurement apparatus was assembled, leveled, zeroed, and leak checked prior to each test run. The static pressure was determined at a single point near the center of the stack.

Flue Gas Component Sampling

During test runs gas samples were withdrawn from a single point near the center of each test site and analyzed with a Fyrite Gas Analyzer to determine percent concentrations of carbon dioxide and oxygen. The sample train was assembled and leak checked before sampling.

Moisture

The sample trains were assembled, equilibrated to required temperatures, and leak checked before testing. During sampling, the gas exiting the condenser was maintained below 68°F to ensure complete condensation of the stack gas water vapor. At the conclusion of each test run, the sample trains were leak checked at the highest vacuum attained during the test run. Acceptable leakage rates are 0.02 cfm or 4 percent of the average sampling rate (whichever is less).

Thermocouple Calibration Data
Westlake CA &O Hg Fume Scrubber Stack Emissions Evaluation
December 15, 1998

		Ambient	Ice Water	Boiling Water	Hot Oil
%Difference		1.1%	3.1%	0.5%	0.2%
Reference #	Mercury	88	32	208	428
Sensor #	SS-60-4	87	31	209	429
Date:	6/25/98	Stack gas temperature			
Average % Difference		0.8%			

		Ambient	Ice Water	Boiling Water	Hot Oil
%Difference		2.3%	3.0%	0.0%	0.5%
Reference #	Mercury	86	33	208	422
Sensor #	Apex HB-1	84	32	208	420
Date:	6/25/98	Filter oven temperature			
Average % Difference		2.7%			

		Ambient	Ice Water	Boiling Water	Hot Oil
%Difference		2.3%	3.0%	0.5%	#N/A
Reference #	Mercury	88	33	208	
Sensor #	Apex in	86	32	209	
Date:	6/25/98	Dry gas meter inlet temperature			
Average % Difference		2.7%			

		Ambient	Ice Water	Boiling Water	Hot Oil
%Difference		1.1%	3.0%	0.0%	#N/A
Reference #	Mercury	88	33	208	
Sensor #	Apex-out	87	32	208	
Date:	6/25/98	Dry gas meter outlet temperature			
Average % Difference		2.1%			

		Ambient	Ice Water	Boiling Water	Hot Oil
%Difference		1.2%	3.0%	0.0%	#N/A
Reference #	Mercury	86	33	207	
Sensor #	DC-1	87	32	207	
Date:	6/25/98	Silica gel colume exit temperature			
Average % Difference		2.1%			

		Ambient	Ice Water	Boiling Water	Hot Oil
%Difference		1.1%	3.0%	0.5%	#N/A
Reference #	Mercury	87	33	206	
Sensor #	DC-2	86	32	207	
Date:	6/25/98	Silica gel colume exit temperature			
Average % Difference		2.1%			

		Ambient	Ice Water	Boiling Water	Hot Oil
%Difference		4.5%	3.0%	0.5%	#N/A
Reference #	Mercury	88	33	206	
Sensor #	DC-3	84	32	207	
Date:	6/11/98	Silica gel colume exit temperature			
Average % Difference		1.8%			

FBT

POST-TEST METER CALIBRATION

MB #: Apex
DATE: 12/21/98
PLANT: Westlake CA&O
PERFORMED BY: CG

BAROMETRIC PRESS: 29.98 in. hg
DGM PRETEST γ : 1.037
REFERENCE γ_r: 1.002 DGM#1

	RUN 1	RUN 2	RUN 3
VACUUM ("Hg)	13.00	13.00	13.00
ΔHd ("H2O)	4.60	4.60	4.40
Initial Ref. ft^3	505.261	517.611	529.954
Final Ref. ft^3	517.411	529.754	541.741
Initial DGM ft^3	753.826	765.197	776.578
Final DGM ft^3	765.197	776.578	787.668
Ref Tw °F	60.0	60.0	60.0
DGM Tm °F	65.0	68.0	69.0
Time (min.)	10.0	10.0	10.0
Net Reference, Vw (ft^3) =	12.150	12.143	11.787
Net DGM. Vd (ft^3)=	11.371	11.381	11.090
γ =	1.069	1.073	1.072
ΔH@ =	1.697	1.689	1.712

