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Planning and Standards
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Air Emissions From Reinforced Plastics Composite Manufacturing Process LASCO Panel Products: Volume I

Office of Air Quality
Clean Air
OAQPS
Planning and Standards

FINAL REPORT

AIR EMISSIONS FROM REINFORCED PLASTICS COMPOSITE MANUFACTURING PROCESS LASCO PANEL PRODUCTS

VOLUME I OF III
REPORT TEXT
APPENDIX A.1

EPA Contract No. 68D70069
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VOLUME I

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) Emission Standards Division (ESD) requested that the EPA's Emissions Monitoring and Analysis Division (EMAD), Emission Measurement Center (EMC) provide testing support in the investigation of the reinforced plastics composite manufacturing source category to properly set the maximum achievable control technology (MACT) standards as required by the Clean Air Act Amendments of 1990. The sampling program was conducted through EPA Contract No. 68D20162, Work Assignment No. 4-05. Figure 1.1 represents the test program organization and major lines of communication.

The reinforced plastics composite manufacturing process located at LASCO Panel Products in Florence, Kentucky was selected by the ESD for this emissions testing program for the following reasons:

1. The lamination process (resin and gel coat application areas) is contained in a single room. This room can be treated as a total enclosure with slight modifications.

2. The process line can accommodate a wide variety of operating conditions to simulate worst case production plus the gel coating conditions.

3. The facility was willing to assist with the sampling effort. The "Wide Line" lamination table currently has an enclosure around the wet application areas (resin and gel coat) which controls organic emissions and vents to the roof exhaust.

4. The facility was willing to conduct a careful mass balance (using special scales to weigh raw materials and final product) to determine emissions during the tests so that the mass balance technique could be compared against stack measurements.

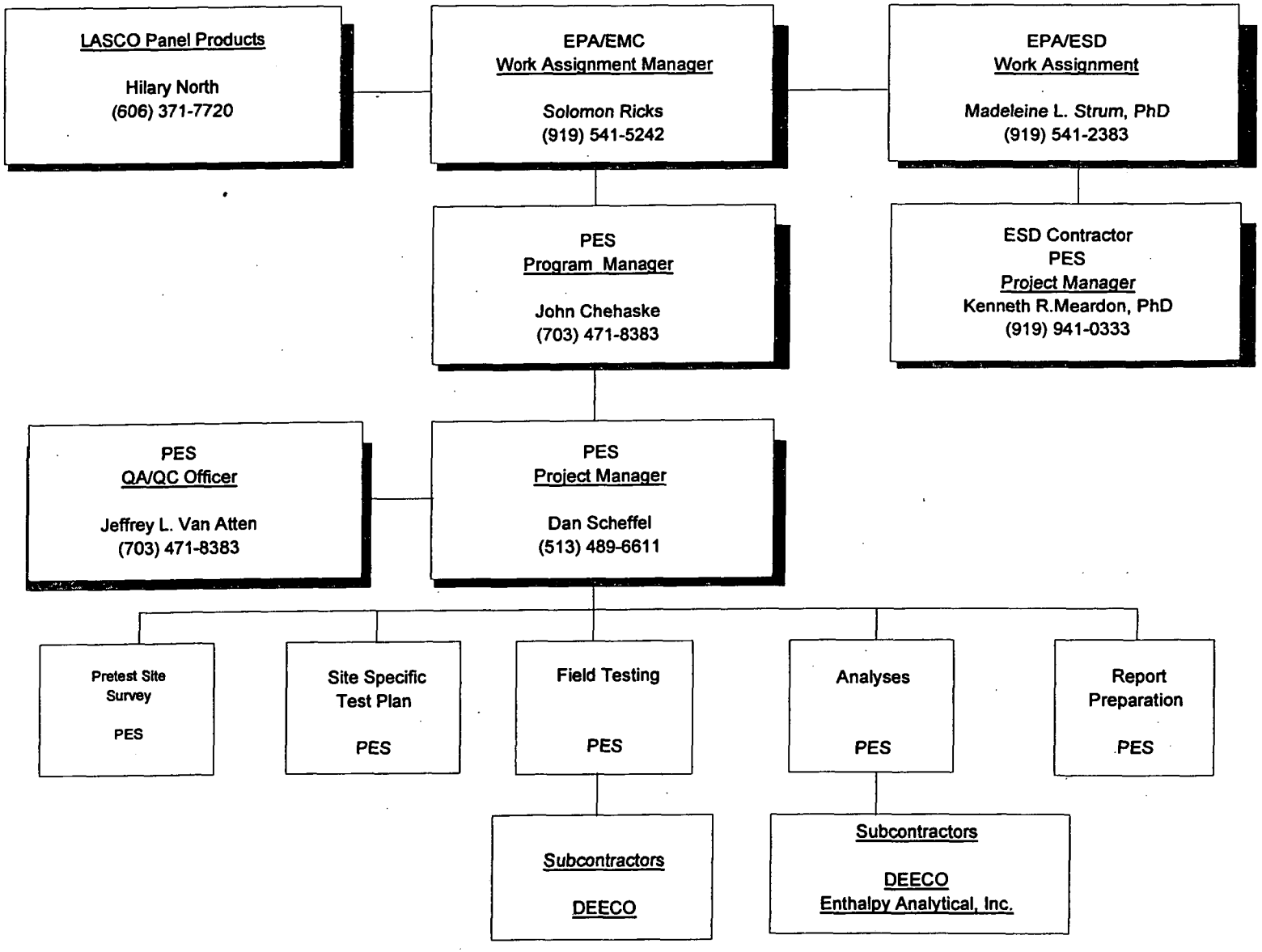

Figure 1.1 Key Personnel and Responsibility for Testing at LASCO Panel Products

The sampling program was designed to support the following ESD objectives:

1. Identify and quantify the hazardous air pollutants (HAPs) emitted by reinforced plastic manufacturing.

2. Identify the sources of HAPs and the total HAPs mass emission rates from the wet application area and the oven area.

3. Evaluate the following ventilation scenarios:

   - The current enclosure of the wet application area which is referred to as "current."

   - The current enclosure disconnected and turned off, where there is no capture of emissions in the wet application areas. This is referred to as "open."

   - Enclosure of all wet application areas, or as much as is possible, with the current exhaust fan disconnected. This is referred to as "closed." (In the original test plan, this condition was referred to as WAE.)

4. Depending on the effectiveness of the industry proposed "closed" system, develop a performance-based emission limitation achieved by the use of a wet area enclosed table system.

5. Assess the existing factors for volatile organic compound emissions from a continuous lamination process for the purposes of updating the information in AP-42 and determining cost effectiveness for MACT options involving emissions abatement.

6. Determine the effect of various process parameters such as line speed, laminate thickness, hazardous air pollutant content of raw material and the addition of a gel coat layer on the emission factor. Monitor and record related process and operating information to support the establishment of the emission limit and the assessment and development of emission factors.

The primary objective of the testing program was to obtain total HAPs emitted from the lamination line and resin/gel coat usage rates to develop emission factors. The emission factors (pounds of HAPs emitted per pound of HAP used) were developed for a variety of process conditions. Sampling was performed during 13 process operating conditions. Measurements were made of the total hydrocarbons (THC), styrene, cumene,

and methyl methacrylate (MMA), and the air flow rate at all enclosure exhausts. It should be noted that styrene and cumene were originally expected to account for more than 99 percent (%) of the total HAP emissions and were the compounds of primary interest. The measurement of MMA was not part of the original test plan, but was added while onsite, after it was discovered that MMA may account for higher percentages of the HAP content depending on the type of product produced. The secondary objective of the sampling program was to obtain data on the emissions of HAPs from the oven area.

PES utilized the support services of two subcontractors to provide sampling and analytical support for this test program. Enthalpy Analytical, Inc. performed EPA Method 24 analyses on resin samples, analysis of HAP content of resin samples and vacuum distillations of several different resin samples. DEECO provided onsite gas chromatography HAP analysis of sorbent tube samples, spike tube preparations, ethane/methane analysis of oven bag samples and continuous measurements of total hydrocarbons on the oven exhausts and natural draft openings (NDOs). Figure 1.2 presents an overview of the sample locations at the LASCO site. Included in the diagram are the following locations: main exhaust, room exhaust, auxiliary exhaust, natural draft openings (A, B, C, and D) and ovens 9 and 10. Sample locations are described in detail in Section 4.0.

Table 1.1 summarizes the test matrix for the test program.

In addition to this introduction, this report contains the following sections:

2.0 SUMMARY OF RESULTS
3.0 PROCESS DESCRIPTION
4.0 SAMPLING LOCATIONS
5.0 SAMPLING AND ANALYTICAL PROCEDURES
6.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND RESULTS

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- A. RAW FIELD DATA
- B. ANALYTICAL DATA
- C. CALCULATIONS
- D. QA/QC DATA
- E. PARTICIPANTS

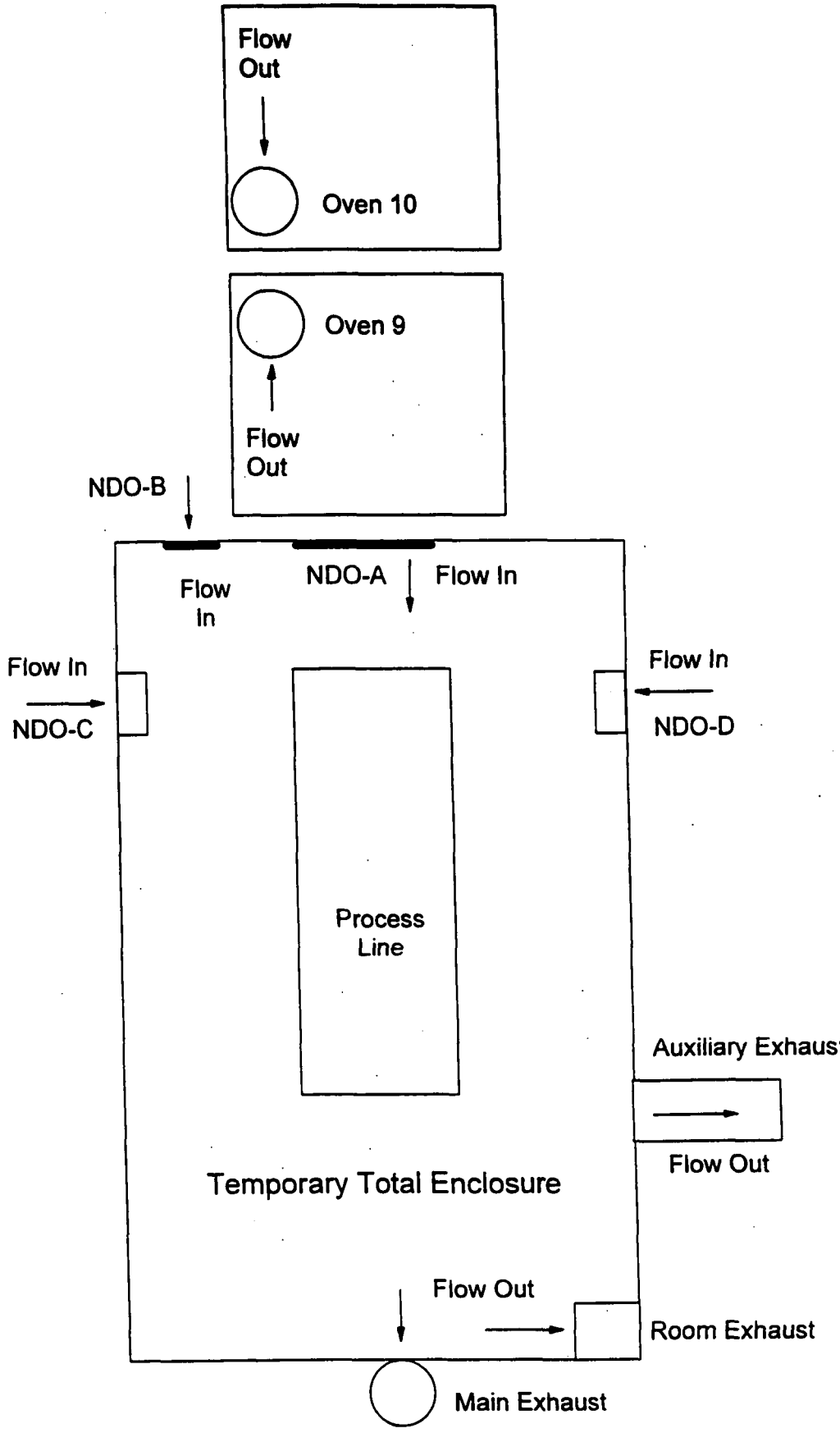


Figure 1.2 Overview of Sampling Locations

TABLE 1.1

LASCO PANEL PRODUCTS TEST MATRIX

Sample Location	Number of Test Conditions	Sample Type	Sampling Method	Analytical Method	Contractor (Subcontractor)
Main Wide Line Exhaust	13	THC Styrene, Cumene, MMA	EPA 25A EPA 18	FIA GC/FID	PES PES (DEECO)
Room Exhaust	13	THC Styrene, Cumene, MMA	EPA 25A EPA 18	FIA GC/FID	PES PES (DEECO)
Auxiliary Exhaust	2	THC Styrene, Cumene, MMA	EPA 25A EPA 18	FIA GC/FID	PES PES (DEECO)
Natural Draft Openings A, B, C, D	13	THC Styrene, Cumene, MMA	EPA 25A EPA18	FIA GC/FID	DEECO PES (DEECO)
Oven Exhaust No. 9	13	THC Styrene, Cumene, MMA Methane/Ethane	EPA 25A EPA 18 EPA 18	FIA GC/FID GC/FID	DEECO PES (DEECO) (DEECO)
Oven Exhaust No. 10	13	THC Styrene, Cumene, MMA Methane/Ethane	EPA 25A EPA 18 EPA 18	FIA GC/FID GC/FID	(DEECO) PES (DEECO) (DEECO)
Resin Holding Tanks	13	Volatile content, solids, water, density HAPS	EPA 24 EPA 18	Gravimetric GC/MS	(Enthalpy) (Enthalpy)

2.0 SUMMARY OF TEST RESULTS

This section provides summaries of the test results obtained from the testing program at LASCO Panel Products. The primary focus of the sampling effort was to measure THC concentrations and calculate mass emission rates from the temporary total enclosure (TTE). Also included are the results of the tests conducted for styrene, MMA, cumene, ethane and methane. The ethane and methane data was only collected from the oven areas to account for emissions as a result of poor burner efficiency. The oven data is included and was a secondary objective of this field effort to evaluate HAP emissions from the oven area. The resin analysis for VOC, water, solids, density and HAPs are not included in this report. The resin results and process data are contained in the ESD Test Reports.

2.1 EMISSIONS TEST LOG

Sampling was conducted during the period of May 14 through May 29, 1997. Table 2.1 summarizes the emissions test log. Presented in the table are the condition numbers, test runs, dates, sample locations, pollutants and process conditions. Each condition number correlates to a variation in process conditions, which included CURRENT, OPEN, CLOSED, and variations in product, line speed, and panel thickness. The following is a general description of the three room conditions that were examined during this sampling program. For each of the three conditions, the process room was treated as a TTE with all the access doors closed and NDOs minimized. The negative static pressure in the room was maintained at -0.004 inches of water or greater.

The current condition was the operation of the process line the normal way it operates each production day. The main exhaust system is exhausting air emissions from the table area to the main roof exhaust stack. The table area is covered partially. Most top areas of the table are covered with panels and side areas mostly open. The initial resin application area is partially closed, with some panels open. The sampling areas consisted of the Main Exhaust which normally draws emission directly from the wet application area, the Room Exhaust which draws fugitive emission from floor level in one corner of the room, four natural draft openings (NDOs), and Ovens 9 and 10 exhaust stacks.

TABLE 2.1

EMISSION TEST LOG
LASCO PANEL PRODUCTS
FLORENCE, KENTUCKY

Condition No.	Run No.	Date	Sample Location	Pollutant	Process Condition
1	1,2,3	5/14/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10 Resin Tank	THC[a], C_8H_8[b], THC, C_8H_8, THC, C_8H_8, THC, CH_4[c], C_2H_6[d], C_8H_8 HAPS, Solvent, Moisture, Density	Current +Gelcoat Application Tank Supplied 0.06" panel 38.5% HAP with MMA
2	1,2,3	5/14/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10 Resin Tank	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8	Current + Gelcoat Application Used totes 0.045" panel 38.8% HAP with MMA
3	1,2,3	5/15/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10 Resin Tank	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8	Current No Gelcoat 0.09" panel 45.2% HAP without MMA
4	1,2	5/15/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10 Resin Tank	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8	Current No Gelcoat Increased line speed to 18 fpm 0.09" panel 45.2% HAP without MMA
5	1,2,3	5/19/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10 Auxiliary	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8	Open No Gelcoat Removed metal panels and one glass panel. Disconnected exhaust line on table. 84 minute samples 0.06" panel 40.5% HAP with MMA
6	1,2,3	5/19/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8	Current No Gelcoat 0.06" panel 40.5% HAP with MMA

Table 2.1 (Concluded)

Condition No.	Run No.	Date	Sample Location	Pollutant	Process Condition
7	1,2,3	5/20/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8	Current No Gelcoat 0.075" panel 40.5% HAP with MMA
8	1,2,3	5/22/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8	Current No Gelcoat 0.06" panel 42.4% HAP without MMA
9	1	5/22/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8	Current No Gelcoat 0.09" panel 42.4% HAP without MMA
10	1	5/22/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8	Current No Gelcoat 0.129" panel 39.5% HAP without MMA
11	1,2,3	5/23/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8	Current No Gelcoat 0.09" panel 39.5% HAP without MMA
12	1,2,3,4 Void No. 2	5/29/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10 Auxiliary Exhaust	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8 THC, C_8H_8,	Open No Gelcoat Panels removed System opened up Auxiliary fan on 0.09" panel 45.2% HAP without MMA
13	1,2,3	5/29/97	Main Exhaust Room Exhaust NDOs Oven 9 & 10 Auxiliary Exhaust	THC, C_8H_8, THC, C_8H_8, THC, C_8H_8, THC, CH_4, C_2H_6, C_8H_8 THC, C_8H_8,	Closed No Gelcoat Panels all in place Additional panels + plastic used to enclose all table "wet" areas Auxiliary Fan on 0.09" panel 45.2% HAP without MMA

[a] Total hydrocarbon concentration measured by EPA Method 25A.
[b] Styrene concentration measured by EPA Method 18.
[c] Methane concentration measured by EPA Method 18.
[d] Ethane concentration measured by EPA Method 18.

The open condition involved the removal of panels and enclosures covering the wet application area of the line. The top panels and hinged access panels were removed or opened where possible. The Main Exhaust duct was disconnected so there was no air being pulled directly from the table area. The Main Exhaust pickup lines were all closed (knife dampers closed) and the pickup lines disconnected and taped off. The Main Exhaust fan continued to draw fugitive emissions from above the table area. The open condition was to simulate uncontrolled emissions from the table area. The Auxiliary Exhaust was operated during the open condition so that pressure negativity could be maintained in the room. The sampling areas consisted of the Main Exhaust, Room Exhaust, Auxiliary Exhaust, three NDOs, and Ovens 9 and 10 exhaust stacks.

The closed condition was the operation of the line with everything covered and panels in place on the process line. The Main Exhaust line was disconnected so there was no air flow being pulled directly from the table area. The Main Exhaust pickup lines were all closed (knife dampers closed), and the pickup lines disconnected and taped off. Additional rigid panels were placed on any open areas on the top and sides of the table area. The rigid panels were taped closed where possible. Areas where rigid panels could not be used were covered with foil-faced foam insulation board and taped shut. The table area was estimated to be 98% covered. The Auxiliary Exhaust was operated during the closed condition so that pressure negativity could be maintained in the room. The sampling areas consisted of the Main Exhaust, Room Exhaust, three NDOs, and Ovens 9 and 10 exhaust stacks.

During all process conditions (current, open, and closed), the production room was treated as a TTE. All air THC concentrations entering the room enclosure and exiting the room enclosure were measured continuously by EPA Method 25A. A more detailed description of the process conditions is presented in Section 3, Process Description.

2.2 PROCESS LINE RESULTS

The room containing the process line was treated as a TTE. The TTE enabled sampling all HAP concentrations entering and leaving the enclosure for the purpose of determining total HAPs emitted from the process line. The TTE is described in detail at the end of this section. The emission points sampled were the following: main exhaust, room exhaust, auxiliary exhaust, and NDOs A, B, C and D. Sampling at the emission points was conducted using EPA Methods 1-4, 18 and 25A to determine stack gas velocity, temperature, molecular weight, moisture content, styrene/MMA/cumene concentrations and THC concentrations. Typically, three 60-minute sample runs were conducted for each process condition sampled. Sample run times were modified dependent on process material production rates.

2.3 TOTAL TEMPORARY ENCLOSURE - METHOD 25A TOTAL HYDROCARBON RESULTS

Table 2.2 presents the THC mass emission rate summary for data collected at the TTE locations. The THC mass rate data represents emissions collected using EPA Method 25A. The THC mass rate data was calculated using styrene response factors to adjust all data to a styrene basis. The calculated overall THC mass emission rate from the TTE exhaust was determined by adding the THC mass emission rates from the Main Exhaust, Room Exhaust and Auxiliary Exhaust, and subtracting the THC mass emission rates from NDOs A, B, C and D. Conditions 1 and 2 showed the highest THC mass emission rates which represented a "current" condition with the gel coat line in operation. The gel coat line was expected to increase THC mass emission rates. The lowest THC mass emission rates were measured during Condition 13 which was the "closed" condition. Concentrations and mass emission rates were consistent during each sample condition.

2.4 TOTAL TEMPORARY ENCLOSURE - VOLUMETRIC AIR FLOW RATE RESULTS

Tables 2.3 through 2.15 present volumetric flow rate data and THC concentration and mass emission rate data collected at the TTE sites. Each table of results represents a sample condition, 13 total conditions were sampled. The sampling sites consisted of the main exhaust, room exhaust, auxiliary exhaust and NDOs A, B, C and D. One volumetric flow rate was performed for each sample run at each location. Flow conditions were very consistent over the sample program.

2.5 TOTAL TEMPORARY ENCLOSURE - METHOD 18 RESULTS

Table 2.16 presents the Method 18 results measured at the TTE sample locations. One sample run for styrene, cumene, and MMA was performed for each sample condition (or 1 run per 3 Method 25A sample runs). The Method 18 data was collected as support for the THC results and as an indicator of the amount of styrene and cumene present at each sample location. The measurement of MMA was not part of the original test plan but was added while onsite. Initial estimates of the HAPs present was that the MMA would account for less than 0.2% of the total HAP content from the process line and was not a compound of concern. While onsite, it was discovered that MMA may account for higher percentages of the HAP content depending on type of product produced. At this point it was decided to measure MMA along with the styrene and cumene HAPs being measured. It should be noted that recovery efficiencies for the MMA were consistently at 70% (70 - 130% were the acceptable ranges). The Method 18 laboratory results were adjusted for recovery efficiencies.

TABLE 2.2

TTE TOTAL HYDROCARBON MASS EMISSION RATE SUMMARY[a]

LASCO Panel Products

Condition No.	Run No.	NDO Total, lb/hr[b]	Main Exhaust, lb/hr[c]	Room Exhaust, lb/hr[c]	Auxiliary Exhaust, lb/hr[c]	Total Overall Enclosure Exhaust, lb/hr[d]
1	1	0.38	70.44	13.11	NA	83.17
1	2	0.34	59.32	11.13	NA	70.11
1	3	0.34	56.62	11.47	NA	67.75
Average		0.35	62.13	11.91	NA	73.68
2	1	0.64	56.92	10.51	NA	66.79
2	2	0.66	55.50	15.11	NA	69.95
2	3	0.69	55.34	14.85	NA	69.50
Average		0.66	55.92	13.49	NA	68.75
3	1	0.65	18.22	3.88	NA	21.45
3	2	0.64	17.59	4.50	NA	21.45
3	3	0.64	16.74	4.42	NA	20.52
Average		0.64	17.52	4.27	NA	21.14
4	1	0.80	18.34	3.69	NA	21.23
4	2	0.80	18.37	4.04	NA	21.61
4	3	NA	NA	NA	NA	NA
Average		0.80	18.35	3.87	5.02	21.42
5	1	0.18	11.24	3.53	4.70	19.61
5	2	0.18	10.00	3.98	4.79	18.51
5	3	0.18	9.70	4.02	4.84	18.32
Average		0.18	10.31	3.85	NA	18.81
6	1	0.20	21.40	5.42	NA	26.62
6	2	0.20	21.20	5.03	NA	26.03
6	3	0.20	21.59	3.94	NA	25.33
Average		0.20	21.40	4.80	NA	25.99

TABLE 2.2 (Concluded)

Condition No.	Run No.	NDO Total, lb/hr[b]	Main Exhaust, lb/hr[c]	Room Exhaust, lb/hr[c]	Auxiliary Exhaust, lb/hr[c]	Total Overall Enclosure Exhaust, lb/hr[d]
7	1	0.14	18.12	3.28	NA	21.26
7	2	0.14	21.69	3.63	NA	25.18
7	3	0.14	22.20	3.38	NA	25.44
Average		0.14	20.67	3.43	NA	23.96
8	1	0.47	15.98	6.65	NA	22.17
8	2	0.47	16.08	6.44	NA	22.06
8	3	0.46	17.18	5.01	NA	21.73
Average		0.47	16.41	6.04	NA	21.99
9	1	0.18	15.53	2.61	NA	17.96
10	1	0.21	15.28	2.12	NA	17.19
11	1	0.28	14.11	3.81	NA	17.64
11	2	0.27	14.35	3.03	NA	17.11
11	3	0.28	14.13	2.99	NA	16.84
Average		0.28	14.20	3.28	NA	17.20
12	1	0.88	8.96	4.86	6.05	18.98
12	2	0.88	7.42	4.32	4.89	15.75
12	3	0.85	7.05	3.97	4.71	14.88
Average		0.87	7.81	4.38	5.22	16.54
13	1	0.77	4.59	3.16	4.11	11.08
13	2	0.76	4.34	3.25	3.89	10.72
13	3	0.77	4.42	3.34	4.11	11.11
Average		0.77	4.45	3.25	4.04	10.97

[a] Oven emissions are not included in this table.
[b] Pound per hour, total of four natural draft openings as styrene equivalent.
[c] Pound per hour, as styrene equivalent.
[d] Pound per hour, Enclosure exhaust adjusted for NDO contribution as styrene equivalent.

TABLE 2.3

SUMMARY OF TTE STACK GAS CONDITIONS, AND THC CONCENTRATIONS AND MASS EMISSION RATES CONDITION 1 - MAY 14, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Main Exhaust										
1	1034-1134	37.22	3729	3378	92	1.6	2965.4	3013.6	1284.7	70.44
2	1225-1325	33.83	3390	3030	91	3.5	2730.4	2829.4	1206.2	59.32
3	1546-1646	31.62	3168	2804	93	4.1	2798.6	2918.2	1244.0	56.62
Average		34.22	3429	3071	92	3.1	2831.5	2921.0	1245.0	62.13
Room Exhaust										
1	1034-1134	18.86	5281	4886	78	1.9	380.5	387.9	165.3	13.11
2	1225-1325	17.28	4838	4483	81	1.6	353.2	358.9	153.0	11.13
3	1546-1646	17.82	4993	4644	79	1.6	351.3	357.0	152.2	11.47
Average		17.99	5037	4671	79	1.7	361.7	367.9	156.9	11.91

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	275	7334	6.1	550	138	NA	263	665	15.9	210	531	15.9
2	235	6267	5.0	600	150	6.0	230	582	NA	200	506	NA
3	230	6134	6.9	600	150	6.0	240	607	3.0	200	506	3.0
Average	247	6578	6.0	583	146	6.0	244	618	9.5	203	514	9.5

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor.
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute.

TABLE 2.4

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 2 - MAY 14, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Main Exhaust										
1	2020-2125	34.87	3494	3173	92	1.5	2553.6	2592.5	1105.2	56.92
2	2155-2255	33.70	3377	3105	89	0.8	2562.8	2583.5	1101.3	55.50
3	2337-0038	36.20	3628	3333	89	0.9	2378.0	2399.6	1022.9	55.34
Average		34.92	3500	3204	90	1.1	2498.1	2525.1	1076.5	55.92
Room Exhaust										
1	2020-2125	17.86	5001	4637	82	1.1	324.1	327.7	139.7	10.51
2	2155-2255	19.16	5369	4983	82	1.0	433.9	438.3	186.8	15.11
3	2337-0038	19.45	5450	5062	81	1.1	419.4	424.1	180.8	14.85
Average		18.82	5273	4894	82	1.1	392.5	396.7	169.1	13.49

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	225	6000	5.7	450	113	NA	265	670	1.6	200	506	1.6
2	235	6267	4.5	350	88	NA	260	658	2.9	210	531	2.9
3	225	6000	30.1	550	138	4.4	260	658	5.4	260	658	5.4
Average	228	6089	13.4	450	113	4.4	262	662	3.3	223	565	3.3

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor.
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute.

TABLE 2.5

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 3 - MAY 15, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Room Exhaust										
1	1425-1525	37.65	3772	3526	80	1.0	739.2	746.7	318.3	18.22
2	1559-1659	36.41	3648	3414	80	0.9	738.1	744.8	317.5	17.59
3	1735-1836	36.36	3643	3424	80	1.1	698.6	706.4	301.1	16.74
Average		36.81	3688	3455	80	1.0	725.3	732.6	312.3	17.52
Room Exhaust										
1	1425-1525	18.76	5255	4961	75	0.8	112.2	113.1	48.2	3.88
2	1559-1659	18.60	5213	4950	75	0.9	130.1	131.3	56.0	4.50
3	1735-1836	18.71	5241	4974	76	0.8	127.5	128.5	54.8	4.42
Average		18.69	5236	4962	75	0.8	123.3	124.3	53.0	4.27

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	225	6000	12.0	650	163	12.3	245	620	0.6	260	658	0.6
2	240	6400	15.1	650	163	1.8	240	607	1.8	250	633	1.8
3	230	6134	11.3	650	163	8.3	240	607	2.8	260	658	2.8
Average	232	6178	12.8	650	163	7.5	242	611	1.7	257	650	1.7

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor.
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute.

TABLE 2.6

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 4 - MAY 15, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Main Exhaust										
1	2005-2105	40.44	4053	3846	78	0.9	682.8	689.0	293.7	18.34
2	2130-2230	40.23	4032	3823	78	1.0	687.6	694.5	296.1	18.37
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		40.34	4043	3835	78	1.0	685.2	691.8	294.9	18.35
Room Exhaust										
1	2005-2105	18.15	5083	4846	75	0.9	109.2	110.2	47.0	3.69
2	2130-2230	18.32	5129	4886	75	0.9	118.4	119.5	50.9	4.04
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		18.24	5106	4866	75	0.9	113.8	114.8	49.0	3.87

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	250	6668	12.8	700	175	1.6	250	633	1.7	275	696	1.7
2	275	7334	18.3	700	175	NA	300	759	1.6	275	696	1.6
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average	263	7000	15.6	700	175	1.6	275	696	1.7	275	696	1.7

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor.
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute.

TABLE 2.7

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 5 - MAY 19, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Main Exhaust										
1	0903-1027	36.59	3667	3345	87	2.0	476.0	485.7	207.1	11.24
2	1106-1231	36.55	3663	3314	90	2.1	426.9	436.1	185.9	10.00
3	1357-1521	36.94	3701	3308	92	2.4	413.5	423.7	180.6	9.70
Average		36.69	3677	3322	90	2.2	438.8	448.5	191.2	10.31
Room Exhaust										
1	0903-1027	17.06	4777	4402	80	2.1	113.5	115.9	49.4	3.53
2	1106-1231	17.28	4842	4297	83	2.3	130.9	134.0	57.1	3.98
3	1357-1521	18.21	5099	4619	85	2.2	123.1	125.9	53.7	4.02
Average		17.52	4906	4439	83	2.2	122.5	125.3	53.4	3.85
Auxiliary Exhaust										
1	0903-1027	40.84	5219	4780	83	2.1	148.7	151.9	64.8	5.02
2	1106-1231	40.14	5124	4677	84	2.1	142.3	145.4	62.0	4.70
3	1357-1521	39.28	5020	4541	86	2.1	149.1	152.3	64.9	4.79
Average		40.09	5121	4666	84	2.1	146.7	149.8	63.9	4.84

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	325	8668	1.1	500	125	0.0	300	759	0.0	350	886	0.0
2	325	8668	4.7	400	100	0.5	275	696	0.9	250	633	0.9
3	325	8668	1.1	500	125	3.3	275	696	0.8	250	633	0.8
Average	325	8668	2.3	467	117	1.3	283	717	0.6	283	717	0.6

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor.
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute.

TABLE 2.8

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 6 - MAY 19, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Main Exhaust										
1	1605-1706	38.68	3876	3513	88	2.2	861.0	880.4	375.3	21.40
2	1734-1855	38.09	3817	3449	89	2.3	868.0	888.4	378.7	21.20
3	1936-2018	38.07	3815	3488	86	1.9	877.6	894.6	381.4	21.59
Average		38.28	3836	3483	88	2.1	868.9	887.8	378.5	21.40
Room Exhaust										
1	1605-1706	18.23	5107	4663	83	2.2	164.2	167.9	71.6	5.42
2	1734-1855	19.03	5331	4868	83	2.2	146.0	149.3	63.6	5.03
3	1936-2018	19.06	5341	4920	81	1.9	113.6	115.8	49.4	3.94
Average		18.77	5260	4817	82	2.1	141.3	144.3	61.5	4.80

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	300	8001	3.9	250	62.5	3.0	250	633	2.7	250	633	2.7
2	250	6668	3.8	250	62.5	9.7	250	633	5.6	250	633	5.6
3	275	7334	2.4	200	50	29.6	250	633	1.9	350	886	1.9
Average	275	7334	3.4	233	58	14.1	250	633	3.4	283	717	3.4

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor.
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute.

TABLE 2.9

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 7 - MAY 20, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Main Exhaust										
1	1449-1613	38.82	3891	3585	84	1.8	717.5	730.7	311.5	18.12
2	1705-1828	38.73	3881	3593	83	1.5	859.4	872.5	371.9	21.69
3	1913-2036	38.86	3893	3608	83	1.4	876.6	889.0	379.0	22.20
Average		38.59	3866	3575	83	1.6	817.9	830.8	354.1	20.67
Room Exhaust										
1	1449-1613	18.16	5085	4772	77	1.1	98.1	99.2	42.3	3.28
2	1705-1828	18.86	5291	4979	77	0.8	104.4	105.2	44.9	3.63
3	1913-2036	18.06	5060	4753	77	1.0	101.7	102.7	43.8	3.38
Average		18.36	5145	4835	77	1.0	101.4	102.4	43.6	3.43

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	250	6668	3.4	200	50	3.5	250	633	2.2	300	759	2.2
2	250	6668	2.0	200	50	3.8	250	633	1.5	300	759	1.5
3	300	8001	1.9	300	75	1.4	300	759	1.0	300	759	1.0
Average	267	7112	2.4	233	58	2.9	267	675	1.6	300	759	1.6

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor.
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute.

TABLE 2.10

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 8 - MAY 22, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Main Exhaust										
1	0752-0844	38.58	3866	3724	74	1.2	612.8	620.2	264.4	15.98
2	0919-1049	38.45	3853	3679	77	1.5	622.3	631.8	269.3	16.08
3	1139-1309	38.47	3855	3661	80	1.5	667.9	678.1	289.1	17.18
Average		38.50	3858	3688	77	1.4	634.3	643.3	274.3	16.41
Room Exhaust										
1	0752-0844	18.95	5309	5144	71	1.0	185.0	186.9	79.7	6.65
2	0919-1049	19.42	5441	5272	71	1.0	174.9	176.7	75.3	6.44
3	1139-1309	18.58	5202	5013	74	1.0	143.1	144.5	61.6	5.01
Average		18.98	5317	5143	72	1.0	167.7	169.4	72.2	6.04

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	275	7334	11.0	550	138	NA	550	1392	6.2	450	1139	6.2
2	300	8001	5.6	400	100	2.5	350	886	3.0	400	1012	3.0
3	300	8001	NA	400	100	NA	300	759	NA	400	1012	NA
Average	292	7779	8.3	450	113	2.5	400	1012	4.6	417	1054	4.6

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor.
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute

TABLE 2.11

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 9 - MAY 22, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Main Exhaust										
1	1802-1844	38.69	3877	3624	84	1.6	609.3	619.2	264.0	15.53
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		38.69	3877	3624	84	1.6	609.3	619.2	264.0	15.53
Room Exhaust										
1	1802-1844	17.74	4971	4728	78	0.8	79.2	79.8	34.0	2.61
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		17.74	4971	4728	78	0.8	79.2	79.8	34.0	2.61

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	250	6668	3.2	300	75	2.7	300	759	2.7	400	1012	2.7
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average	250	6668	3.2	300	75	2.7	300	759	2.7	400	1012	2.7

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor.
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute.

TABLE 2.12

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 10 - MAY 22, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Main Exhaust										
1	1959-2050	38.45	3854	3623	82	1.4	600.9	609.4	259.8	15.28
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		38.45	3854	3623	82	1.4	600.9	609.4	259.8	15.28
Room Exhaust										
1	1959-2050	17.16	4806	4597	76	0.6	66.1	66.5	28.3	2.12
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		17.16	4806	4597	76	0.6	66.1	66.5	28.3	2.12

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	300	8001	3.8	550	138	2.6	400	1012	2.6	400	1012	2.6
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average	300	8001	3.8	550	138	2.6	400	1012	2.6	400	1012	2.6

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor.
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute.

TABLE 2.13

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 11 - MAY 23, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm,asstyrene[f]	
Main Exhaust										
1	0912-1015	38.36	3844	3672	77	1.4	547.5	555.3	236.7	14.11
2	1040-1121	38.42	3849	3652	79	1.7	558.3	568.0	242.1	14.35
3	1200-1242	38.06	3813	3581	81	1.6	561.2	570.3	243.1	14.13
Average		38.28	3835	3635	79	1.6	555.7	564.5	240.7	14.20
Room Exhaust										
1	0912-1015	17.32	4850	4694	72	0.9	116.3	117.4	50.0	3.81
2	1040-1121	16.87	4727	4557	74	0.9	95.2	96.1	41.0	3.03
3	1200-1242	18.24	5107	4863	77	0.8	88.2	88.9	37.9	2.99
Average		17.48	4895	4705	74	0.9	99.9	100.8	43.0	3.28

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	300	8001	8.0	525	131	1.5	400	1012	3.3	400	1012	3.3
2	300	8001	5.0	525	131	0.9	400	1012	1.0	400	1012	1.0
3	200	5334	3.9	525	131	3.1	400	1012	0.8	400	1012	0.8
Average	267	7112	5.6	525	131	1.8	400	1012	1.7	400	1012	1.7

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute.

TA[redacted] 2.1

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 12 - MAY 29, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Main Exhaust										
1	0835-0935	36.60	3667	3459	79	1.7	368.0	374.4	159.6	8.96
3	1104-1202	35.63	3571	3364	80	1.6	313.5	318.6	135.8	7.42
4	1230-1330	35.24	3531	3305	82	1.9	304.9	308.3	131.4	7.05
Average		35.82	3590	3376	80	1.7	328.8	333.7	142.3	7.81
Room Exhaust										
1	0835-0935	17.05	4774	4541	74	1.6	152.1	154.6	65.9	4.86
3	1104-1202	17.30	4846	4610	74	1.6	133.2	135.4	57.7	4.32
4	1230-1330	16.37	4587	4350	75	1.7	129.6	131.8	56.2	3.97
Average		16.91	4736	4500	74	1.6	138.3	140.6	59.9	4.38
Auxiliary Exhaust										
1	0835-0935	38.53	4924	4694	72	1.7	183.0	186.2	79.4	6.05
3	1104-1202	38.91	4967	4731	73	1.6	147.1	149.5	63.7	4.89
4	1230-1330	37.56	4800	4547	76	1.6	147.4	149.8	63.9	4.71
Average		38.33	4897	4657	74	1.6	159.2	161.8	69.0	5.22

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	450	12,002	10.8	1000	250	1.4	250	633	1.5	350	886	1.5
3	450	12,002	12.0	950	238	0.2	300	759	0.3	450	1139	0.3
4	450	12,002	11.2	850	213	0.2	300	759	0.4	400	1012	0.4
Average	450	12,002	11.3	933	234	0.6	283	717	0.7	400	1012	0.7

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, dry basis as propane equivalent.
[f] Part per million as styrene equivalent based on styrene response factor
[g] Pound per hour.
[h] Feet per minute.
[i] Cubic feet per minute.

TABLE 2.15

SUMMARY OF TTE STACK GAS CONDITIONS AND THC CONCENTRATIONS
CONDITION 13 - MAY 29, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration			Mass Rate, lb/hr[g]
			acfm[b]	dscfm[c]			ppm, wet[d]	ppm, dry[e]	ppm, as styrene[f]	
Main Exhaust										
1	1518-1614	35.46	3553	3362	77	1.4	194.4	197.2	84.0	4.59
2	1637-1737	35.77	3585	3358	81	1.7	183.8	187.0	79.7	4.34
3	1801-1901	35.56	3565	3325	82	1.9	188.5	192.2	81.9	4.42
Average		35.60	3568	3348	80	1.7	188.9	192.1	81.9	4.45
Room Exhaust										
1	1518-1614	16.89	4729	4465	75	1.8	100.3	102.1	43.5	3.16
2	1637-1737	16.68	4671	4412	75	1.8	104.5	106.4	45.4	3.25
3	1801-1901	16.82	4708	4447	76	1.6	106.9	108.6	46.3	3.34
Average		16.80	4703	4441	75	1.7	103.9	105.7	45.1	3.25
Auxiliary Exhaust										
1	1518-1614	37.58	4797	4536	75	1.6	128.8	130.9	55.8	4.11
2	1637-1737	37.14	4741	4471	76	1.7	123.6	125.7	53.6	3.89
3	1801-1901	37.59	4799	4529	76	1.7	129.0	131.2	55.9	4.11
Average		37.44	4779	4512	76	1.7	127.1	129.3	55.1	4.04

Run No.	NDO-A (-)			NDO-B (-)			NDO-C (+) Forced Makeup Air			NDO-D (+) Forced Makeup Air		
	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]	Velocity, fpm[h]	Flow Rate, cfm[i]	Conc, ppm wet[d]
1	450	12,002	11.7	950	238	4.2	300	759	1.8	400	1012	1.8
2	450	12,002	10.1	950	238	1.5	400	1012	1.9	400	1012	1.9
3	450	12,002	8.4	950	238	3.1	400	1012	1.8	400	1012	1.8
Average	450	12,002	10.1	950	238	2.9	367	928	1.8	400	1012	1.8

[a]Feet per second.
[b]Actual cubic feet per minute.
[c]Dry standard cubic feet per minute.
[d]Part per million, wet basis as propane equivalent.
[e]Part per million, dry basis as propane equivalent.
[f]Part per million as styrene equivalent based on styrene response factor.
[g]Pound per hour.
[h]Feet per minute.
[i]Cubic feet per minute.