Pretest γ = 1.037
New γ = 1.071
% Δ = 3.3

Average ΔH@ = 1.699

Calculations:

$\gamma = (Vw \times \gamma_r \times Pb \times (Tm + 460)) / (Vd\ (Pb + (\Delta Hd / 13.6)) \times (Tw + 460)$

$\Delta H@ = 0.0317 \times \Delta H / (Pb\ (Td + 460)) \times ((Tw + 460) \times time / Vw)^2$

COMMENTS:

FBT

POST-TEST METER CALIBRATION

MB #: Apex
DATE: 10/25/98
PLANT: Polar Minerals
PERFORMED BY: CG

BAROMETRIC PRESS: 30.23 in. hg
DGM PRETEST γ : 1.037
REFERENCE γ_r: 1.002 DGM#1

	RUN 1	RUN 2	RUN 3
VACUUM ("Hg)	12.00	12.00	12.00
ΔHd ("H2O)	2.40	2.40	2.40
Initial Ref. ft^3	467.115	476.158	482.435
Final Ref. ft^3	476.066	482.435	492.238
Initial DGM ft^3	862.917	871.436	877.356
Final DGM ft^3	871.520	877.356	886.667
Ref Tw °F	69.0	69.0	70.0
DGM Tm °F	78.0	77.0	79.0
Time (min.)	10.0	7.0	11.0
Net Reference, Vw (ft^3) =	8.951	6.277	9.803
Net DGM. Vd (ft^3)=	8.603	5.920	9.311
γ =	1.054	1.072	1.067
ΔH@ =	1.634	1.631	1.651

Pretest γ = 1.037
New γ = 1.064
% Δ = 2.6

Average ΔH@ = 1.639

Calculations:

$\gamma = (Vw \times \gamma_r \times Pb \times (Tm + 460)) / (Vd\ (Pb + (\Delta Hd / 13.6)) \times (Tw + 460)$

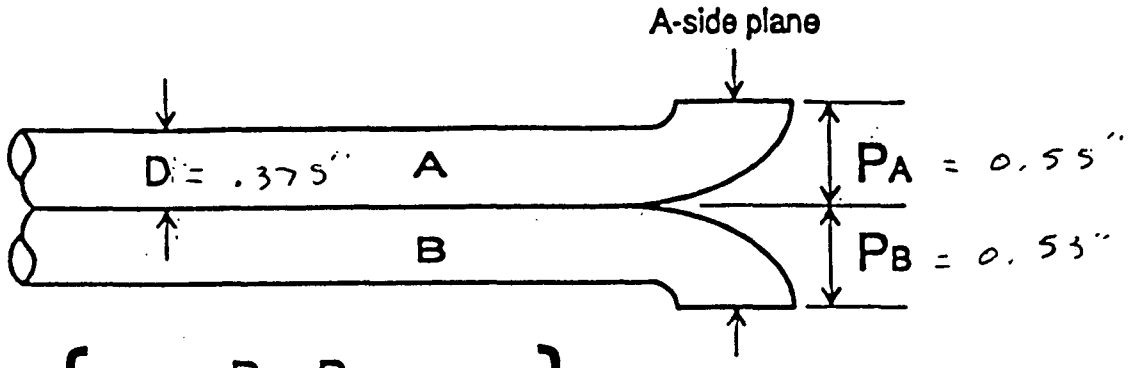
$\Delta H@ = 0.0317 \times \Delta H / (Pb\ (Td + 460)) \times ((Tw + 460) \times time / Vw)^2$

COMMENTS:

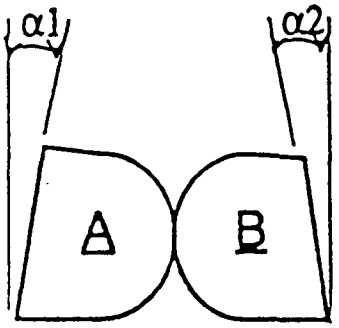
FBT

S-type Pitot Tube Calibration

Identification: PT-03
Performed by: Chris Gottschalk
Date: 6/17/98

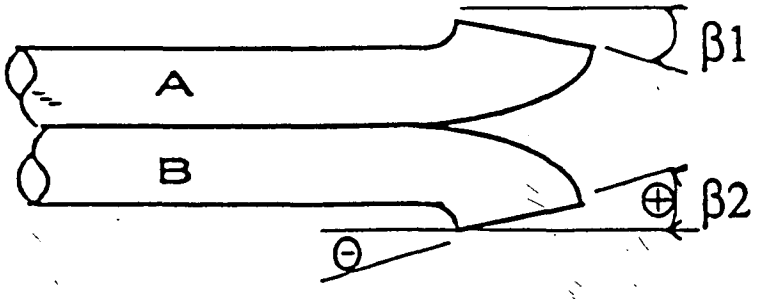


$$\left\{ \begin{array}{c} P_A = P_B \\ 1.05Dt \le P \le 1.50Dt \end{array} \right\}$$



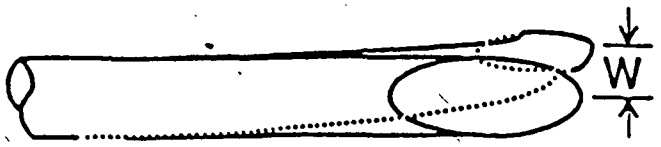
α1 = 0.05 °

α2 = 0.0 °



β 1= 2 °

β 2= 0 °



W = 0 in.

FBT

APPENDIX F

ANALYTICAL DATA

FBT

DATA CHEM LABORATORIES
A JACOBS COMPANY

1/5/99

Submitted To:
Chris Gottschalk
FBT Testing & Environmental Services
6860 Stonepoint Court
Paducah, KY
42039

Reference Data:

Sample Location:	Westlake CA & O Hg Fume Scrubber / 461
Sample Type:	Water
Client Sample No.:	461C-1 through 461C-5
PO #:	461-2
Method Reference:	EPA 101
Sample Set ID#:	98-S-8314
DATACHEM Lab No.:	98-49200 through 98-49204
Preparation Date:	01/04/99
Analysis Date:	01/04/99

The samples were prepared and analyzed in accordance with EPA method 101 using a Varian SpectrAA 300 (AAS).

The results are in the enclosed data table.

Stephanie Wilcox
Analyst

Reviewer

SALT LAKE CITY OFFICE
960 WEST LeVOY DRIVE
SALT LAKE CITY, UTAH 84123-2547
801 266-7700, FAX 801 268-9992

CINCINNATI OFFICE
4388 GLENDALE-MILFORD ROAD
CINCINNATI, OHIO 45242-3706
513 733-5336 FAX 513 733-5347

MARYLAND OFFICE
17624 MACQUEEN AVENUE
OLNEY, MARYLAND 20832
301 924-1067 FAX 301 924-1981

98-S-8314

Results
µg/Sample

Client #		DCL #	Hg
461C-1	Run 1	98-49200	360.0
461C-2	Run 2	98-49201	360.0
461C-3	Run 3	98-49202	340.0
461C-4	ICI Blank	98-49203	ND
461C-5	DI H_2O Blank	98-49204	ND
LOD			**5.0**

ND indicates the value is below the limit of detection (LOD)

Stephanie Wilcox
Analyst

Reviewer

C - 8

ANALYTICAL REQUEST AND CHAIN OF CUSTODY

98-S-8314

FBT Engineering

6860 Stonepoint Court
Paducah, Kentucky 42039
(502) 898-8782 Fax:(502) 898-8782

LABORATORY: Attn Ed Slick
Data Chem
4388 Glendale-Milford Rd
Cincinnati, OH 45242