TABLE 2.16 (Concluded)

Condition No.	Run No.	NDO[a] Total, lb/hr[b]	Main Exhaust, lb/hr[b]	Room Exhaust, lb/hr[b]	Auxiliary Exhaust, lb/hr[b]	Total Overall Enclosure Exhaust, lb/hr[b]
7	1	ND	11.25	1.20	NA	13.99
7	2	ND	-	-	NA	
7	3	-	14.33	-	NA	
Average			12.79	1.20	NA	
8	1	ND	10.11	3.39	NA	13.50
8	2	ND	-	-	NA	
8	3	-	-	-	NA	
Average			10.11	3.39	NA	
9	1	ND	10.47	2.08	NA	12.15
10	1	ND	VOID	0.44	NA	0.44[f]
11	1	ND	7.97	1.47	NA	8.76
11	2	-	7.36	-	NA	
11	3	-	-	0.71	NA	
Average			7.67	1.09	NA	
12	1	ND	5.29	-	4.03	8.69
12	2	ND	-	-	-	
12	3	-	4.87	-	3.19	
Average			5.08	-	3.61	
13	1	0.36	-	1.781	2.43	7.04
13	2	-	2.80	-	-	
13	3	-	-	-	-	
Average		0.36	2.80	1.81	2.43	

[a] Note: NDO-Aflowrates and concentrations were used to calculate mass rates.
[b] lb/hr = Pound per hour, total pounds of styrene and MMA measured.
[c] ND = Detection limit of analytical instrument.
[d] - = Sample not collected in this test condition.
[e] NA = Not applicable - auxiliary fan not in operation.
[f] Result is not valid due to a voided main exhaust sample.

The Method 18 analysis showed MMA, styrene and cumene at detection limit (± 1 ppm) values for most of the runs conducted at the NDO sites. If compounds were detected, the TTE results were adjusted based on HAP content at the NDO sites.

2.6 OVEN NOS. 9 AND 10 - METHOD 25A TOTAL HYDROCARBON RESULTS

Table 2.17 presents the THC mass emission rate summary for the Oven Nos. 9 and 10 locations. The THC mass emission rate data represents emissions collected using EPA Method 25A and corrected for methane and ethane mass emission rates measured by Method 18. The methane and ethane concentrations were a result of inefficient natural gas dryers; these concentrations were measured and subtracted from the Method 25A total. The final THC mass emission rate data was calculated using styrene response factors to adjust all data to a styrene basis. The oven sampling program was performed simultaneously with the TTE sampling.

2.7 OVEN NOS. 9 AND 10 - VOLUMETRIC FLOW RATE RESULTS

Tables 2.18 through 2.30 present flow rate data and THC concentration data collected at the Oven Nos. 9 and 10 sample sites. Each table of results represents a sample condition, 13 total conditions. One volumetric flow rate was performed for each sample run at each location. Flow conditions were very consistent during the sample program.

2.8 OVEN NOS. 9 AND 10 - METHOD 18 HAP RESULTS

Table 2.31 presents the Method 18 results measured at the Oven Nos. 9 and 10 sample locations. One sample run for styrene, cumene and MMA was performed for each sample condition. As mentioned in Section 2.5, the Method 18 data was collected as support for the THC results and as an indicator of the amount of styrene, cumene and MMA present at each sample location. The Method 18 results were adjusted for recovery efficiencies.

2.9 UNCATALYZED RESIN (UCR) AND GEL COAT SAMPLE RESULTS

Process samples of the UCR and gel coat (gel coat was only used during Conditions 1 and 2) were collected at the beginning and end of each sample run. The process samples were analyzed by EPA Method 24 to determine volatile matter content, water content, density and weight of solids. Analysis was also performed to determine HAP content. Results of the analysis are contained in the ESD Test Report.

TABLE 2.17

OVENS 9 AND 10 THC
MASS EMISSION RATE SUMMARY

LASCO Panel Products

Condition No.	Run No.	Oven No. 9 Exhaust, lb/hr[a]	Oven No. 10 Exhaust, lb/hr[a]	Total Oven Exhaust, lb/hr[a]
1	1	0.27	0.18	0.45
1	2	0.31	0.12	0.43
1	3	0.28	0.11	0.39
Average		0.28	0.14	0.42
2	1	0.00	0.18	0.18
2	2	0.00	0.07	0.07
2	3	0.22	0.05	0.27
Average		0.07	0.10	0.17
3	1	0.43	2.24	2.67
3	2	0.29	2.21	2.50
3	3	0.29	2.45	2.74
Average		0.34	2.30	2.64
4	1	0.26	2.80	3.06
4	2	0.33	2.66	2.99
4	3	NA	NA	NA
Average		0.29	2.73	3.02
5	1	0.40	1.46	1.86
5	2	0.72	1.35	2.07
5	3	0.60	1.43	2.03
Average		0.57	1.41	1.98
6	1	1.11	1.26	2.37
6	2	0.85	1.54	2.39
6	3	0.95	1.46	2.41
Average		0.97	1.42	2.39

TABLE 2.17 (Concluded)

Condition No.	Run No.	Oven No. 9 Exhaust, lb/hr[a]	Oven No. 10 Exhaust, lb/hr[a]	Total Oven Exhaust, lb/hr[a]
7	1	0.53	1.81	2.34
7	2	0.68	1.96	2.64
7	3	0.61	1.89	2.50
Average		0.61	1.89	2.50
8	1	0.00	0.55	0.55
8	2	0.23	0.56	0.79
8	3	0.12	1.10	1.22
Average		0.12	0.74	0.86
9	1	0.32	2.68	3.00
10	1	0.58	2.16	2.74
11	1	0.03	3.18	3.21
11	2	0.20	3.39	3.59
11	3	0.17	3.23	3.40
Average		0.13	3.27	3.40
12	1	0.75	2.95	3.70
12	2	0.78	3.40	4.18
12	3	0.55	3.39	3.94
Average		0.69	3.25	3.94
13	1	0.74	3.94	4.68
13	2	0.69	4.11	4.80
13	3	0.96	4.09	5.05
Average		0.80	4.05	4.85

[a] Pound per hour, as styrene equivalent, excluding methane and ethane.

TABLE 2.18

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 1 - MAY 14, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	1034-1134	32.44	2394	1907	169	1.8	118.7	19.7	20.1	8.6	0.27
2	1225-1325	32.80	2420	1924	169	1.8	132.3	22.7	23.2	9.9	0.31
3	1546-1646	33.18	2449	1927	173	1.8	128.2	20.5	20.9	8.9	0.28
Average		32.81	2421	1919	170	1.8	126.4	21.0	21.4	9.1	0.28
Oven 10											
1	1034-1134	34.25	2522	1836	218	2.7	43.5	13.7	14.1	6.0	0.18
2	1225-1325	34.83	2564	1893	214	2.3	41.7	9.1	9.3	4.0	0.12
3	1546-1646	34.98	2575	1878	222	1.9	39.5	8.4	8.6	3.7	0.11
Average		34.69	2554	1869	218	2.3	41.6	10.4	10.7	4.5	0.14
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											0.42

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.19

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 2 - MAY 14, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	2020-2125	32.52	2394	1905	172	1.3	50.4	0.0	0.0	0.0	0.00
2	2155-2255	31.62	2328	1870	165	1.2	71.9	0.0	0.0	0.0	0.00
3	2337-0038	33.15	2446	1964	165	1.1	108.0	15.7	15.8	6.8	0.22
Average		32.43	2389	1913	167	1.2	76.8	5.2	5.3	2.3	0.07
Oven 10											
1	2020-2125	33.66	2478	1825	219	1.4	43.5	14.4	14.6	6.2	0.18
2	2155-2255	32.67	2405	1769	220	1.4	38.1	5.8	5.9	2.5	0.07
3	2337-0038	33.25	2454	1807	219	1.4	34.6	4.1	4.2	1.8	0.05
Average		33.19	2446	1800	219	1.4	38.7	8.1	8.2	3.5	0.10
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											0.17

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.20

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 3 - MAY 15, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, Of	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	1425-1525	31.24	2306	1855	167	1.1	87.9	33.5	33.8	14.4	0.43
2	1559-1659	31.82	2348	1886	167	1.1	118.9	22.3	22.6	9.6	0.29
3	1735-1836	31.96	2359	1894	167	1.1	106.4	22.2	22.4	9.6	0.29
Average		31.67	2338	1878	167	1.1	104.4	26.0	26.3	11.2	0.34
Oven 10											
1	1425-1525	35.43	2615	1910	229	1.1	185.7	167.3	169.1	72.1	2.24
2	1559-1659	34.49	2545	1852	232	1.1	189.1	170.9	172.8	73.7	2.21
3	1735-1836	34.71	2561	1871	229	1.1	204.7	186.8	188.9	80.5	2.45
Average		34.88	2574	1878	230	1.1	193.2	175.0	176.9	75.4	2.30
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											2.64

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.21

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 4 - MAY 15, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, Of	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	2005-2105	31.85	2345	1890	164	1.2	110.1	19.5	19.7	8.4	0.26
2	2130-2230	32.22	2372	1917	163	1.2	113.4	24.3	24.6	10.5	0.33
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		32.03	2359	1904	164	1.2	111.8	21.9	22.1	9.4	0.29
Oven 10											
1	2005-2105	35.29	2599	1897	229	1.1	231.0	210.8	213.1	90.8	2.80
2	2130-2230	34.46	2537	1850	230	1.2	226.6	205.0	207.5	88.4	2.66
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		34.88	2568	1874	230	1.2	228.8	207.9	210.3	89.6	2.73
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											3.02

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.22

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 5 - MAY 19, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	0903-1027	31.83	2349	1821	164	2.8	149.8	30.6	31.5	13.4	0.40
2	1106-1231	32.54	2401	1934	164	2.5	164.1	52.6	53.9	23.0	0.72
3	1357-1521	31.28	2308	1958	165	2.2	139.8	43.6	44.6	19.0	0.60
Average		31.88	2353	1904	164	2.5	151.2	42.3	43.4	18.5	0.57
Oven 10											
1	0903-1027	34.20	2524	1859	222	2.5	125.6	110.7	113.5	48.4	1.46
2	1106-1231	34.84	2571	1890	223	2.5	121.6	100.8	103.4	44.1	1.35
3	1357-1521	34.83	2571	1882	226	2.5	118.1	106.9	109.7	46.8	1.43
Average		34.62	2555	1877	224	2.5	121.8	106.1	108.9	46.4	1.41
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											1.98

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.23

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 6 - MAY 19, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	1605-1706	32.68	2412	1948	164	2.2	156.3	80.4	82.2	35.0	1.11
2	1734-1855	32.64	2409	1942	164	2.2	161.4	62.2	63.6	27.1	0.85
3	1936-2018	32.22	2378	1923	162	2.2	167.2	69.6	71.2	30.4	0.95
Average		32.51	2400	1938	163	2.2	161.6	70.7	72.3	30.8	0.97
Oven 10											
1	1605-1706	33.52	2474	1814	225	2.3	111.7	98.0	100.3	42.8	1.26
2	1734-1855	33.64	2482	1835	222	2.1	139.9	118.6	121.1	51.6	1.54
3	1936-2018	33.65	2484	1837	222	1.9	131.0	112.6	114.8	48.9	1.46
Average		33.60	2480	1829	223	2.1	127.5	109.8	112.1	47.8	1.42
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											2.39

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.24

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 7 - MAY 20, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	1449-1613	32.00	2362	1905	164	1.2	146.3	39.4	39.8	17.0	0.53
2	1705-1828	32.27	2376	1898	168	1.6	121.8	51.2	52.1	22.2	0.68
3	1913-2036	32.56	2397	1905	169	1.9	109.9	45.3	46.1	19.7	0.61
Average		32.28	2378	1903	167	1.6	126.0	45.3	46.0	19.6	0.61
Oven 10											
1	1449-1613	32.50	2393	1746	229	1.3	165.6	147.7	149.7	63.8	1.81
2	1705-1828	34.04	2507	1829	229	1.3	168.0	153.2	155.2	66.2	1.96
3	1913-2036	34.27	2523	1833	232	1.3	161.3	147.1	149.0	63.5	1.89
Average		33.60	2474	1803	230	1.3	165.0	149.3	151.3	64.5	1.89
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											2.50

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.25

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 8 - MAY 22, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	0752-0844	32.10	2363	1926	167	1.7	112.9	0.0	0.0	0.0	0.00
2	0919-1049	32.10	2361	1927	166	1.7	131.5	17.3	17.6	7.5	0.23
3	1139-1309	32.16	2367	1929	167	1.7	110.8	8.7	8.9	3.8	0.12
Average		32.12	2364	1927	167	1.7	118.4	8.7	8.8	3.8	0.12
Oven 10											
1	0752-0844	34.24	2521	1918	214	1.3	62.4	40.8	41.3	17.6	0.55
2	0919-1049	34.19	2517	1883	213	3.1	64.4	41.6	43.0	18.3	0.56
3	1139-1309	34.41	2533	1854	215	4.9	101.1	81.6	85.8	36.6	1.10
Average		34.28	2524	1885	214	3.1	76.0	54.7	56.4	24.1	0.74
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											0.86

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.26

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 9 - MAY 22, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	1802-1844	31.20	2297	1839	160	4.5	67.0	23.7	24.8	10.6	0.32
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		31.20	2297	1839	160	4.5	67.0	23.7	24.8	10.6	0.32
Oven 10											
1	1802-1844	33.30	2452	1763	230	4.5	222.7	209.5	219.3	93.5	2.68
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		33.30	2452	1763	230	4.5	222.7	209.5	219.3	93.5	2.68
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											3.00

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.27

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 10 - MAY 22, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	1959-2050	31.12	2297	1909	164	0.2	110.9	44.0	44.1	18.8	0.58
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		31.12	2297	1909	164	0.2	110.9	44.0	44.1	18.8	0.58
Oven 10											
1	1959-2050	33.38	2464	1851	230	0.2	189.5	168.0	168.3	71.7	2.16
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average		33.38	2464	1851	230	0.2	189.5	168.0	168.3	71.7	2.16
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											2.74

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.28

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 11 - MAY 23, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	0912-1015	32.04	2359	1979	156	0.5	59.2	2.1	2.1	0.9	0.03
2	1040-1121	32.40	2385	2001	156	0.5	67.8	14.6	14.7	6.3	0.20
3	1200-1242	32.19	2369	1988	156	0.5	71.5	12.4	12.4	5.3	0.17
Average		32.21	2371	1989	156	0.5	66.2	9.7	9.8	4.2	0.13
Oven 10											
1	0912-1015	33.84	2492	1872	231	0.3	269.2	245.0	245.7	104.7	3.18
2	1040-1121	33.08	2435	1823	230	0.5	283.6	267.3	268.6	114.5	3.39
3	1200-1242	33.70	2481	1843	231	1.2	273.3	250.8	255.3	108.0	3.23
Average		33.54	2469	1846	231	0.7	275.4	254.3	255.9	109.1	3.27
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											3.40

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.29

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 12 - MAY 29, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	0835-0935	60.17	4430	3482	177	3.0	103.5	30.3	31.2	13.3	0.75
3	1104-1202	60.03	4419	3511	170	3.0	130.3	31.3	32.2	13.7	0.78
4	1230-1330	59.67	4393	3474	173	3.0	112.9	22.1	22.8	9.7	0.55
Average		59.96	4414	3489	173	3.0	115.6	27.9	28.8	12.3	0.69
Oven 10											
1	0835-0935	35.14	2587	1920	232	0.5	240.9	220.8	221.9	94.6	2.95
3	1104-1202	33.06	2508	1842	231	1.6	280.5	262.7	266.9	113.8	3.40
4	1230-1330	34.13	2512	1818	234	2.7	284.3	262.5	269.7	115.0	3.39
Average		34.11	2536	1860	232	1.6	268.6	248.6	252.7	107.7	3.25
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											3.94

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.30

SUMMARY OF OVEN STACK GAS CONDITIONS AND THC CONCENTRATIONS AND MASS EMISSION RATES, CONDITION 13 - MAY 29, 1997

LASCO Panel Products

Run No.	Time	Stack Gas Velocity, fps[a]	Volumetric Flow Rate		Temperature, °F	Moisture, %	THC Concentration				Mass Rate, lb/hr[h]
			acfm[b]	dscfm[c]			ppm, wet[d]	Adjusted ppm, wet[e]	ppm, dry[f]	ppm, as styrene[g]	
Oven 9											
1	1518-1614	59.97	4416	3560	172	1.0	124.6	29.9	30.2	12.9	0.74
2	1637-1737	59.81	4404	3530	171	1.6	130.8	27.8	28.3	12.1	0.69
3	1801-1901	59.92	4412	3545	173	1.0	121.8	38.6	39.0	16.6	0.96
Average		59.90	4411	3545	172	1.2	125.7	32.1	32.5	13.8	0.80
Oven 10											
1	1518-1614	33.63	2476	1804	230	2.2	331.8	308.9	315.8	134.6	3.94
2	1637-1737	33.83	2491	1823	226	2.2	340.3	318.7	325.9	138.9	4.11
3	1801-1901	33.97	2500	1814	233	2.2	334.0	318.9	326.0	139.0	4.09
Average		33.81	2489	1814	230	2.2	3354	315.5	322.6	137.5	4.05
Ovens 9 and 10 Total Mass Rate, lb/hr[h]											4.85

[a] Feet per second.
[b] Actual cubic feet per minute.
[c] Dry standard cubic feet per minute.
[d] Part per million, wet basis as propane equivalent.
[e] Part per million, wet basis adjusted for NDO contributions.
[f] Part per million, dry basis.
[g] Part per million as styrene equivalent based on styrene response factor.
[h] Pound per hour.

TABLE 2.31

OVENS 9 AND 10 MASS EMISSION RATE SUMMARY
STYRENE, METHYL METHACRYLATE, AND CUMENE BY EPA METHOD 18

LASCO Panel Products

Condition No.	Run No.	Oven No. 9 Exhaust, lb/hr[a]	Oven No. 10 Exhaust, lb/hr[a]	Total Oven Exhaust, lb/hr[a]
1	1	-[b]	0.003	0.003
1	2	-	-	
1	3	-	-	
Average		-	0.003	
2	1	0.040	-	0.197
2	2	-	0.157	
2	3	-	-	
Average		0.040	0.157	
3	1	-	0.006	0.032
3	2	0.026	-	
3	3	-	-	
Average		0.026	0.006	
4	1	-	0.006	0.463
4	2	0.457	-	
4	3	-	-	
Average		0.457	0.006	
5	1	0.044	-	0.870
5	2	-	0.826	
5	3	-	-	
Average		0.044	0.826	
6	1	-	0.766	0.816
6	2	0.050	-	
6	3	-	-	
Average		0.050	0.766	

TABLE 2.31 (Concluded)

Condition No.	Run No.	Oven No. 9 Exhaust, lb/hr[a]	Oven No. 10 Exhaust, lb/hr[a]	Total Oven Exhaust, lb/hr[a]
7	1	0.006	-	1.213
7	2	-	1.207	
7	3	-	-	
Average		0.006	1.207	
8	1	-	0.241	0.0247
8	2	0.006	-	
8	3	-	-	
Average		0.006	0.241	
9	1	0.032	-	0.032
10	1	-	1.555	1.555
11	1	-	0.614	0.620
11	2	0.006	-	
11	3	-	-	
Average		0.006	0.614	
12	1	-	0.749	1.603
12	3	0.129	-	
12	4	-	2.199	
Average		0.129	1.474	
13	1	-	2.711	3.138
13	2	0.427	-	
13	3	-	-	
Average		0.427	2.711	

[a] Pound per hour, total pounds of styrene and MMA measured.
[b] - = Sample not collected in this test condition.

2.10 RESPONSE FACTOR RESULTS

The THC concentrations were monitored continuously according to EPA Method 25A guidelines, using flame-ionization analyzers (FIAs). The instruments were calibrated onsite before and after each sample run using EPA Protocol propane-in-air standards. Since the main HAP of interest was styrene, response factors (RFs) were developed to determine instrument responses relative to styrene. A modified EPA proposed Method 204F was used to prepare styrene bag standards. From the bag standards, instrument response factors were developed over three concentration ranges used during sampling. The RF results are presented in Table 2.32. The factors were very consistent over the three calibration ranges. An average RF value of 0.4263 was used to convert all Method 25A propane results to styrene. The RF laboratory results are contained in Appendix C.

2.11 METHOD 204 TOTAL TEMPORARY ENCLOSURE VERIFICATION

The room containing the process line was treated as a TTE, which enabled sampling all HAP concentrations entering and leaving the enclosure. Figure 2.1 is the general layout (not to scale) of the TTE and dimensions of the NDOs and exhaust locations. EPA proposed Method 204, "Criteria for and Verification of a Permanent or Temporary Total Enclosure" presents a five-point criteria for verification of a TTE. The LASCO Wide Line process room was configured to meet these criteria of a TTE. Natural draft openings were minimized and an auxiliary room exhaust fan was added to ensure a minimum negative static of 0.004 inches H_2O. The enclosure met the following criteria required of a TTE:

A) Natural draft openings (NDOs) are at least four equivalent opening diameters from each VOC emitting point.

B) The total area of all NDOs shall not exceed 5% of the surface area of the enclosure's four walls, floor and ceiling.

C) The average facial velocity (FV) of air through all NDOs shall be at least 3,600 meters per hour (m/hr) or 200 fpm, or the negative static pressure in the enclosure must be $\geq$0.004 in. H_2O. The direction of flow through all NDOs shall be into the enclosure.

D) All access doors and windows whose areas are not included in Criteria B and are not included in the calculation in Criteria C shall be closed during routine process operation.

TABLE 2.32

SUMMARY OF RESPONSE FACTOR RESULTS
STYRENE BAG STANDARDS

LASCO Panel Products

Bag Standard	Syrene Injection, ppm (Styrene)[a]	JUM 1 Response, ppm (Propane)[b]	Response Factor	JUM 5 Response, ppm (Propane)[b]	Response Factor
Run 1	67.7	161.1	0.4202	156.9	0.4315
Run 2	67.9	160.3	0.4236	157.8	0.4303
Run 3	134.6	319.0	04219	316.3	04255
Run 4	189.8	441.3	0.4301	431.4	0.4400
Run 5	362.2	855.9	0.4232	843.9	0.4292
Run 6	557.3	1266	0.4402	1250	0.4458
Run 7	1106.2	2636	0.4197	2642	0.4187
Run 8	1659.5	3983	0.4166	4103	0.4045
Average			0.4244		0.4282
Overall Average 0.4263		Standard Deviation 0.75%		Standard Deviation 1.27%	

[a]Part per million, styrene.
[b]Part per million, propane equivalent.

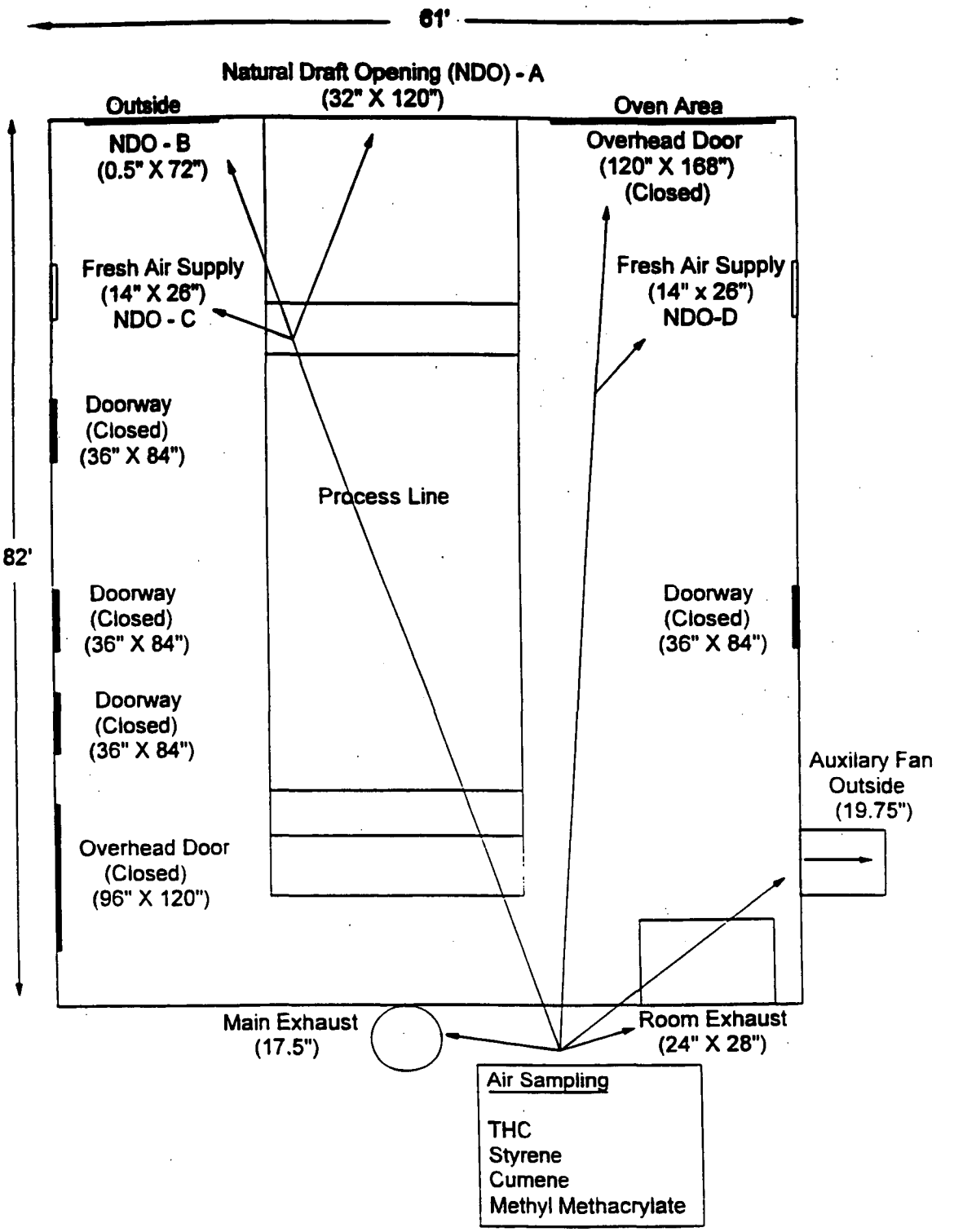


Figure 2.1 Diagram of Temporary Total Enclosure

E) Any exhaust point from the TTE shall be at least 4 equivalent duct or hood diameters from each NDO.

PES measured the room, the doorways, the small gaps around the doors, the large swinging doors and the volumetric air flow rate entering and exiting the room. This data was used to demonstrate that the process room meets the criteria for a TTE.

The TTE room measured 61 x 82 x 16.7 feet high. There are five doorways (one was used for the auxiliary fan) which measure 36 x 84 inches and two large doors 120 x 168 inches and 96 x 120 inches--all are kept closed. Thus, the TTE met Criteria D.

NDO-A is the largest opening and the closest to a VOC lay down area. The opening is 2.7 x 10 feet, an area of 26.67 ft^2, and the equivalent diameter of this opening is 5.83 feet. The distance from the nearest opening to the VOC lay down area was more than the required four equivalent diameters, thus Criteria A was met.

The total surface area of the TTE room is 14,780 ft^2. The total area of the NDOs is 31.98 ft^2 which is 0.2% of the total, which met Criteria B.

The negative static pressure inside the enclosure must be $\geq$0.004 in. H_2O; the enclosure negative static pressure ranged from 0.004 to 0.015 in. H_2O, which met Criteria C.

All access doors were kept closed during the process operation except for ingress and egress by workers and materials. When access doors were opened, the room remained under negative static pressure. The four 36 x 84 inch doorways had gaps around the bottom of each door about 0.5 inches wide. These gaps were considered NDOs and were measured and labeled NDO-B. Thus, the TTE met Criteria D.

All exhaust points from the TTE were at least four equivalent diameters from an NDO, which met Criteria E.

3.0 PROCESS DESCRIPTION

LASCO Panel Products is among the largest (perhaps the largest, since the recent addition of the wide line) producer of reinforced plastic panels from the continuous lamination process in the country. Various panel products are produced with applications in both construction and automotive industries. The facility has two narrow "lines" (or continuous lamination machines) and one wide line. The storage and mix preparation processes involved with the application process were not a subject of this testing program.

The lamination process begins with the unwinding of a large roll of transparent film onto the dispensing table where a catalyzed resin mixture is applied across the width of the film. This is the wet application area. Reinforcing materials are then added to the resin. A top film is unwound from a second roll of film to cover over the wet mixture. After the top film is added, the material moves into the oven curing area.

The emissions from the process come from the evaporation of the monomer, which is either styrene or a combination of styrene, methyl methacrylate, and cumene. The styrene content (98%) and cumene content (1.5%) make up greater than 99% of the total HAP content. The methyl methacrylate was believed to be a small percentage (<0.2%) of the total HAP content, according to LASCO personnel. While onsite, it was discovered that MMA may account for higher percentages of the HAP content depending on the type of product produced. At this point, it was decided to measure MMA along with the other two primary HAP compounds. A fan ducted to a partial enclosure around the table area helps draw air emissions from the wet areas and exhausts the air through a stack on the roof (Main Exhaust site).

Process monitoring for this sampling program was provided to ESD by PES through EPA Contract No. 68D10116, Work Assignment No. 6-01. Specific process data is being handled as confidential business information (CBI) through that work assignment. Therefore, a detailed process description and parameters are not included in this test report

The following is a general description of the three room conditions that were examined during this sample program. For each of the three conditions, the process room was treated as a TTE with all access doors closed and NDOs minimized. The negative static pressure in the room was maintained at -0.004 inches of water or greater.

The current condition was the operation of the process line the normal way it operates each production day. The main exhaust system is exhausting air emissions from the table area to the main roof exhaust stack. The table area is covered partially. Most top areas of the table are covered with panels and side areas mostly open. The initial resin application area is partially closed, with some panels open. The sampling areas consisted of the Main Exhaust which normally draws emission directly from the wet application area, the Room Exhaust which draws fugitive emission from floor level in one corner of the room, four natural draft openings (NDOs), and Ovens 9 and 10 exhaust stacks.

The open condition involved the removal of panels and enclosures covering the wet application area of the line. The top panels and hinged access panels were removed or opened where possible. The Main Exhaust duct was disconnected so there was no air being pulled directly from the table area. The Main Exhaust pickup lines were all closed (knife dampers closed) and the pickup lines disconnected and taped off. The Main Exhaust fan continued to draw fugitive emissions from above the table area. The open condition was to simulate uncontrolled emissions from the table area. The Auxiliary Exhaust was operated during the open condition so that pressure negativity could be maintained in the room. The sampling areas consisted of the Main Exhaust, Room Exhaust, Auxiliary Exhaust, three NDOs, and Ovens 9 and 10 exhaust stacks.

The closed condition was the operation of the line with everything covered and panels in place on the process line. The Main Exhaust line was disconnected so there was no air flow being pulled directly from the table area. The Main Exhaust pickup lines were all closed (knife dampers closed), and the pickup lines disconnected and taped off. Additional rigid panels were placed on any open areas on the top and sides of the table area. The rigid panels were taped closed where possible. Areas where rigid panels could not be used were covered with foil-faced foam insulation board and taped shut. The table area was estimated to be 98% covered. The Auxiliary Exhaust was operated during the closed condition so that pressure negativity could be maintained in the room. The sampling areas consisted of the Main Exhaust, Room Exhaust, three NDOs, and Ovens 9 and 10 exhaust stacks.

4.0 SAMPLING LOCATIONS

The Wide Line continuous lamination process was contained in a single room with several emission points. The room was treated as a TTE to measure all emissions exiting the room and emissions being drawn into the room through the natural draft openings (NDOs). There were also two oven sampling locations (separate room from the TTE) which were sampled simultaneously with the TTE sampling locations. The oven locations were located inside the building, and sampling was conducted to determine if the ovens emitted any hazardous air pollutants.

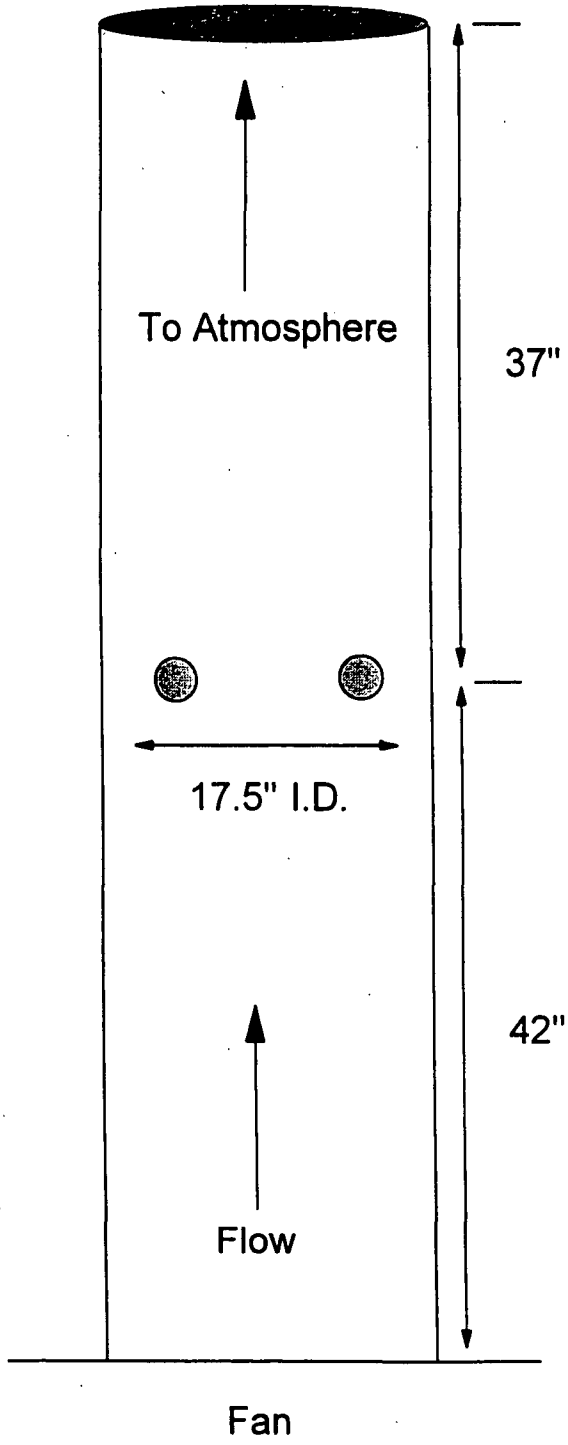
The air sampling locations were the Main Exhaust, Room Exhaust, Auxiliary Exhaust, NDOs, and Oven Nos. 9 and 10. Figure 1.2 in Section 1.0 is an overall schematic of all of the sampling locations. The locations are described below.

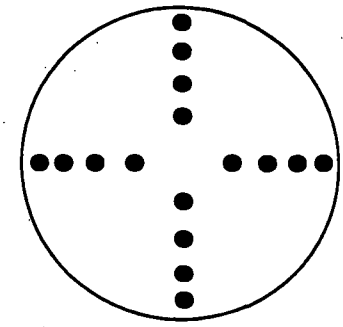
4.1 MAIN EXHAUST STACK

The main exhaust stack pulls air from the table surface area (wet application area) and exhausts the air emissions through a 17.5 inch inside diameter (ID) round vertical stack through the ceiling. Sampling ports were located 42 inches downstream (2.4 duct diameters) of the induced draft fan exhaust and 37 inches upstream of the exhaust (2.1 duct diameters) to the atmosphere. A total of 16 points, eight per port, were used to traverse the duct for velocity measurements. Figure 4.1 is a schematic of the sampling location.

4.2 ROOM EXHAUST STACK

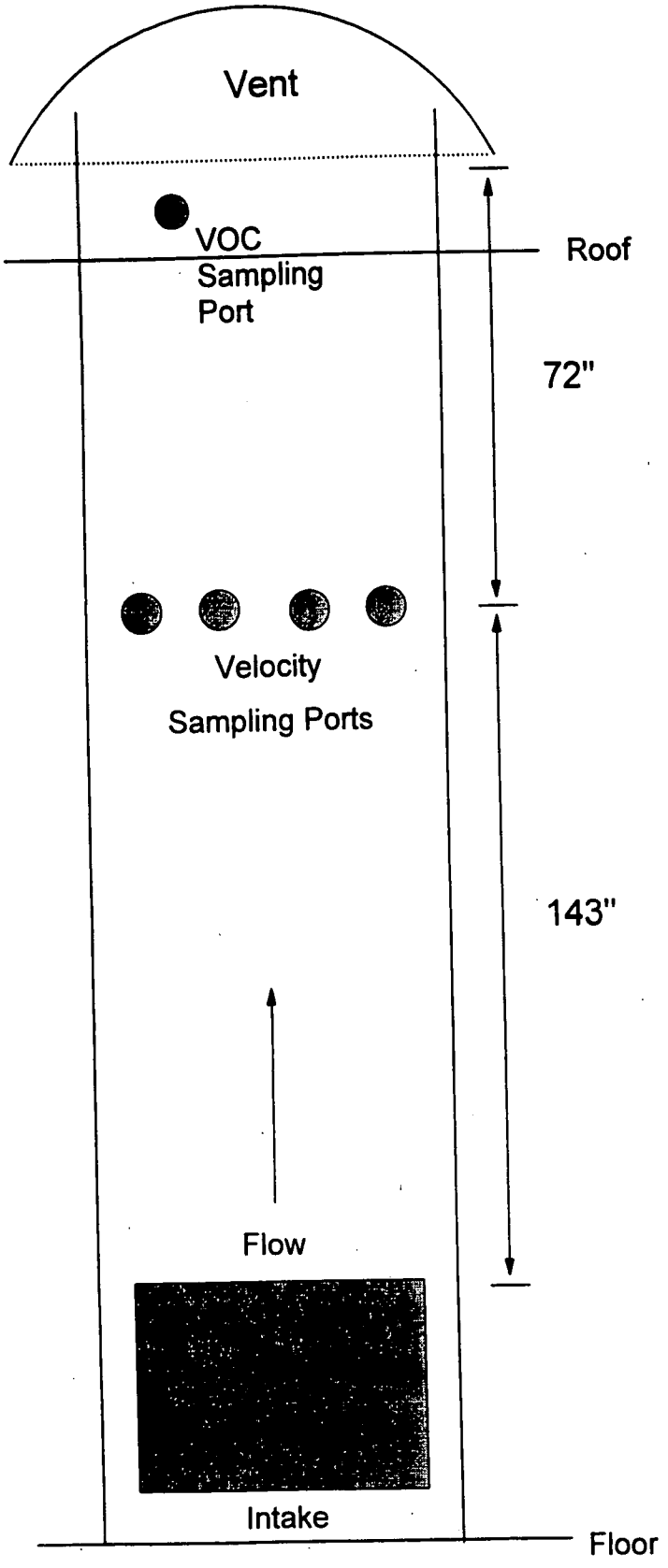
The room exhaust duct pulls room air from the wide line application area and exhausts air through a 24 x 28 inch rectangular vertical stack. The intake was at floor level in the corner of the room nearest the Auxiliary Exhaust. The velocity measurement location was in the wide line application room. The THC/M18 measurement location was in the exhaust duct outside and above the roof. Four equivalent sampling ports were located on the 14 inch side of the duct, approximately 143 inches (5.5 equivalent duct diameters) downstream of the duct work intake and 72 inches (2.8 equivalent duct diameters) upstream of the exhaust fan. A total of 24 points, six per port, were used to traverse the duct. Figure 4.2 is a schematic of the room exhaust sampling location.

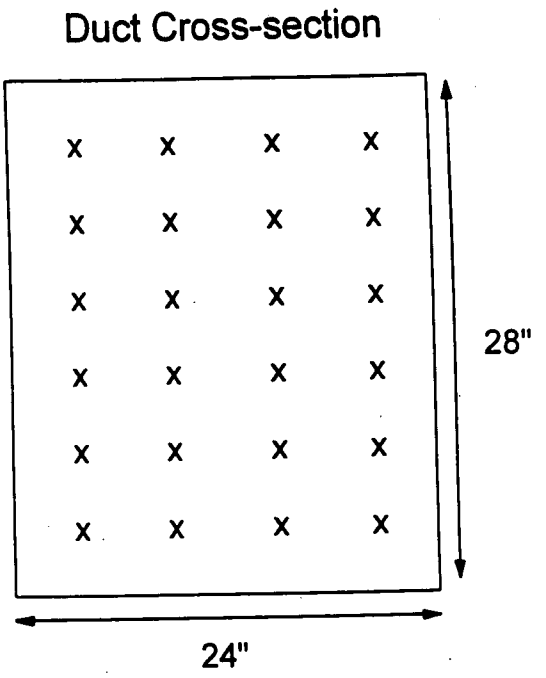




Traverse Point Number	Traverse Point Location
1	0.50"
2	1.75"
3	3.38"
4	5.63"
5	11.88"
6	14.13"
7	15.63"
8	17.00"

Figure 4.1 Main Exhaust Sample Location





Traverse Point Number	Traverse Point Location
1	2.38"
2	7.00"
3	11.63"
4	16.38"
5	21.00"
6	25.63"

Figure 4.2 Room Exhaust Sample Location

4.3 AUXILIARY EXHAUST STACK

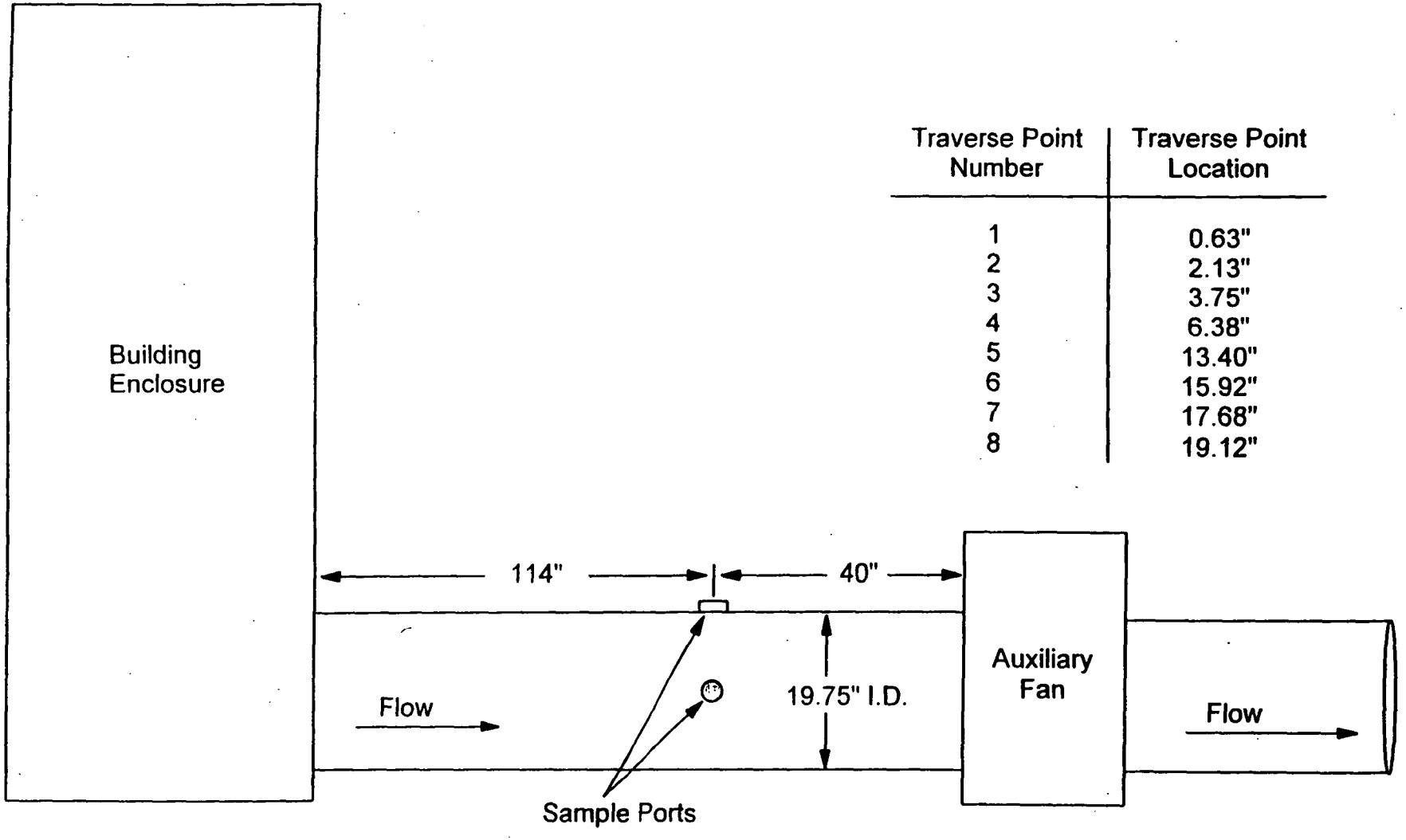
The auxiliary exhaust stack was installed in an existing doorway of the wide line application area about 24 inches above the floor to increase the volume of air exhausted from the enclosure, for purposes of creating a TTE. A section of duct work connected the sealed doorway to an auxiliary exhaust fan with straightening vanes inserted to prevent cyclonic flow. Sampling ports were located approximately 114 inches (5.8 duct diameters) downstream of the doorway and 40 inches (2.0 duct diameters) upstream of the fan intake of the 19.75 inch round horizontal duct. Sixteen traverse points, eight per port, were used to conduct velocity traverses. Figure 4.3 is a schematic of the auxiliary exhaust sampling location.