DATE SHIPPED	# OF SAMPLES	SAMPLE TYPE	PROJECT NAME & NUMBER
12/16/98	5	liquid	Westlake CA #0 Hg fume Scrubber / 461
PO# 461-2	CONTACT PERSON Chris Gottschalk		

COMMENTS/SPECIAL INSTRUCTIONS:
Federal regulation requires analysis within 30 days of sample date, or by Jan 14, 1999.
CJF

PRIORITY			SAMPLE RETURN	
NORMAL ✓	RUSH	EMERG RUSH	YES	NO ✓

SAMPLE #	SAMPLE DATE	CONTAINER DESCRIPTION	ANALYSES REQUESTED	
461C-1	12/15/98 49200	1 l glass Jar / 461C-1	Sample Volume and Hg concentration by Method 101	Run1
461C-2	49201	" / 461C-2	"	Run2
461C-3	49202	" / 461C-3	"	Run3
461C-4	49203	" / 461C-4	"	Blank ICl
461C-5	49204	Plastic Jar / 461C-5	"	DI H_2O Blank

CHAIN OF CUSTODY REQUEST

SAMPLES DELIVERED BY: U.S. MAIL ___ FEDEX/UPS ___ COURIER ___ OTHER Airborne Express

DATE	PURPOSE FOR CUSTODY CHANGE	RELINQUISHED BY: (SIGNATURE)	RECEIVED BY: (SIGNATURE)
12/16/98	Analysis	Chris Gottschalk	[illegible]

FBT

APPENDIX G

PROCESS DATA

WESTLAKE CA&O CORPORATION

Mercury Fume Scrubber Stack Test Parameters

Date: 12/15/98

Run 1: **Start Time:** 0850 **End Time:** 1058

Time	pH	ORP			Water Flow			Inlet Air Temp.
		Reading	Conversion	(mV)	Reading	Conversion	(gpm)	(°F)
0900	8.70	19	x 10 + 400	590	35	÷ 250 x 20	2.80	92
0915	8.70	19	x 10 + 400	590	35	÷ 250 x 20	2.80	92
0930	8.80	18	x 10 + 400	580	35	÷ 250 x 20	2.80	93
0950	8.80	18	x 10 + 400	580	35	÷ 250 x 20	2.80	95
1000	9.00	17	x 10 + 400	570	90	÷ 250 x 20	7.20	95
1015	9.00	17	x 10 + 400	570	38	÷ 250 x 20	3.04	96
1030	8.90	16	x 10 + 400	560	35	÷ 250 x 20	2.80	96
1045	9.00	15	x 10 + 400	550	42	÷ 250 x 20	3.36	96

Run 2: **Start Time:** 1148 **End Time:** 1355

Time	pH	ORP			Water Flow			Inlet Air Temp.
		Reading	Conversion	(mV)	Reading	Conversion	(gpm)	(°F)
1200	9.00	14	x 10 + 400	540	55	÷ 250 x 20	4.40	100
1215	8.95	14	x 10 + 400	540	48	÷ 250 x 20	3.84	100
1230	8.90	14	x 10 + 400	540	47	÷ 250 x 20	3.76	100
1245	8.90	14	x 10 + 400	540	52	÷ 250 x 20	4.16	100
1300	8.90	14	x 10 + 400	540	50	÷ 250 x 20	4.00	100
1315	8.85	14	x 10 + 400	540	47	÷ 250 x 20	3.76	100
1330	8.85	14	x 10 + 400	540	47	÷ 250 x 20	3.76	100
1345	8.90	15	x 10 + 400	550	50	÷ 250 x 20	4.00	100
1355	8.85	15	x 10 + 400	550	50	÷ 250 x 20	4.00	100