4.4 NATURAL DRAFT OPENINGS

A total of four NDOs were present in the wide line application area TTE. Those openings were the material feed opening to the oven area (designated as NDO-A), the double door outside doorway (NDO-B), and two fresh air supply ducts as part of the HVAC system (designated as NDO-C and NDO-D). NDO-A (material feed opening) dimensions were 120 x 32 inches. NDO-B was 72 inches long by 0.5 inches high. NDO-C and NDO-D dimensions were 14 x 26 inches. A Kurz hot-wire anemometer was used at various points across the face of each opening to measure air velocity into the room enclosure. NDO-A and NDO-B were negative drafts into the enclosure; NDO-C and NDO-D were forced makeup air into the enclosure, as part of the building's HVAC system. Figure 4.4 details the dimensions of each NDO.

4.5 OVEN EXHAUST NO. 9 AND NO. 10

The oven curing zone was a two section process that had a long, enclosed area for curing the fiberglass panels. Each of the two oven sections had individual makeup air supply ducts and a single exhaust duct. All sampling was conducted in the round, horizontal 15-inch inside diameter (ID) duct work, prior to the outlet stack exhaust fan. Sampling ports on No. 9 were located 50 inches (3.3 duct diameters) downstream of a disturbance and 38 inches (2.5 duct diameters) upstream of the exhaust fan. Sampling ports on No. 10 were located 55 inches (3.7 duct diameters) downstream of a disturbance and 38 inches (2.5 duct diameters) upstream of the exhaust fan. A total of 12 points, six per port, were used to traverse the ducts for velocity determinations. Figures 4.5 and 4.6 are schematics of the sampling locations for Oven Nos. 9 and 10.



Traverse Point Number	Traverse Point Location
1	0.63"
2	2.13"
3	3.75"
4	6.38"
5	13.40"
6	15.92"
7	17.68"
8	19.12"

Figure 4.3 Auxiliary Exhaust Sampling Location

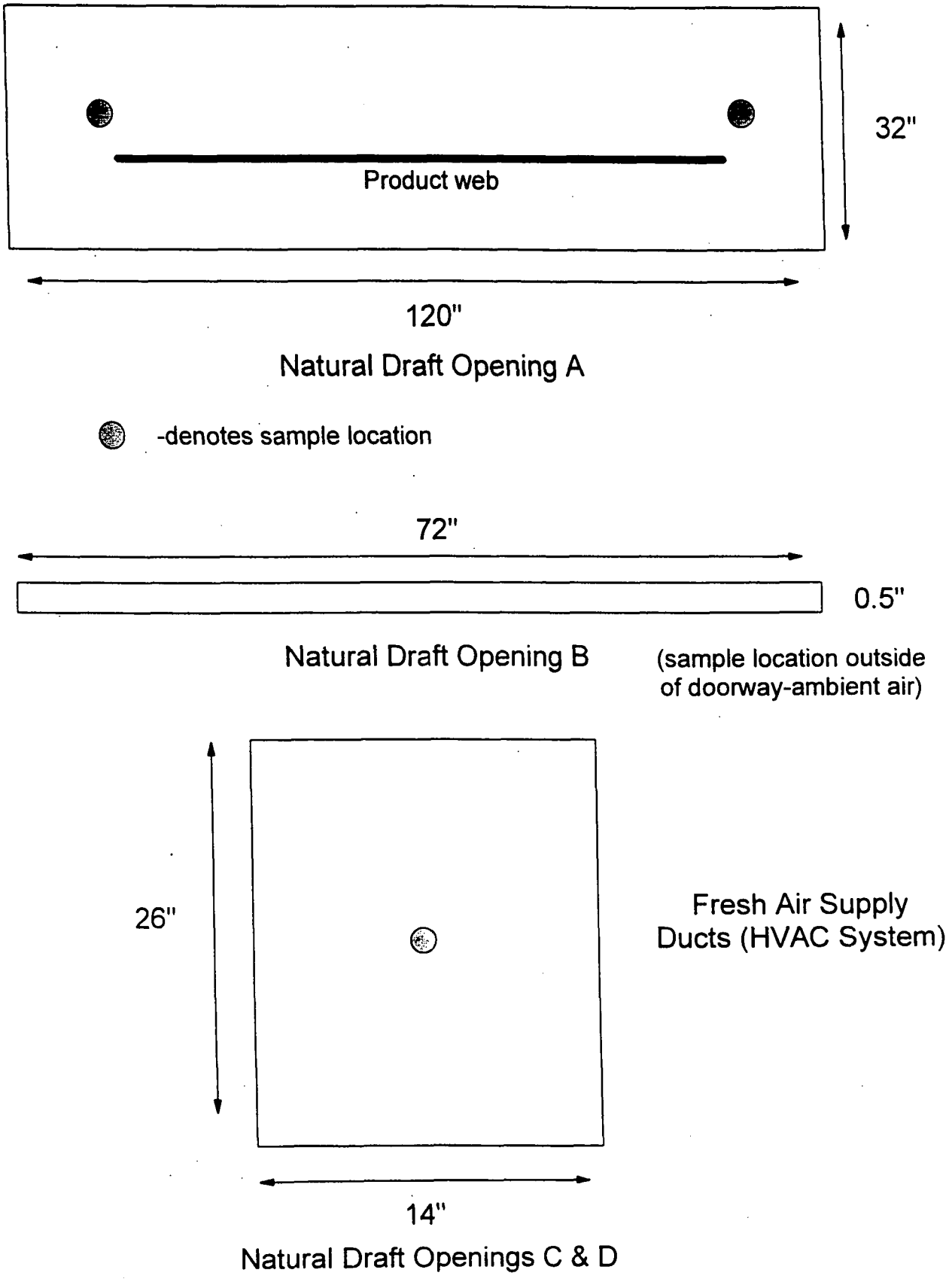
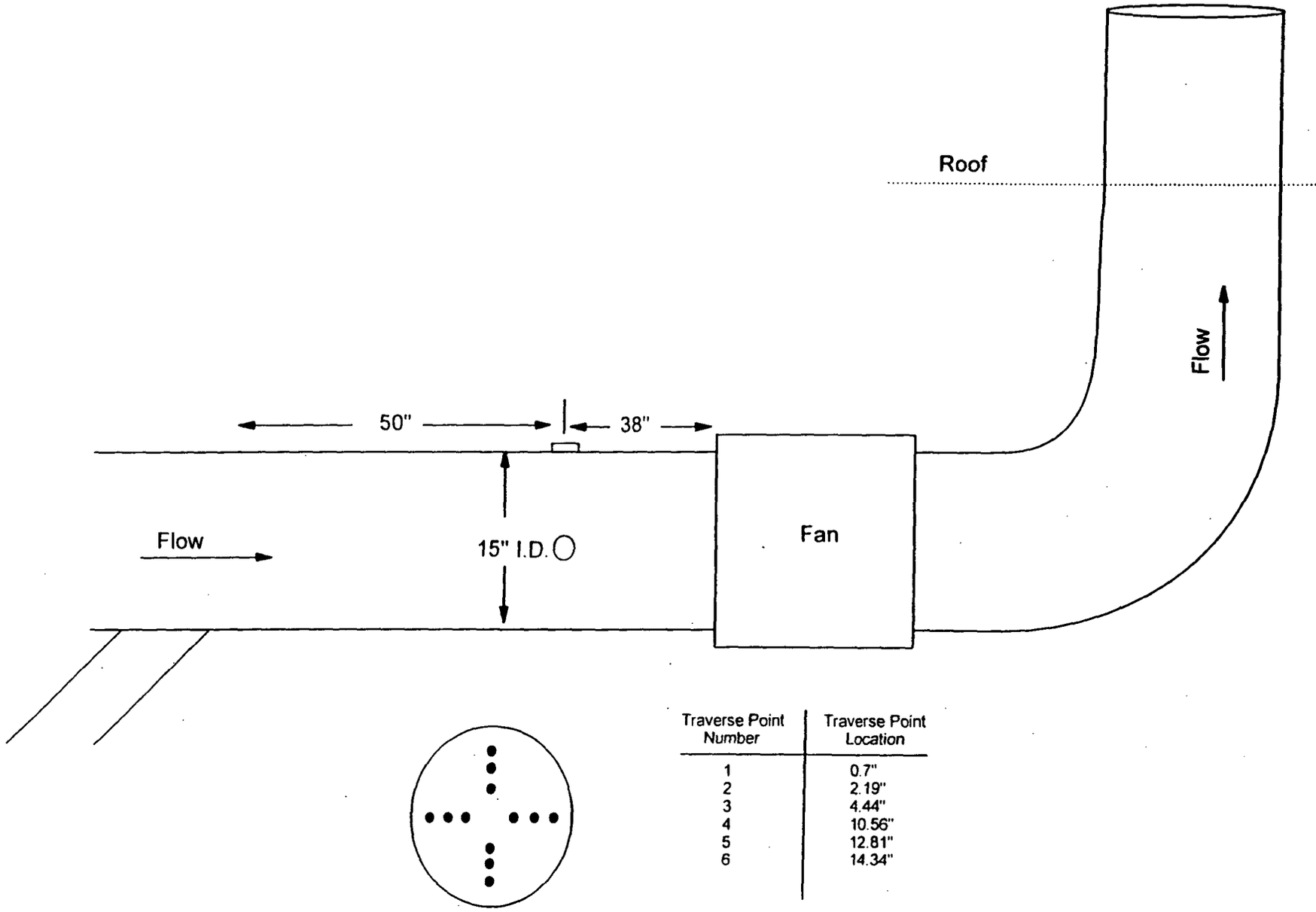
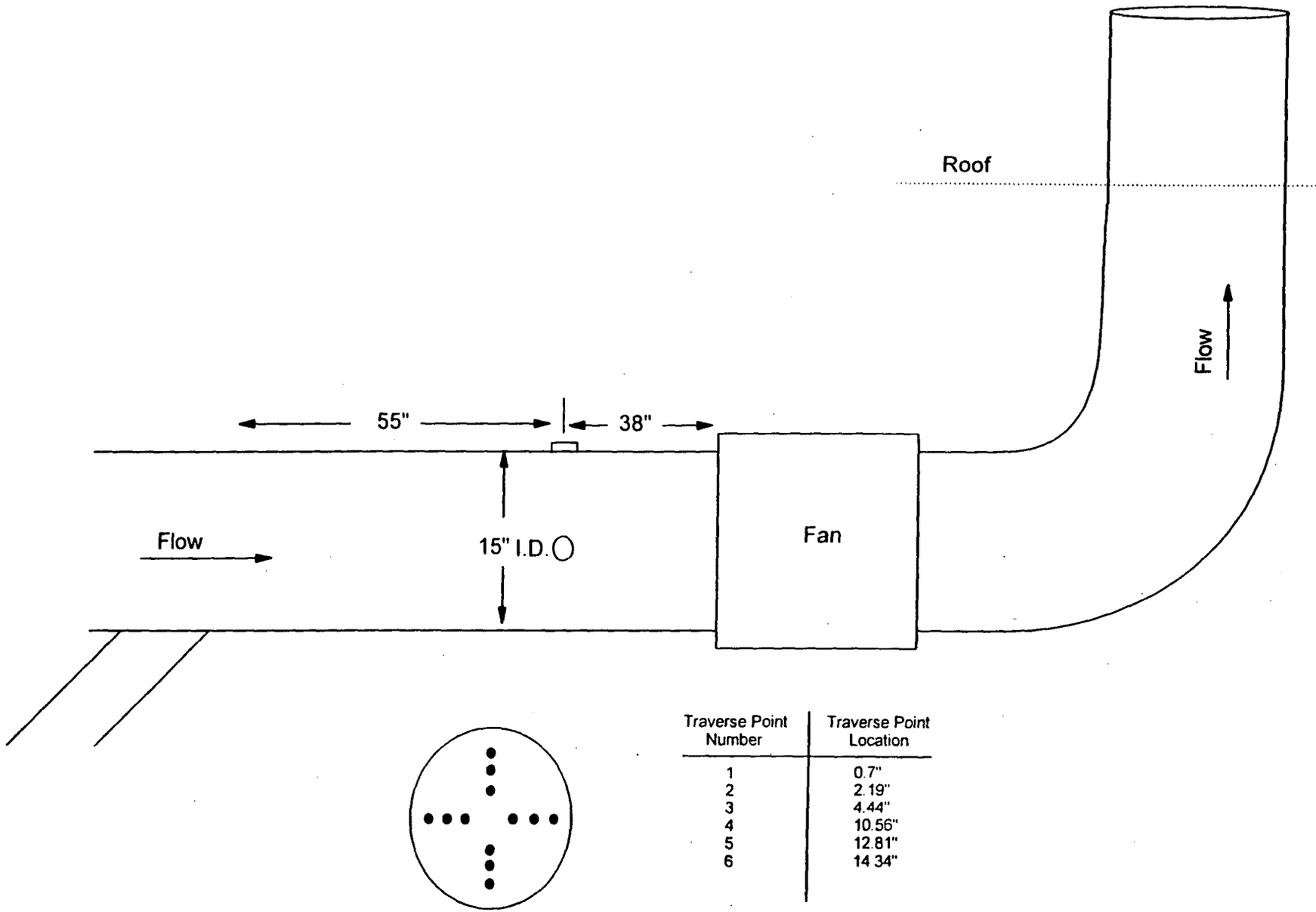


Figure 4.4 Natural Draft Opening Sampling Locations



Traverse Point Number	Traverse Point Location
1	0.7"
2	2.19"
3	4.44"
4	10.56"
5	12.81"
6	14.34"

Figure 4.5 Oven No. 9 Schematic of Sampling Location



Traverse Point Number	Traverse Point Location
1	0.7"
2	2.19"
3	4.44"
4	10.56"
5	12.81"
6	14.34"

Figure 4.6 Oven No. 10 Schematic of Sampling Location

5.0 SAMPLING AND ANALYTICAL PROCEDURES

The Wide Line continuous lamination process (application and oven curing areas) was sampled for a variety of stack gas constituents following the procedures of EPA Reference Methods 1-4, 18, 24, 25A, and proposed Methods 204 and 204F. Table 5.1 summarizes the testing parameters, test methods, number of tests, and duration of sampling runs. Brief descriptions of each method are presented below:

5.1 LOCATION OF MEASUREMENT SAMPLE/VELOCITY TRAVERSE POINTS

EPA Method 1, "Sample and Velocity Traverses for Stationary Sources," was used to select the measurement sites and to establish velocity and sample traverse point locations. The measurement sites are discussed in Section 4.0.

5.2 DETERMINATION OF STACK GAS VOLUMETRIC FLOW RATE

EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate," was used in the measurement of stack gas velocity and volumetric flow rate from the exhaust ducts of the wide line lamination process. Type "S" pitot tubes with an assigned coefficient of 0.84 or Standard type pitot tubes with an assigned coefficient of 0.99 and inclined manometer were used to measure differential pressure of the stack gas. Calibrated Type "K" thermocouples were attached to the pitot tubes to measure stack gas temperatures. The average stack gas velocities were calculated from the average square root of the velocity pressure, stack gas temperature, gas molecular weight, and absolute stack gas pressure. Volumetric flow rate is the product of velocity and stack cross-sectional area.

Velocities from the natural draft openings were checked with a Kurz hot wire anemometer to verify a minimum face velocity of 200 feet per minute.

TABLE 5.1

SOURCES, TEST PARAMETERS, AND METHODS SUMMARY
LASCO PANEL PRODUCTS - FLORENCE, KENTUCKY

Source	Parameter	EPA Test Methods	No. of Tests	Time per Test,[a] Minutes
Main Exhaust Stack	THC	25A	3[b]	60
	HAPs[c] - Styrene	18	1[d]	20
	- Cumene	18	1[d]	20
	- MMA	18	1[d]	20
Auxiliary Exhaust Stack	THC	25A	3[b]	60
	HAPs - Styrene	18	1[d]	20
	- Cumene	18	1[d]	20
	- MMA	18	1[d]	20
Room Exhaust Stack	THC	25A	3[b]	60
	HAPs - Styrene	18	1[d]	20
	- Cumene	18	1[d]	20
	- MMA	18	1[d]	20
Natural Draft Openings A, B, C, & D	THC	25A	3[b]	60
	HAPs - Styrene	18	1[d]	60
	- Cumene	18	1[d]	60
	- MMA	18	1[d]	60
Oven Exhausts	THC	25A	3[b]	60
	HAPs - Styrene	18	1[d]	60
	- Cumene	18	1[d]	60
	- MMA	18	1[d]	60
	Methane and Ethane	18	3[b]	60
Resin/Gel Coat Mixing Tanks	Volatiles, H_2O, Density	24	1	-------

TABLE 5.1 (Concluded)

Source	Parameter	EPA Test Methods	No. of Tests	Time per Test,[a] Minutes
Resin/Gel Coat Mixing Tanks	HAPs - Styrene	204F	1[c]	-------
	- Cumene	204F	1[c]	-------
	- MMA	204F	1[c]	-------

[a] Time per test run varied between conditions based on process operation and production schedules.
[b] Three test runs were conducted for conditions 1, 2, 3, 5, 6, 7, 8, 11, 12, and 13. Two test runs were conducted for Condition 4. One test run was conducted for Conditions 9 and 10.
[c] Styrene and cumene were known HAPs for this site, and MMA was added while onsite based on discussions with Mr. Haberlein, a representative of the reinforced plastics industry. The styrene is believed to comprise 98% of the total HAPs and was the main pollutant of interest.
[d] One Method 18 sample was collected for every three Method 25A sample runs.
[e] One Method 204F solvent distillation was conducted per condition.

A pressure transducer was used in the enclosure to continuously monitor negative static in the enclosure. The enclosure was kept at a negative static equal to or greater than -0.004 inches of water column, which is the equivalent of 200 feet per minute through the natural draft openings.

5.3 DETERMINATION OF DRY MOLECULAR WEIGHT

EPA Reference Method 3, "Gas Analysis for the Determination of Dry Molecular Weight," was used to measure the percentages of carbon dioxide (CO_2) and oxygen (O_2) present in each exhaust gas stream. Bacharach Fyrite combustion gas analyzers were used to directly read concentrations of CO_2 and O_2. All of the sources were essentially ambient in nature (zero percent CO_2, 21 percent O_2).

5.4 EXHAUST GAS MOISTURE CONTENT

EPA Method 4, "Determination of Stack Gas Moisture Content," was used to measure exhaust gas moisture content. This determination was made in two ways, dependent upon the temperature of the gas stream. For locations that had a stack gas temperature of 150°F or less, a wet bulb/dry bulb technique was used, utilizing calibrated thermocouples and a psychrometric chart. On the oven exhaust ducts, an EPA Method 4 sampling train was used to collect condensate from the stack gas with a series of Greenburg-Smith impingers contained in an ice water bath. The quantity of condensed moisture was determined gravimetrically and then compared to the total volume of stack gas metered to determine the volume percent moisture content. Figure 5.1 is a schematic of an EPA Method 4 sampling train.