Run 3: **Start Time:** 1454 **End Time:** 1700

Time	pH	ORP			Water Flow			Inlet Air Temp.
		Reading	Conversion	(mV)	Reading	Conversion	(gpm)	(°F)
1500	8.85	14	x 10 + 400	540	45	÷ 250 x 20	3.60	100
1520	8.90	14	x 10 + 400	540	50	÷ 250 x 20	4.00	100
1530	8.90	13	x 10 + 400	530	50	÷ 250 x 20	4.00	100
1545	8.95	13	x 10 + 400	530	48	÷ 250 x 20	3.84	100
1600	8.95	13	x 10 + 400	530	52	÷ 250 x 20	4.16	100
1615	8.90	13	x 10 + 400	530	53	÷ 250 x 20	4.24	100
1630	9.00	13	x 10 + 400	530	50	÷ 250 x 20	4.00	100
1645	9.00	13	x 10 + 400	530	50	÷ 250 x 20	4.00	100

	pH (SU)		ORP (mV)		Water Flow (gpm)	Inlet Gas Temp. (°F)
6 Hour Avg.	8.90	14.92	549.20	47.56	3.80	98.20

APPENDIX H

MERCURY SAMPLING DATA AND RESULTS

CLIENT/PROJECT #:	**Westlake CA & O/461**
PROCESS:	**Chlor Alkali Plant**
SAMPLE LOCATION:	**Hg Fume Scrubber Stack**
DATE:	**12/15/98**
TIME:	**0847-1055 hrs**
RUN #:	**1**

STATIC PRESSURE("H_2O):	-0.24	Ps	30.02	"Hg
BAROMETRIC("HG):	30.04			
SAMPLE TIME(min):	120 0	Vm(corr)	126 467	ft^3
MOIST. SAMPLE VOLUME(ft^3):	126.467	Sample, Vm(std)	137.625	dscf
AVG. SQ. ROOT DELTA P:	0.6959			
AVG ORIFICE DELTA H:	4.238			
AVG STACK TEMP °F:	87.8		547.8	°R
AVG METER TEMP °F:	50.4			
Cp PITOT :	0.84			
NOZZLE DIA.(inches):	0.313	An	5.34E-04	ft^2
METER GAMMA:	1.037			
LEAK RATE(0 IF<0.02):	0			
CIRC STACK? 1=Y,0=N:	1	As	1 07	ft^2
DIA (in) IF 1 or AREA (in^2) IF 0:	14.00			
% O_2 :	22.00	Dry Mole Wt	29.04	
% CO_2 :	1.00	Stack Mole Wt	28.53	
CONDENSATE(g):	142	% H_20	4.63	
ANALYTE # 1:	Mercury			
MOLECULAR WEIGHT:	200.6			
micrograms Hg/sample:	360.0			
PPM in stack gas:				

**********************CALCULATED RESULTS**********************

Stack Gas Conditions

VELOCITY (Vs):	39.97	ft/sec
VOLUMETRIC FLOW RATE(Qs):	2,563	acfm
:	2,364	dscfm
TEMPERATURE :	88	°F
% H_2O:	4.6	%
% O_2 :	22.0	%
% CO_2 :	1.0	%
% ISOKINETIC:	97.1	%

Mercury Emissions

CONCENTRATION (Cs):	5.77E-09	lb/dscf
:	2.62E-06	grams/dscf
EMISSION RATE (Er):	0.0008183	lb/hr
	8.906	grams/day

COMMENTS:

FBT

CLIENT/PROJECT #:	**Westlake CA & O/461**
PROCESS:	**Chlor Alkali Plant**
SAMPLE LOCATION:	**Hg Fume Scrubber Stack**
DATE:	**12/15/98**
TIME:	**1148-1354 hrs**
RUN #:	**2**

STATIC PRESSURE("H_2O):	-0.02	Ps	30.04	"Hg
BAROMETRIC("HG):	30.04			
SAMPLE TIME(min):	120.0	Vm(corr)	132.373	ft^3
MOIST. SAMPLE VOLUME(ft^3):	132.373	Sample. Vm(std)	142.026	dscf
AVG. SQ. ROOT DELTA P:	0.7119			
AVG ORIFICE DELTA H:	4.492			
AVG STACK TEMP °F:	91.6		551.6	°R
AVG METER TEMP °F:	58.0			
Cp PITOT :	0.84			
NOZZLE DIA.(inches):	0.313	An	5.34E-04	ft^2
METER GAMMA:	1.037			
LEAK RATE(0 IF<0.02):	0			
CIRC STACK? 1=Y,0=N:	1	As	1.07	ft^2
DIA (in) IF 1 or AREA (in^2) IF 0:	14.00			
% O_2 :	23.00	Dry Mole Wt	29.00	
% CO_2 :	0.50	Stack Mole Wt	28.47	
CONDENSATE(g):	153	% H_2O	4.83	
ANALYTE # 1:	Mercury			
MOLECULAR WEIGHT:	200.6			
micrograms Hg/sample:	360.0			
PPM in stack gas:				

**********************CALCULATED RESULTS**********************

Stack Gas Conditions

VELOCITY (Vs):	41.06	ft/sec
VOLUMETRIC FLOW RATE(Qs):	2,634	acfm
:	2,409	dscfm
TEMPERATURE :	92	°F
% H_2O:	4.8	%
% O_2 :	23.0	%
% CO_2 :	0.5	%
% ISOKINETIC:	98.4	%

Mercury Emissions

CONCENTRATION (Cs):	5.59E-09	lb/dscf
:	2.53E-06	grams/dscf
EMISSION RATE (Er):	0.0008077	lb/hr
	8.792	grams/day

COMMENTS:

FBT

CLIENT/PROJECT #:	Westlake CA & O/461
PROCESS:	Chlor Alkali Plant
SAMPLE LOCATION:	Hg Fume Scrubber Stack
DATE:	12/15/98
TIME:	1454-1700 hrs
RUN #:	3

STATIC PRESSURE("H_2O):	-0.24	Ps	30.02	"Hg
BAROMETRIC("HG):	30.04			
SAMPLE TIME(min):	120.0	Vm(corr)	135.400	ft^3
MOIST. SAMPLE VOLUME(ft^3):	135.400	Sample. Vm(std)	143.791	dscf
AVG. SQ. ROOT DELTA P:	0.7207			
AVG ORIFICE DELTA H:	4.617			
AVG STACK TEMP °F:	94.9		554.9	°R
AVG METER TEMP °F:	63.5			
Cp PITOT :	0.84			
NOZZLE DIA.(inches):	0.313	An	5.34E-04	ft^2
METER GAMMA:	1.037			
LEAK RATE(0 IF<0.02):	0			
CIRC STACK? 1=Y,0=N:	1	As	1.07	ft^2
DIA (in) IF 1 or AREA (in^2) IF 0:	14.00			
% O_2 :	22.00	Dry Mole Wt	28.93	
% CO_2 :	0.30	Stack Mole Wt	28.36	
CONDENSATE(g):	168	% H_2O	5.21	
ANALYTE # 1:	Mercury			
MOLECULAR WEIGHT:	200.6			
micrograms Hg/sample:	340.0			
PPM in stack gas:				

**********CALCULATED RESULTS**********

Stack Gas Conditions

VELOCITY (Vs):	41.78	ft/sec
VOLUMETRIC FLOW RATE(Qs):	2.680	acfm
:	2.425	dscfm
TEMPERATURE :	95	°F
% H_2O:	5.2	%
% O_2 :	22.0	%
% CO_2 :	0.3	%
% ISOKINETIC:	98.9	%

Mercury Emissions

CONCENTRATION (Cs):	5.21E-09	lb/dscf
	2.36E-06	grams/dscf
EMISSION RATE (Er):	0.0007587	lb/hr
	8.258	grams/day

COMMENTS:

FBT