5.5 DETERMINATION OF HAZARDOUS AIR POLLUTANTS (HAPS)

EPA Method 18, "Measurement of Gaseous Organic Compound Emissions by Gas Chromatography," was used to determine the concentration and mass emission rate of styrene, cumene, and methyl methacrylate. This method was used in combination with NIOSH Method 1501 for collecting aromatic hydrocarbons on sorbent tube media (coconut shell charcoal) using low flow dry gas meters (100 to 250 cc/min) and vacuum pumps. A pair of sorbent tubes were used in series to prevent sample breakthrough. HAPs were desorbed from the sampling media with carbon disulfide. The first tube was analyzed separately from the back tube to check for sample breakthrough. Analysis was done in duplicate by gas chromatography with flame ionization detection. Methane and ethane concentrations were collected in Tedlar® bags on the two oven exhausts in evacuated canisters and also analyzed by GC/FID to determine the contribution of natural

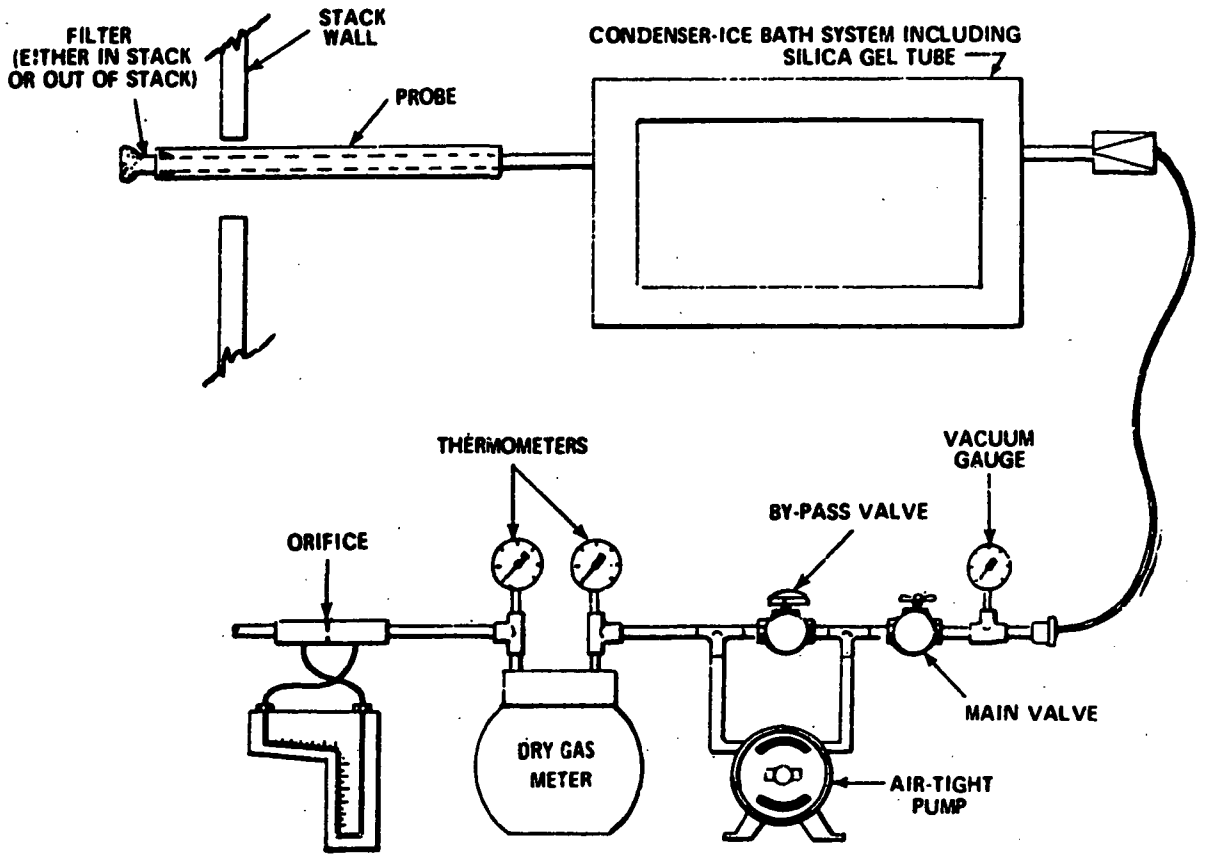


Figure 5.1 Schematic of EPA Method 4 Sampling Train

gas to the air stream. At least one sorbent tube sample was collected on each exhaust duct during each condition. Spiked samples were also run on at least one exhaust duct per condition, with a control sample run concurrently to determine desorption/recovery efficiency of the sampling and analytical procedures. Figure 5.2 is a schematic of the EPA Method 18 sampling system for sorbent tubes, and Figure 5.3 is a schematic of the collection system for methane and ethane concentrations.

5.6 DETERMINATION OF TOTAL HYDROCARBONS

EPA Method 25A, "Determination of Total Gaseous Organic Concentrations Using a Flame Ionization Analyzer," was used to measure total hydrocarbon (THC) concentrations at the sampling locations. THC concentrations were monitored continuously in the main exhaust, room exhaust, auxiliary exhaust, and oven exhausts. At these locations heated Teflon® sample lines were used to prevent polymerization of styrene. One instrument was used to monitor the NDOs by alternating sampling lines between the sampling locations. Unheated Teflon® sampling lines were used at all the NDO locations. The FIAs were calibrated directly and through the sampling system before each test condition began. The instruments were checked for drift by system calibrations after each test run. Calibration gases were EPA Protocol propane-in-air standards. Styrene-in-air calibration standards were used to determine instrument responses. The sampling system consisted of a stainless steel probe and three-way valve with Teflon® tubing connections to switch from calibration to sampling mode. A heated Teflon® line routed stack gas to an internally heated FIA. Instrument responses were recorded on strip chart recorders and Rustrak Ranger® data logging systems. Values presented are based on data logging system averages. Figure 5.4 is a schematic of the sampling system.

5.7 DETERMINATION OF VOLATILE MATTER CONTENT, DENSITY, VOLUME OF SOLIDS, WEIGHT OF SOLIDS, WATER CONTENT, AND HAPS BY DISTILLATION

EPA Method 24, "Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings," was used in the collection of uncatalyzed resin samples used in the wide line lamination process. Volatile matter contents was determined by ASTM D2369-81. Water content was determined by ASTM D4017-81, using the Karl Fischer titration method. One uncatalyzed resin (UCR) material sample per condition was treated to a solvent distillation by vacuum method.

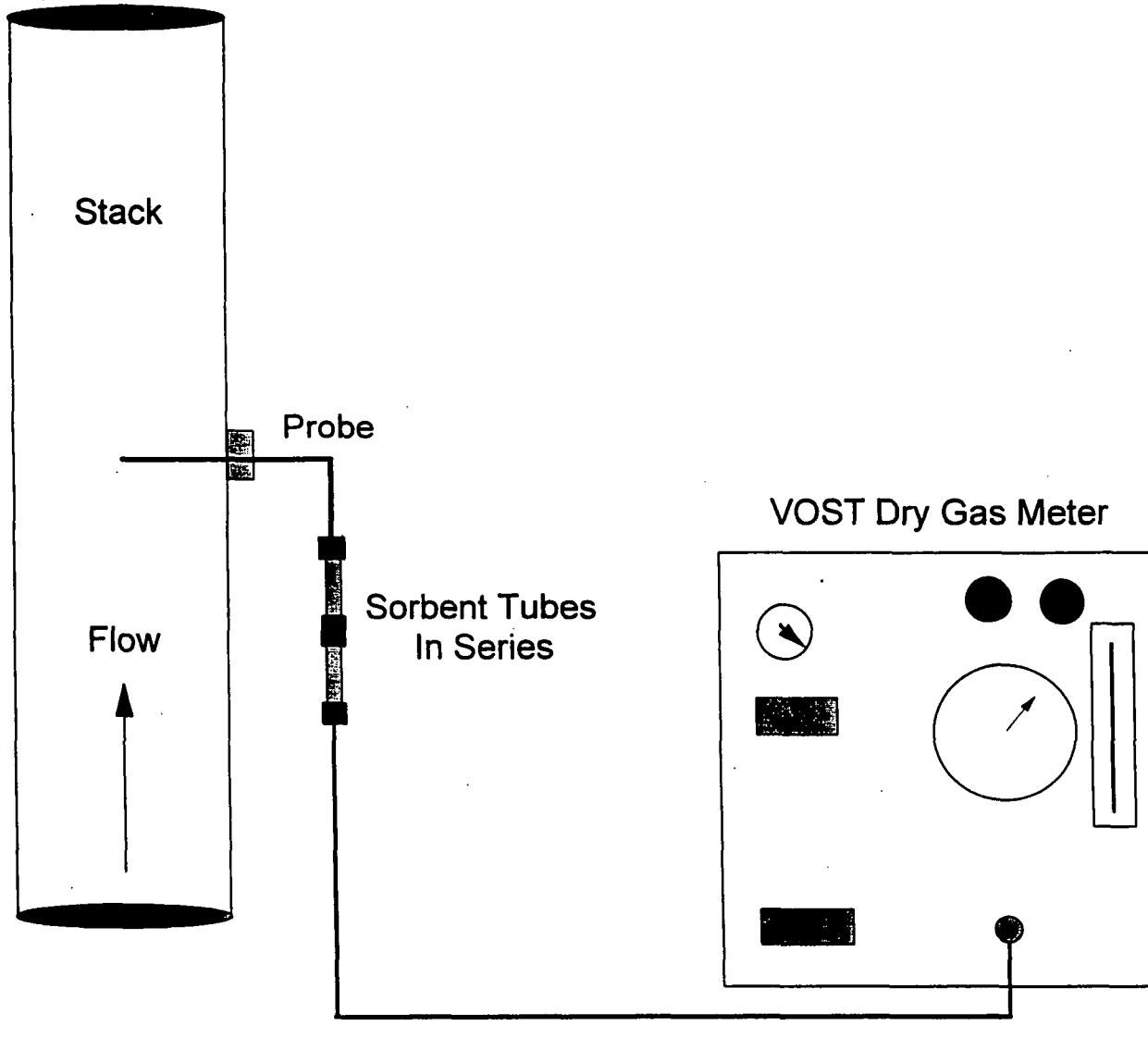


Figure 5.2 Schematic of EPA Method 18 Sampling System - Sorbent Tube Method

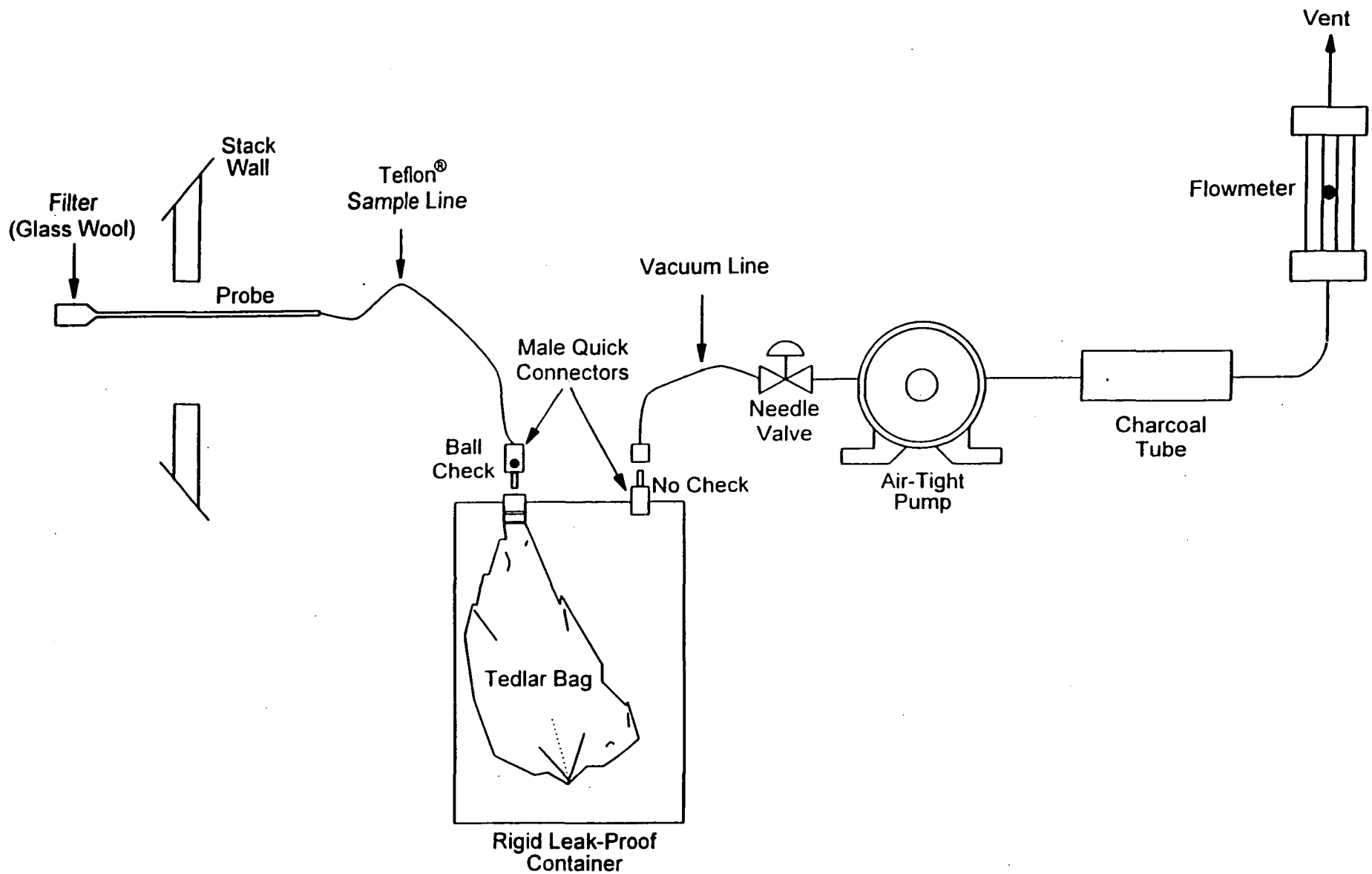


Figure 5.3 Schematic of Methane/Ethane Sampling System

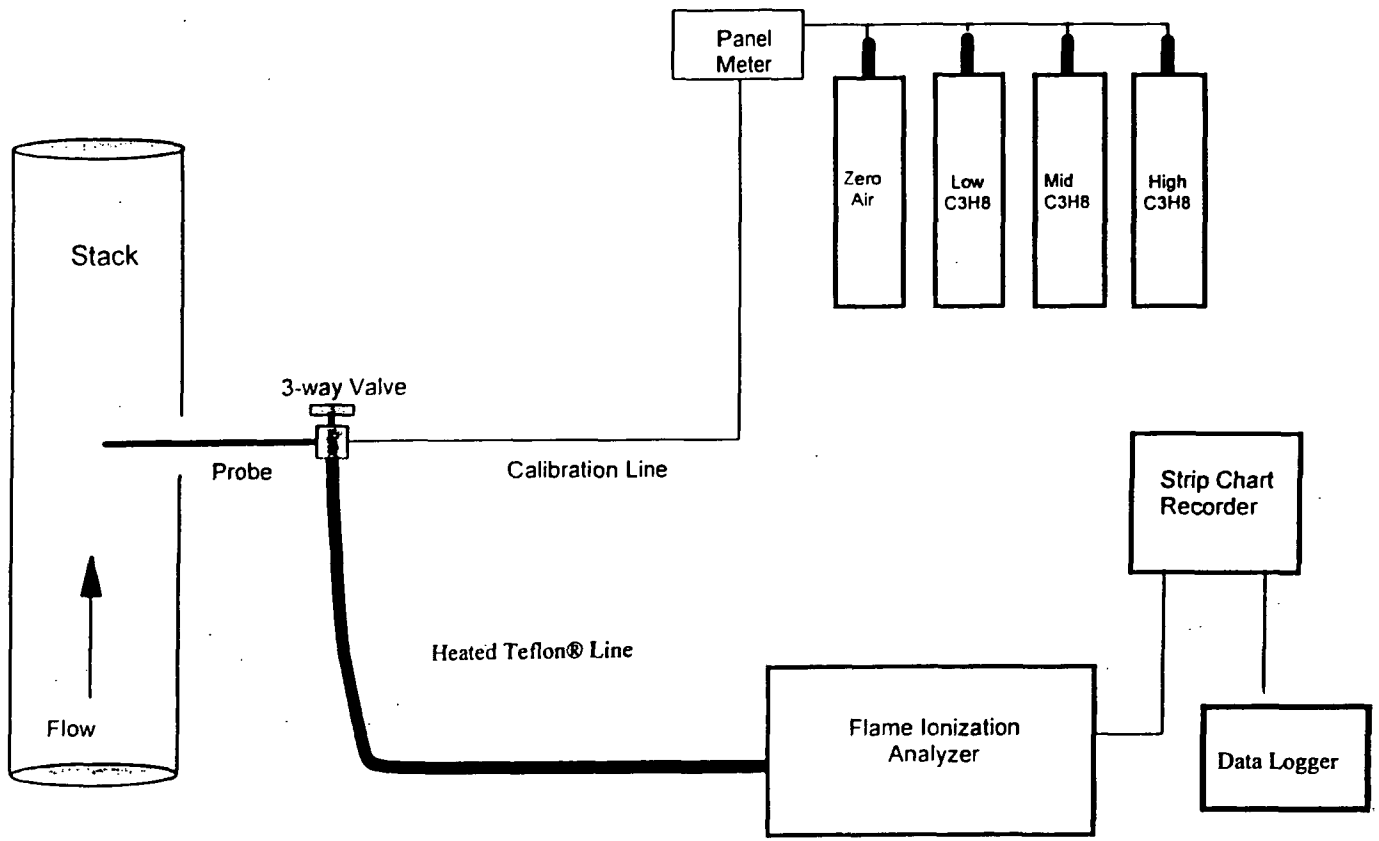


Figure 5.4 EPA Method 25A Total Gaseous Organic Analyzer and Sample System

5.8 RESPONSE FACTORS FOR FLAME IONIZATION ANALYZERS

The initial test plan method for determining styrene response factors was to use a commercially prepared styrene calibration gas. The styrene calibration gas response would then be compared to our calibration curve generated by the EPA Protocol propane standards. The commercially prepared styrene calibration gases (styrene 102 ppm, 143.1 ppm, 250.7 ppm), showed responses which were non-linear. EPA Method 18 tube samples were run on the styrene cylinders, and it was found that the cylinder values were higher than the Method 18 sample results. The cylinder values were believed to be inaccurate and could not be used for comparison. The cylinder styrene values were unstable even at low concentrations and low pressures (<500 psi). It was decided the styrene calibration gases were not stable and could not be used to determine response factors.

The alternative plan used EPA modified proposed Method 204F to determine styrene response factors. Bag standards of styrene were prepared in the lab and run on three ranges to determine responses relative to propane. The three ranges were: 0-500 ppm, 0-1000 ppm, and 0-5000 ppm as propane. The average response factor was 0.4263 based on 8 bag standards which were analyzed on two separate flame ionization analyzers (FIAs). The data was very consistent throughout the ranges. The following describes the EPA Method 204F procedure used:

<u>Preparing the Response Factor Mixture</u>

1. The amount of VOC introduced to the process is the sum of the products of the weight of each VOC containing liquid used and its VOC content corrected for a response factor (RF). Typically, a sample of the resin is distilled to separate the VOC fraction from the inorganic contents. The distillate is used to prepare a known standard for analysis by an FIA, calibrated against propane standards, to determine its RF. In this case, styrene was the primary VOC, and a 99%+ styrene liquid sample was used to prepare bag standards.

2. The styrene concentration in the bag sample should be similar to the gaseous VOC concentration measured in the sample gas stream. To create a specific styrene concentration in the sample bag, the following expression was used:

$$C_{styrene} = \frac{ML}{BV}$$

where: $C_{styrene}$ = Concentration of bag sample as styrene, mg/liter

ML = Mass of styrene liquid injected into bag, mg

BV = Volume of bag sample, liters

3. The FIA used EPA Protocol propane-in-air calibration gas standards to develop a linear calibration line. These calibration gases were commercially prepared in concentrations of parts per million (ppm). Therefore it was necessary to convert the styrene concentration from mg/liter to ppm. This conversion was performed by applying the following formula:

$$C_{ppm} = \frac{C_{styrene} \ x \ C \ x \ 1000 \frac{ug}{mg}}{MW}$$

where: C_{ppm} = Concentration of bag sample as ppm, styrene

$C_{styrene}$ = Concentration of bag sample as mg/liter, styrene

C = Constant of 24.04 liters per mole.

MW = Molecular weight of styrene, 104.15 g/gmol

4. The preparation of the styrene bag sample concentrations were performed in a consistent, repetitive manner. A dry gas meter and pump were set at a constant flow rate of 3 liters per minute to provide the air for the bag sample. A Teflon® line carried the measured air volume into a glass injection impinger which was submersed in oil heated to a temperature of 400 °F. The styrene was introduced into the glass injection impinger by means of a Teflon® coated septum cap. The styrene tainted airstream was transported through a Teflon® line heated to 180 °F and into the Tedlar® bag. The Tedlar® bag was kept in a heated box maintained at a temperature of 135 °F to eliminate condensation and adsorption in the bag.

When the Tedlar® bag sample was filled with the required volume of air, the heated line from the glass injection impinger was switched to the FIA. The FIA pumped the styrene bag sample through the heated line to the detector. The response from the styrene bag sample was monitored

until a stabilized measurement was reached and then for approximately five more minutes. Figure 5.5 is a diagram of the bag standard preparation system.

5. The response on the FIA of the styrene bag standard was measured in the same units as the calibration gases. In this instance, the styrene bag standard was measured in ppm as propane. A response factor (RF) was developed from the ratio of the calculated ppm of styrene in the bag standard verses the measured styrene concentration reported in ppm as propane. The following equation calculated the response factor for each bag sample.

$$RF = \frac{C_{ppm}}{C_{measured}}$$

where: RF = Response Factor

C_{ppm} = Concentration of bag sample as ppm, styrene

$C_{measured}$ = FIA reading for bag gas sample, ppm as propane

6. To ensure the quality assurance in preparing the styrene bag standards, the following procedures were performed:

   I. The dry gas meter that measured the volume of air used to fill the Tedlar® bag was calibrated against a reference test meter to develop a dry gas meter calibration coeficient (gamma).

   II. The ambient air used to fill the styrene bag standard was monitored by the FIA during the entire procedure of creating the standard. The results of the styrene bag standard were corrected according to the measured ambient air VOC concentrations.

   III. The styrene bag standard preparation system was always purged continuously between styrene bag standards. The Tedlar® bag was also purged after each styrene standard and the purged air was measured on the FIA to ensure that no residual styrene remained in the Tedlar® bag.

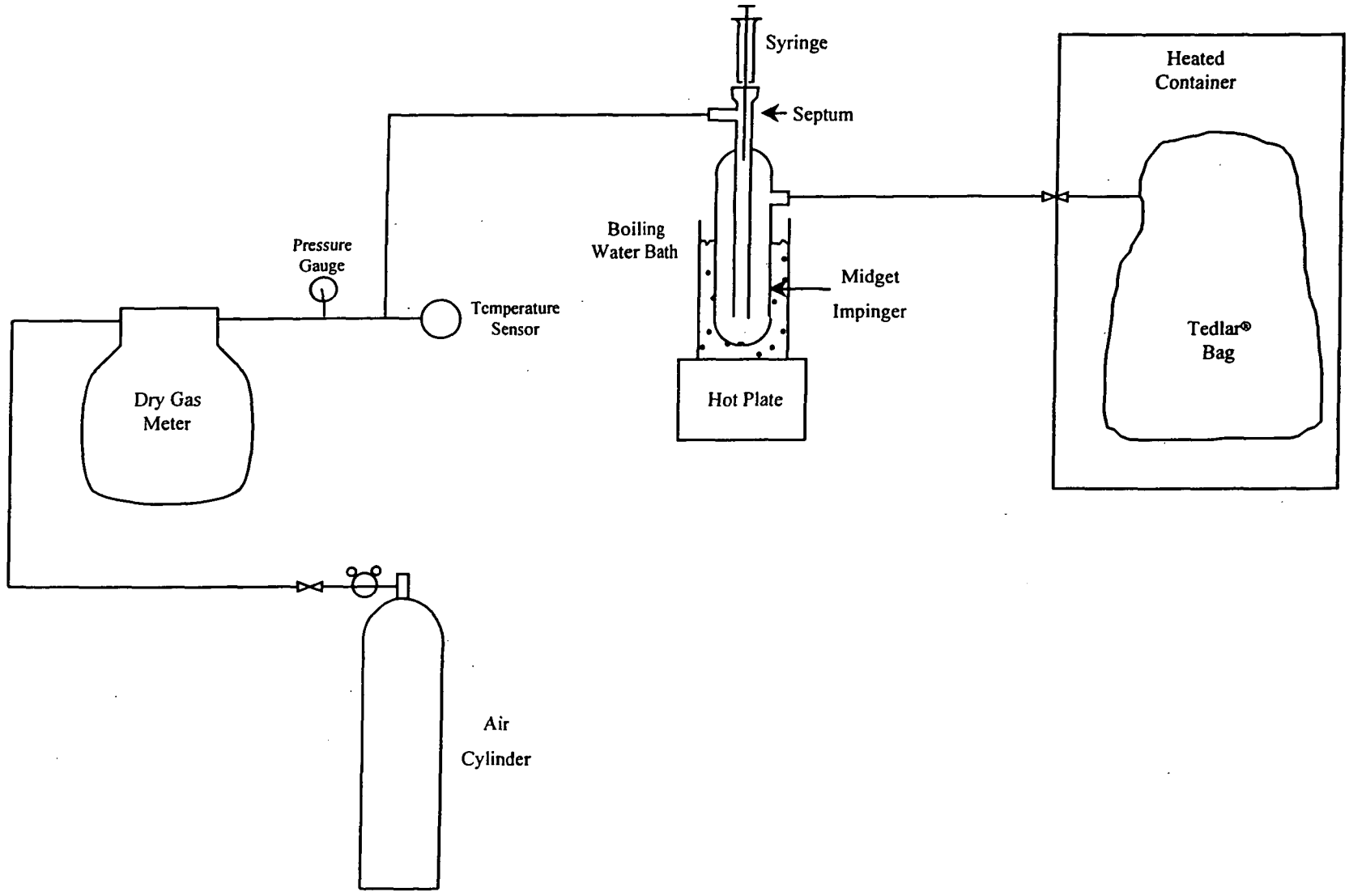


Figure 5.5 Schematic of Bag Standard Preparation System

IV. The styrene bag samples were analyzed on two separate J.U.M. FIAs to ensure consistent responses to the styrene standards. The gas sample from the styrene bag standard was split to each analyzer. J.U.M. analyzer #1 was used at the main exhaust location at the LASCO Panel Products plant and J.U.M. analyzer #5 was used at the room exhaust location.

V. Both J.U.M. analyzers were calibrated according to EPA Reference Method 25A. The maximum mid calibration gas drift was 0.77% of span value and no zero calibration drift was detected for any of the styrene bag standards.

VI. The response factors for the J.U.M. analyzer #1 had a standard deviation of 0.75% for the 8 separate styrene bag standards tested. J.U.M. analyzer #5 had a standard deviation of only 1.27% for the response factors developed from the 8 separate styrene bag standards.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

The following section describes the specific quality assurance/quality control (QA/QC) procedures employed by PES in performing this series of tests. The goals of the QA/QC activities for this project were intended 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 III, Stationary Source Specific Methods," EPA-600/R-94/038c, served as the basis for performance for all testing and related work activities in this project.

6.1 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 PES follow.

Barometers

PES uses aneroid barometers which are calibrated against a station pressure value reported by a nearby National Weather Service Station corrected for elevation.

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. Table 6.1 summarizes the types of calibrations performed and the acceptable levels of variance. The calibration data is contained in Appendix E. The temperature sensor calibration results were within the acceptable levels of variance. Thermocouple read-out devices are calibrated using a thermocouple simulator having a range of 0-2400°F.

TABLE 6.1

SUMMARY OF TEMPERATURE SENSORS CALIBRATION REQUIREMENTS

Temperature Sensor Usage	Number of Calibration Points	Calibration Media					Tolerances
		Ice Bath (0°C)	Ambient Air (20-25°C)	Hot Water (40-50°C)	Boiling Water (100°C)	Heated Oil (150-200°C)	
Impinger Outlet Thermcouple	2	*	*				±1°C
Dry Gas Meter Thermometer	3	*	*	*			±3°C
Stack Temperature Thermocouple	4	*	*		*	*	±1.5% of reference temperature

Pitot Tubes

PES uses Type S and Standard type tubes which are constructed to EPA Method 2 specifications. Type S pitot tubes meeting these criteria are assigned a baseline coefficient to 0.84 and need not be calibrated. Standard pitot tubes are assigned a coefficient of 0.99 and also need not be calibrated. The pitot tube calibration data is contained in Appendix E. The calibration results are within the acceptable levels of variance.

Differential Pressure Gauges

PES uses Dwyer inclined and inclined/vertical manometers to measure differential pressures. These include velocity pressure, static pressure, and meter orifice pressure. Manometers are selected with sufficient sensitivity to accurately measure pressures over the entire range of expected values. 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 dry test meter. The reference dry test meter is routinely calibrated using a wet test meter or a liquid displacement technique. 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 is calibrated at a single intermediate setting based on the previous field test. Acceptable tolerances of the initial and final dry gas meter factors and orifice calibration factors are ±0.02 and ±0.20 from average, respectively. The dry gas meter and orifice calibration data are in Appendix E. The calibration results are within the acceptable levels of variance.

6.2 ONSITE QA/QC

The onsite QA/QC activities included:

Measurement Sites

Prior to sampling, all stack dimensions were checked to verify measurement site locations, location of test ports, and stack inside dimensions. Inside dimensions were checked through all available test ports to determine uniformity of the stack cross-sectional area and the sample test ports were checked to verify that they do not extend beyond the inside wall. The stack inside dimensions, wall thicknesses, and sample port depths were measured to the nearest 1/16 inch. When stack dimensions are found to be

out of round or uneven, then multiple traverse point locations are required on the pitot tube.

Velocity Measurements

All velocity measurement apparatus were assembled, leveled, zeroed, and leak-checked prior to use and at the end of each determination. The static pressure was determined at a single point near the center of the stack cross-section.

Moisture

Stack gas moisture content was determined during each test run using calibrated wet bulb/dry bulb thermocouples and a psychrometric chart on all ambient type sources. EPA Method 4 sampling trains were used at the oven exhaust because of higher (>150°F) stack gas temperatures. All impingers were measured gravimetrically prior to and at the end of each sampling run.

Total Hydrocarbon Concentration

Total hydrocarbon concentrations (THC) were measured following the guidelines of EPA Method 25A. The flame ionization analyzers were calibrated with three EPA Protocol propane-in-air gas standards and zero gas. A bias check and response time test were conducted initially. Bias check acceptability is a difference of not more than five percent between direct injection measured values and system injection. The bias check must be within ± 5% to proceed with the sample efforts. Prior to sampling, PES performed the bias check, response time tests and calibration error tests. Calibration drift checks were performed after each test run; acceptable drifts for zero or span gases is ± 3% of span. Table 6.2 summarizes the maximum system calibration bias, calibration error and drift percentages for each FIA per each condition. Calibration data is contained in Appendix A with the field strip charts.

Hazardous Air Pollutants

Analysis for target hazardous air pollutants (HAPs) was performed onsite by DEECO. Spiked tubes were prepared onsite based on THC measurements conducted during each sampling condition. Sample tube blanks were also collected and analyzed onsite. Samples were desorbed and analyzed within specified holding times for the individual compounds. Following are the laboratory quality assurance procedures.

> There were duplicate injections of each sample aliquot, with agreement between both injections to within 5% of the mean of the injections.

TABLE 6.2

SUMMARY OF CALIBRATION RESULTS FOR THC ANALYZERS
CONDITION NOS. 1-13
LASCO PANEL PRODUCTS

Cond. No.	Main Exhaust			Room Exhaust			Auxiliary Exhaust			Oven No. 9			Oven No. 10			NDOs		
	System Bias, %	Calib. Error, %	Drift, %	System Bias, %	Calib. Error, %	Drift, %	System Bias, %	Calib. Error, %	Drift, %	System Bias, %	Calib. Error, %	Drift, %	System Bias, %	Calib. Error, %	Drift, %	System Bias, %	Calib. Error, %	Drift, %
1	1.53	0.98	0.4	0.40	0.60	0.8	NA			3.6	2.8	0.9	2.0	3.5	1.0	3.0	3.2	2.1
2	1.92	0.39	0.8	1.52	0.41	1.5	NA			3.7	2.8	0.8	3.8	1.0	1.0	3.4	3.2	0.8
3	2.70	0.56	0.4	1.13	0.60	3.0	NA			2.1	4.1	0.4	3.6	4.8	1.3	3.6	3.6	1.6
4	2.70	0.83	1.5	1.1	0.21	1.2	NA			2.8	4.1	0.7	0.7	4.8	0.2	3.2	3.6	2.4
5	2.29	0.17	0.4	1.53	0.06	0.4	1.9	0.24	0.8	1.6	2.2	1.3	0.9	2.6	0.5	2.8	4.1	1.5
6	2.29	1.06	1.1	1.53	0.15	1.5	NA			1.6	2.2	0.9	1.1	2.6	0.3	2.8	4.1	1.2
7	1.53	0.08	0.8	0.76	0.45	0.4	NA			3.1	2.2	0.7	2.5	2.2	1.1	4.5	2.6	0.8
8	1.53	0.24	0.8	2.27	0.34	0.8	NA			3.2	2.8	1.3	1.8	2.8	0.1	3.2	2.8	2.1
9	1.53	0.20	1.2	2.27	0.24	0.8	NA			3.2	2.8	0.0	1.1	2.8	0.1	2.4	2.4	0.2
10	1.53	0.20	0.4	2.27	0.24	0.0	NA			2.5	2.8	1.2	1.4	2.8	0.1	2.8	2.4	1.2
11	1.91	0.25	1.2	2.68	0.36	1.1	NA			1.8	2.4	1.0	2.4	3.2	0.3	3.2	2.9	1.4
12	1.91	0.43	0.8	2.68	0.44	1.9	3.44	0.87	1.5	2.9	2.2	1.0	2.1	2.0	0.5	2.2	2.2	1.4
13	1.91	0.43	0.8	2.68	1.09	1.9	3.44	0.87	1.9	2.2	2.2	0.5	1.3	2.0	0.3	4.5	2.8	1.1

Note: Values listed for each condition are maximum for each set of test runs.
NA - Not applicable for these conditions.

- There were three point calibration curves for all components (based on least squared regression analysis) with the curve range bracketing sample concentrations.

- Calibration curves were developed every 24 hours.

- All calibration points agreed within 10% of the theoretical value.

- For at least every nine samples, a field blank, duplicate and spiked sample were conducted. The blank sample was an unopened sample tube. The duplicate sample results were used to determine method precision.

Analysis for the target HAPs were measured following the procedures of EPA Method 18. Sampling media consisted of activated coconut shell charcoal in sorbent tubes, a pair in series. Pre-test and post-test leak checks were conducted on each set of sampling trains. Spiked sorbent tubes were run in duplicate with another set of sample tubes to determine recovery efficiency of the analytical method. Run No. RES-4-1 recovery efficiency was 195%, which was the result of over spiking the tube compared to measured stack values. The spike amount was non- representative of sample conditions, and the data was not used to correct stack concentrations. Run No. AFS-12-4 recovery was borderline at 68%. All other styrene recoveries were within the acceptable range. Styrene and methyl methacrylate results were adjusted for recovery efficiencies. At least one spiked duplicate was run per each of nine samples run. Target compounds were styrene (primary), cumene and methyl methacrylate.

Table 6.3 summarizes the Method 18 quality assurance results for the sample tubes spiked with styrene standards and run in duplicate with a separate unspiked sample. Recovery efficiencies are listed for the test runs conducted at the sample locations under different test conditions. EPA Method 18 guidelines specify recovery efficiencies ranging from 70% to 130%, with the majority of the spiked runs within this range. Table 6.4 summarizes the desorption efficiencies for the three compounds of interest: styrene, cumene and methyl methacrylate. Desorption efficiencies for styrene averaged 89.1%; cumene averaged 131.3% and methyl methacrylate efficiencies averaged 80.0%.

Methane and Ethane

Methane and ethane concentrations were collected in Tedlar gas bags during each THC measurement run on the oven exhausts to determine the natural gas contribution to the total gaseous organic concentration. Volumes recorded were based on air displacement in the evacuated containers with pre-test and post-test pressure measurements.

TABLE 6.3

SUMMARY OF EPA METHOD 18 QUALITY ASSURANCE RESULTS STYRENE RECOVERY EFFICIENCIES

Run No.	Recovery Efficiency, %	Acceptable Range, %	Pass
MES-3-3	94	70%-130%	Yes
RES-4-1	195	70%-130%	No
AFS-5-2	70	70%-130%	Yes
MES-6-2	103	70%-130%	Yes
MES-11-2	85	70%-130%	Yes
RES-11-3	79.0	70%-130%	Yes
MES-12-3	111	70%-130%	Yes
AFS-12-4	68	70%-130%	No

TABLE 6.4

SUMMARY OF DESORPTION EFFICIENCIES

Compound	Spike Level, mg	Desorption Efficiency, %	Acceptable Range, %	Pass
Styrene	0.9009	85.0	70%-130%	Yes
Styrene	4.5045	92.1	70%-130%	Yes
Styrene	9.009	90.1	70%-130%	Yes
Cumene	0.86	138.0	70%-130%	Yes
Cumene	4.30	134.8	70%-130%	Yes
Cumene	8.60	121.0	70%-130%	Yes
Methyl Methacrylate	0.9306	60.7	70%-130%	No
Methyl Methacrylate	4.653	93.9	70%-130%	Yes
Methyl Methacrylate	9.306	85.2	70%-130%	Yes

APPENDIX A

RAW FIELD DATA

Appendix A.1

Manual Methods
Raw Field Data

APPENDIX A.1.1

Method 1 Field Data Sheets
(includes flows, moistures, and Method 18)

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant: LASCO Panel Products

Date: 5/13/97

Sampling Location: Oven No. 9 Exhaust

Inside of Far Wall to Outside of Nipple: 15"

Inside of Near Wall to Outside of Nipple (Nipple Length): 0

Stack I.D.: 15"

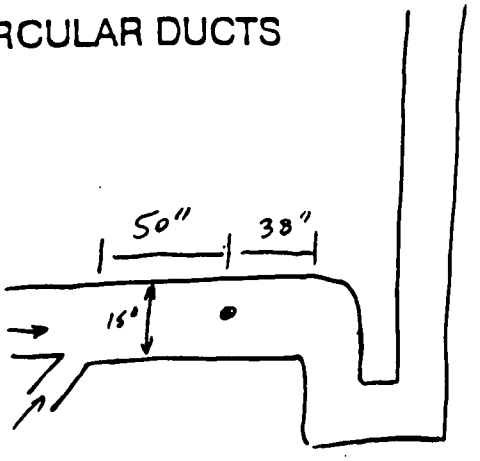
Distance Downstream from Flow Disturbance (Distance B):

50 inches / Stack I.D. = 3.33 dd

Distance Upstream from Flow Disturbance (Distance A):

38 inches / Stack I.D. = 2.53 dd

Calculated By: TA



Schematic of Sampling Location

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3 (To nearest 1/8")	Nipple Length (inches)	Traverse Point Location (Sum of Col. 4 & 5)
1	0.044	15"	0.7	0	0.7
2	0.146		2.19		2.19
3	0.296		4.44		4.44
4	0.704		10.56		10.56
5	0.854		12.81		12.81
6	0.956		14.34		14.34

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant: LASCO Panel Products

Date: 5/13/97

Sampling Location: Oven #10 Outlet

Inside of Far Wall to Outside of Nipple: 15"

Inside of Near Wall to Outside of Nipple (Nipple Length): 0

Stack I.D.: 15"

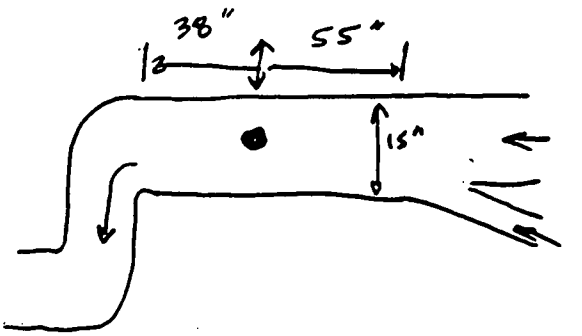
Distance Downstream from Flow Disturbance (Distance B):

55 inches / Stack I.D. = _____ dd

Distance Upstream from Flow Disturbance (Distance A):

38 inches / Stack I.D. = _____ dd

Calculated By: TA



Schematic of Sampling Location

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3 (To nearest 1/8")	Nipple Length (inches)	Traverse Point Location (Sum of Col. 4 & 5)
1	0.044	15"	0.7	0"	0.7
2	0.146		2.19		2.19
3	0.296		4.44		4.44
4	0.704		10.56		10.56
5	0.854		12.81		12.81
6	0.956		14.34		14.34

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant: LASCO PRODUCTS

Date: 5/13/97

Sampling Location: MAIN EXHAUST

Inside of Far Wall to Outside of Nipple: N/A

Inside of Near Wall to Outside of Nipple (Nipple Length): N/A

Stack I.D.: 17.5"

Distance Downstream from Flow Disturbance (Distance B):

42 inches / Stack I.D. = 2.4 dd

Distance Upstream from Flow Disturbance (Distance A):

37 inches / Stack I.D. = 2.1 dd

Calculated By: A. Weisman

Schematic of Sampling Location

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3 (To nearest 1/8")	Nipple Length (inches)	Traverse Point Location (Sum of Col. 4 & 5)
1	.032	17.5	.56	N/A	1/2"
2	.105	↓	1.84	↓	1 3/4"
3	.194	↓	3.395	↓	3 3/8"
4	.323	↓	5.65	↓	5 5/8
5	.677	↓	11.85	↓	11 7/8"
6	.806	↓	14.11	↓	14 1/8"
7	.895	↓	15.66	↓	15 5/8"
8	.968	↓	16.94	↓	17"

TRAVERSE POINT LOCATION FOR RECTANGULAR DUCTS

Plant: LASCO PRODUCTS

Date: 5/13/97

Sampling Location: ROOM EXHAUST

Duct Width, inches: ~~28~~ 24

Inside of Far Wall to Outside of Nipple: N/A

Inside of Near Wall to Outside of Nipple (Nipple Length): N/A

Duct Length, inches: ~~24~~ 28

Equivalent Diameter = 2 x L x W / (L + W) = 25.85"

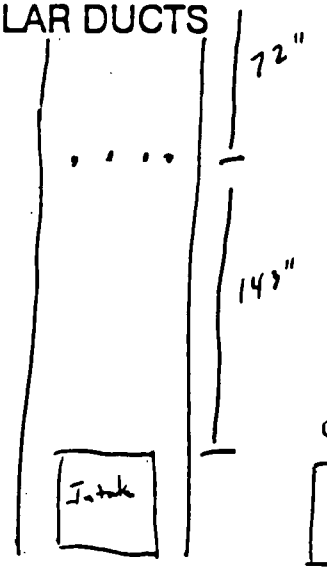
Distance Downstream from Flow Disturbance (Distance B):

143 inches / Equivalent Diameter = 5.5 dd

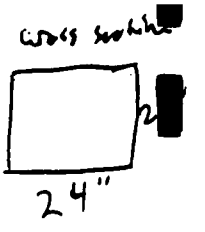
Distance Upstream from Flow Disturbance (Distance A):

72 ~~10.ph~~ inches / Equivalent Diameter = ~~0.4~~ dd

Calculated By: A. WERMAN



Schematic of Sampling Location



Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3* (To nearest 1/8")	Nipple Length (inches)	Traverse Point Location (Sum of Col. 4 & 5)
1	0.083	28	2.32	N/A	2 3/8
2	0.25	↓	7.00	↓	7
3	0.417	↓	11.68	↓	11 5/8
4	0.583	↓	16.32	↓	16 3/8
5	0.750	↓	21.00	↓	21
6	0.917	↓	25.68	↓	25 5/8

If No Ports, Calculate Distances From Stack Walls For Port Locations

Number of Ports	Fraction of Width	Width (inches)	Port Location . Product of Col. 2 & 3* (To Nearest 1/8")

*All points or ports should be an equal distance from each other (D) and 1/2 of that distance from the stack walls (D/2), where D = Width / # of points or ports

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant: LASCO PRODUCTS

Date: 5/13/97

Sampling Location: AUXILIARY ROOM EXHAUST

Inside of Far Wall to Outside of Nipple: N/A

Inside of Near Wall to Outside of Nipple (Nipple Length): N/A

Stack I.D.: 19.75"

Distance Downstream from Flow Disturbance (Distance B):

114 inches / Stack I.D. = 5.8 dd

Distance Upstream from Flow Disturbance (Distance A):

~~14~~ 40 inches / Stack I.D. = 2.0 dd

Calculated By: A. WEISMAN

Schematic of Sampling Location

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3 (To nearest 1/8")	Nipple Length (inches)	Traverse Point Location (Sum of Col. 4 & 5)
1	0.032	19.75	0.63	N/A	5/8
2	0.105		2.07		2 1/8
3	0.194		3.83		3 3/4
4	0.323		6.38		6 3/8
5	0.677		13.40		13 3/3
6	0.806		15.92		15 7/8
7	0.895		17.68		17 5/8
8	0.968		19.12		19 1/8

APPENDIX A.1.2

Condition 1
(includes flows, moistures, and Method 18)

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-21-97

Sampling Location: Main Exhaust Clock Time: 1220

Run #: ME-1-1 Operators: TA/Dave S.

Barometric Pressure, in. Hg: ~~28.92~~ 28.80 Static Pressure, in. H_2O: +.02

Moisture, %: 1.6 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 17.5" Side 2: —

Wet Bulb, °F: 68 Dry Bulb, °F: 89

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.17	91
2	.24	91
3	.30	92
4	.31	92
5	.33	92
6	.36	92
7	.28	91
8	.38	91
1	.26	92
2	.28	91
3	.28	91
4	.30	92
5	.28	92
6	.30	92
7	.32	92
8	.27	92
	$\overline{\sqrt{\Delta P}}$ = 0.5378	$\overline{T_s}$ = 92

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 28.84

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ 28.67

$\overline{T_s} =$ 92 °F = 552 °R (°F + 460)

$P_s = P_b + \frac{S.P.}{13.6} = (28.80) + \frac{+.02}{13.6}$

$P_s =$ 28.80 in. Hg

$\overline{\sqrt{\Delta P}} =$ 0.5378

$V_s = 85.49 \times C_p \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{P_s \times M_s}}$

$V_s = 85.49 \times (0.99) \times (0.5378) \times \sqrt{\frac{552}{28.67 \times 28.80}}$

$V_s =$ 37.216 ft/s

$A_s =$ 1.67 ft^2

$Q_s = V_s \times A_s \times 60$ s/m

$Q_s = \quad \times \quad \times 60$

$Q_s =$ 3729 acfm

$Q_{s_{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{\%H_2O}{100})$

$Q_{s_{std}} = \quad \times 17.647 \times \frac{28.80}{552} \times (1 - \frac{\quad}{100})$

$Q_{s_{std}} =$ 3378 dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: MAIN EXHAUST

Site: MAIN EXHAUST Operators: TA/DAVE Run #: ME-1-1 Date: 5-14-97

Barometric Pressure, in. Hg = Pbar = 28.80 in. Hg

Static Pressure, in. H_2O = Pg = 7.02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.80 in. Hg

Wet-Bulb Temperature, °F = Tw = 68 °F

Dry-Bulb Temperature, °F = Td = 89 °F

Temperature Difference, Td - Tw = ΔT = 21 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6903 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.6903) - \frac{(28.80 - 0.6903) \times (21)}{2800 - (1.3 \times 68)} = 0.4726 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.4726)}{(28.80)} = 0.016 \sim 1.6\%$$

[redacted]

$$\frac{590.3}{2711.6} = .2177$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-14-97
Sampling Location: Main Exhaust Clock Time: 1320
Run #: ME-1-2 Operators: TA/Dave S.
Barometric Pressure, in. Hg: 28.92 Static Pressure, in. H_2O: +.01
Moisture, %: 3.5 Molecular wt., Dry: 28.84 Pitot Tube, Cp: 0.99
Stack Dimension, in. Diameter or Side 1: 17.5" Side 2: —
Wet Bulb, °F: 80.6 Dry Bulb, °F: 87

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	0.21	93
2	0.22	92
3	0.24	92
4	0.22	91
5	0.28	91
6	0.29	91
7	0.31	91
8	0.30	91
1	0.24	92
2	0.23	91
3	0.20	91
4	0.21	91
5	0.26	91
6	0.24	91
7	0.19	92
8	0.20	92
	$\overline{\sqrt{\Delta P}}$ = 0.4885	$\overline{T_s}$ = 91°F or 551

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18(\frac{\quad}{100})$

$Ms = 28.46$

$\overline{T_s} = 91$ °F = 551 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.92$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4885$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 33.827$ ft/s

$As = 1.670$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3389.5$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3030$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Products Location: Florence, Ky

Site: Main Exhaust Operators: TA/OS Run #: ME-1-2 Date: 5/19/97

Barometric Pressure, in. Hg = Pbar = 28.92 in. Hg

Static Pressure, in. H_2O = Pg = 1.01 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.92 in. Hg

Wet-Bulb Temperature, °F = Tw = 81 °F

Dry-Bulb Temperature, °F = Td = 87 °F

Temperature Difference, Td - Tw = ΔT = 6 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 1.066 in. Hg

Vapor Pressure of H_2O = Pva = $(Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

Pva = (1.066) - $\frac{(28.92 - 1.066) \times (6)}{2800 - (1.3 \times 81)}$ = 1.004 in. Hg

Proportion of Water Vapor by Volume = Bws

Bws = $\frac{(Pva)}{(Ps)}$ = $\frac{(1.004)}{(28.92)}$ = 0.035 or 3.5% BE

$\frac{167.1}{2694.7}$ = 0.0[illegible]

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 3-14-97
Location: Main Exhaust
Run #: ME-1-3
Stack I.D.: 17.5"
Pbar: 28.92
Sample Tube #: ME-1-2A, ME-1-3B
Operators: TH / Dave S.
Leak Check: Pre: — Post: —

Tested Analyte: Styrene
Orifice Tank #: [redacted]
Pump/Rotometer #: vost 2
Pt: Pretest (mm Hg): .000 @ 10
Post-Test (mm Hg): .000 @ 10
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1540 Finish: 16[redacted] Total: [redacted] 25 min.
W/B: 86 D/B: 93 O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
1540	0	250 cc/min
1550	0	
1600	0	
1605	0	

[redacted]T VOL
[redacted] 73.33
[redacted] 73.50
[redacted] 73.30
[redacted] 74.54

[redacted]
V = 6.21

70
72

STATIC +.02

T_m = 71

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.13	90
2	.22	92
3	.22	92
4	.21	93
5	.23	93
6	.23	93
7	.14	93
8	.13	93
B-1	.12	91
2	.18	93
3	.22	93
4	.25	93
5	.24	93
6	.25	93
7	.27	93
8	.27	93
$\sqrt{\Delta P}$ avg = 0.4553		93

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

Moisture = 4.1 %

$Ms = (28.84) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.40$

$Ts = 93$ °F = 553 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.92$ in. Hg

$\overline{\sqrt{\Delta P}} = .4553$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 31.619$ ft/s

$As = 1.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3168$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 2804.0$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Products Location: Florence, Ky

Site: Main Exhaust Operators: TH Run #: ME-1-3 Date: 5/14/97

Barometric Pressure, in. Hg = Pbar = 28.92 in. Hg

Static Pressure, in. H_2O = Pg = +.02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.92 in. Hg

Wet-Bulb Temperature, °F = Tw = 86 °F

Dry-Bulb Temperature, °F = Td = 93 °F

Temperature Difference, Td - Tw = ΔT = 7 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .253 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.253) - \frac{(28.92 - .253) \times (7)}{2800 - (1.3 \times 86)} = .181 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.181)}{(28.92)} = 0.006 \text{ or } 4.1\%$$ BL

$\frac{193.7}{2682} = 0.072$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LAS CO Date: 5-14-97
Sampling Location: Room Exhaust Clock Time: 1230
Run #: 1 Cond 1 RB-1-1 Operators: TA/DS
Barometric Pressure, in. Hg: ~~28.72~~ 28.80 Static Pressure, in. H_2O: .65 -
Moisture, %: 1.9 Molecular wt., Dry: 28.84 Pitot Tube, Cp: 0.99
Stack Dimension, in. Diameter or Side 1: 24" Side 2: 28"
Wet Bulb, °F: 67 Dry Bulb, °F: 78

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.08	78
2	.07	77
3	.07	77
4	.08	77
5	.08	77
6	.08	77
B-1	.10	78
2	.09	78
3	.07	78
4	.05	78
5	.07	78
6	.07	78
C-1	.16	78
2	.11	78
3	.08	78
4	.07	78
5	.07	77
6	.07	77
D-1	.11	78
2	.07	78
3	.05	78
4	.05	78
5	.05	78
6	.06	78
	$\overline{\sqrt{\Delta P}}$ = 0.2756	$\overline{T_s}$ = 78

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.9}{100}) + 18 (\frac{1.9}{100})$

$Ms = 28.63$

$\overline{T_s} = 78$ °F = 538 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.80) + \frac{-0.65}{13.6}$

$Ps = 28.75$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.2756$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (0.2756) \times \sqrt{\frac{538}{28.75 \times 28.63}}$

$Vs = 18.86$ ft/s

$As = 4.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = 18.86 \times 4.67 \times 60$

$Qs = 5281$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 5281 \times 17.647 \times \frac{28.75}{538} \times (1 - \frac{1.9}{100})$

$Qs_{std} = 4886$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: TA Run #: RE-1-1 Date: 5-14-97

Barometric Pressure, in. Hg = Pbar = 28.8 in. Hg

Static Pressure, in. H_2O = Pg = -.65 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.75 in. Hg

Wet-Bulb Temperature, °F = Tw = 67 °F

Dry-Bulb Temperature, °F = Td = 78 °F

Temperature Difference, Td - Tw = ΔT = 11 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .6669 in. Hg

Vapor Pressure of H_2O = Pva = $(Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$$Pva = (.6669) - \frac{(28.75 - .6669) \times (11)}{2800 - (1.3 \times 67)} = .5530 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.5530)}{(28.75)} = 1.9$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0766	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-14-97
Sampling Location: Room Exhaust Clock Time: 1330
Run #: RE-1-2 Operators: TA / Dave S
Barometric Pressure, in. Hg: 28.92 Static Pressure, in. H_2O: -.65
Moisture, %: 1.6 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 24" Side 2: 28"
Wet Bulb, °F: 64 Dry Bulb, °F: 76

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.05	82
2	.07	81
3	.06	81
4	.08	81
5	.08	81
6	.08	81
1	.05	82
2	.08	81
3	.07	81
4	.06	81
5	.06	81
6	.06	81
1	.08	81
2	.07	81
3	.07	81
4	.05	81
5	.06	81
6	.06	81
1	.06	82
2	.07	82
3	.06	81
4	.06	81
5	.05	81
6	.05	81
	$\overline{\sqrt{\Delta P}}$ = 0.2525	$\overline{Ts}$ = 81 °F

541 °R

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.67$

$\overline{Ts} = 81$ °F = 541 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.87$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.2525$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 17.277$ ft/s

$As = 4.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 4837.5$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4482.7$ dscfm

RB ✓

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Florence, Ky

Site: Room Exhaust Operators: TA/DS Run #: RE-1-2 Date: 5/14/97

Barometric Pressure, in. Hg = Pbar = 28.92 in. Hg

Static Pressure, in. H_2O = Pg = -.65 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.87 in. Hg

Wet-Bulb Temperature, °F = Tw = 64 °F

Dry-Bulb Temperature, °F = Td = 76 °F

Temperature Difference, Td - Tw = ΔT = 12 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6009 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.6009) - \frac{(28.87 - .6009) \times (12)}{2800 - (1.3 \times 64)} = 0.476 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.476)}{(28.87)} = 0.016 \text{ or } 1.6\%$$

$$\frac{339.3}{2717} = .1249$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5.14.97
Location: BOOM EXHAUST
Run #: ~~[illegible]~~ RB-1-3
Stack I.D.: 24" x 28"
Pbar: 28.92
Sample Tube #: RE-[illegible]/RE-[illegible]
Operators: TA/Dnes.
Leak Check: Pre: - Post: -

Tested Analyte: Styrene
Orifice Tank #: [illegible]
Pump/Rotometer #: Vost 1
Pt: Pretest (mm Hg): .000 @ 10
Post-Test (mm Hg): .000 @ 10
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1541 Finish: 1641 Total: 60 min
W/B: 65 D/B: 81 O_2: — CO_2: -

Time	Gauge Vacuum (Hg)	Flow Setting
1541	0	950 cc/min
1551	0	
1601	0	
1611	0	
1621	0	
1631	0	
1641	0	

STATE - .63

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
A-1	.05	79
2	.07	79
3	.07	79
4	.07	79
5	.06	79
6	.07	79
B-1	.08	79
2	.09	78
3	.05	78
4	.06	78
5	.06	78
6	.05	78
C-1	.08	79
2	.10	79
3	.09	78
4	.07	78
5	.06	78
6	.05	78
D 1	.07	79
2	.08	79
3	.07	78
4	.05	78
5	.05	78
6	.07	78
Ave ΔP	0.2609	79

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.67$

Moisture = 1.6 %

$Ts = 79\ °F = 539\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.87$ In. Hg

$\overline{\sqrt{\Delta P}} = .2609$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 17.819$ ft/s

$As = 4.67\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 4992.9$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4644$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Products Location: Florence, Ky

Site: Room Exhaust Operators: [illegible] Run #: RE-1-3 Date: 5/14/97

Barometric Pressure, in. Hg = Pbar = 28.92 in. Hg

Static Pressure, in. H_2O = Pg = -.68 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.87 in. Hg

Wet-Bulb Temperature, °F = Tw = 65 °F

Dry-Bulb Temperature, °F = Td = 81 °F

Temperature Difference, Td - Tw = ΔT = 16 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6222 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.6222) - \frac{(28.87 - .6222) \times (16)}{2800 - (1.3 \times 65)} = 0.4558 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.4558)}{(28.87)} = 0.016 \approx 1.6\%$$

$$\frac{51.9}{2715.5} = .1664$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-14-97
Location: Oven 9 Exhaust
Run #: 9 - 1 - 2
Stack I.D.: 12" 15"
Pbar: 28.92
Sample Tube #: 10-1-2A 10-1-2B
Operators: TH / Dave S.
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #:
Pump/Rotometer #: Apex VOST Box
Pt: Pretest (mm Hg): .000 @ 15
Post-Test (mm Hg): .000 @ 15
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1235 Finish: 1335 Total: 60
W/B: — D/B: — O_2: — CO_2: —

START VOL
[redacted].80
[redacted].30
854.85
[redacted].63
[redacted] 15
860
[redacted].80
[redacted].59
= 15.69
n = 91

Time	Gauge Vacuum (Hg)	Flow Setting
1235	0	950 cc/min
1245	0	
1255	0	
1305	0	
1315	0	
1325	0	
1335	0	

STATIC -.75"

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.15	168
2	.18	168
3	.20	170
4	.23	170
5	.24	171
6	.23	170
B-1	.11	162
2	.20	170
3	.21	172
4	.21	173
5	.21	166
6	.22	165

$\overline{\sqrt{\Delta P}}$ = 0.4442 $\overline{T_s}$ = 169

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 20) + (0.28 \times 79)$

94/93 $Md = 28.84$

87 - 87

89/89 $Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

90/90 $Ms = (28.84) \times (1 - \frac{1.8}{100}) + 18 (\frac{1.8}{100})$

91/91

91/91 $Ms = 28.64$

91/91 $Ts = 169$ °F = 629 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{-.75"}{13.6}$

$Cp = 0.99$

$Ps = 28.86$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4442$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.4442) \times \sqrt{\frac{629}{28.86 \times 28.64}}$

$Vs = 32.796$ ft/s

$As = 1.23$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2420$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{8}{629} \times (1 - \frac{1.8}{100})$

$Qs_{std} = 1924$ dscfm

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO
Date: 5.14.97
Sampling Location: OVEN #9 EXHAUST
Clock Time: 1220
Run #: 9-1-1
Operators: TA / DAVE S.
Barometric Pressure, in. Hg: 28.92
Static Pressure, in. H_2O: [redacted] .72
Moisture, %: 1.8
Molecular wt., Dry: 28.84
Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 12" x 15"
Side 2: —
Wet Bulb, °F: —
Dry Bulb, °F: —

Ave. 2.3

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.21	166
2	.22	167
3	.22	165
4	.21	168
5	.20	169
6	.20	168
B-1	.17	167
2	.14	169
3	.17	171
4	.20	172
5	.23	171
6	.22	171
	$\overline{\sqrt{\Delta P}}$ = .4398	$\overline{T_s}$ = 169

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.8}{100}) + 18 (\frac{1.8}{100})$

$Ms = 28.64$

$\overline{T_s} = 169$ °F = 628 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{-.72}{13.6}$

$Ps = 28.87$ in. Hg

$\overline{\sqrt{\Delta P}} = .4398$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.4398) \times \sqrt{\frac{628}{28.87 \times 28.64}}$

$Vs = 32.44$ ft/s

$As = 1.23$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 32.44 \times 1.23 \times 60$

$Qs = 2,394$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 2,394 \times 17.647 \times \frac{28.87}{628} \times (1 - \frac{1.8}{100})$

$Qs_{std} = 1,907$ dscfm

FIELD DATA SHEET

Plant: LASCO
Sampling Location 5-14-97
Run Number: 9-1-2 Date: 5-14-97
Pretest Leak Rate: .000 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: NA Orsat: -

Sample Type: M-4 Operator: DAVES, TA
Pbar: 28.92 Ps: 28.86
CO2: - O2: -
Probe Length/Type: - Pitot #:
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: - Thermocouple #: -
Assumed Bws: Filter #: -
Meter Box #: MB14 Y: .966 ΔH@: 1.86
Post-Test Leak Rate: .000 cfm @ 15 in. Hg.
Post-Test Leak Check: Pitot: NA Orsat: -

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
		1240	919.645										
	10	1250	927.60		1.86					94	93		4
	20	1300	935.70		1.86					95	92		4
	30	1310	943.647		1.86					96	92		4

ΔVm= 23.997 $\overline{\sqrt{\Delta p}}$= - $\overline{\Delta H}$= 1.86 $\overline{Ts}$= - $\overline{Tm}$= 94

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 9-1-2

DATE 5-14-97 Sample Box No. N-1 Job No. S405.003

SAMPLE LOCATION Oven #9 Outlet Filter No. NA

TRAIN PREPARER JA

SAMPLE RECOVERY PERSON PAUL SIEGEL

COMMENTS EPA METHOD 4 MOISTURE TRAIN
No Sample recovery of contents

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)			
			INITIAL	FINAL	NET	
1	DI H_2O	100	606.5	609.1	2.6	
2	DI H_2O	100	606.4	606.8	0.4	
3	Empty	—	497.2	497.8	0.6 ~~0.80~~	PTS
4	Silica Gel	200	826.8	831.3	4.5	
5						
6						
TOTAL			2536.9	2545.0	8.1 ~~8.5~~	PTS

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 9-1-2 DATE: 5-14-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{23.997}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (23.997) \times (0.966) \times \left(\frac{(28.80) + (1.86 / 13.6)}{(554)}\right)$$

$$V_{m_{std}} = \underline{21.359}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (8.1)$$

$$V_{w_{std}} = \underline{0.381}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(0.381)}{(0.381) + (21.359)}$$

$$B_{ws} = \underline{0.018}$$

1.8 % MOISTURE

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-14-97
Sampling Location: OVEN 9 EXHAUST Clock Time:
Run #: 9-1-3 Operators: DBS/TA
Barometric Pressure, in. Hg: 28.80 Static Pressure, in. H_2O: -.78
Moisture, %: 1.8% Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: ~~47~~ 15 Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.16	171
2	.20	172
3	.21	173
4	.21	174
5	.20	174
6	.23	174
1	.14	174
2	.19	174
3	.21	175
4	.22	174
5	.23	174
6	.21	174
	$\overline{\sqrt{\Delta P}}$ = 0.4471	$\overline{T_s}$ = 173

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.8}{100}) + 18(\frac{1.8}{100})$

$Ms = 28.64$

$\overline{T_s} = 173\ °F = 633\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (28.80) + \frac{-0.78}{13.6}$

$Ps = 28.74$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4471$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s\,(°R)}{P_s \times M_s}}$

$Vs = 85.49 \times (.99) \times (.4471) \times \sqrt{\frac{633}{28.74 \cdot 28.64}}$

$Vs = 33.18$ ft/s

$As = 1.23\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \cancel{2449}\ 88 \times \quad \times 60$

$Qs = 2449$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{28.74}{633} \times (1 - \frac{1.8}{100})$

$Qs_{std} = 1927$ dscfm

RD

FIELD DATA SHEET

Plant: LASCO
Sampling Location: oven #9 outlet
Run Number: 9-1-3 Date: 5-14-97
Pretest Leak Rate: .003 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: NA Orsat: –

Sample Type: m-4 Operator: TOT
Pbar: 28.8 Ps: 28.74
CO2: – O2: –
Probe Length/Type: 3' SS Pitot #: –
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: – Thermocouple #: 3A
Assumed Bws: 1.8% Filter #: –
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: .002 cfm @ 4 in. Hg.
Post-Test Leak Check: Pitot: NA Orsat: –

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
0	0	1540	943.790										
	10	1550	952.3			1.9				60	90	89	4
	20	1600	959.8			1.9				58	92	89	4
	30	1610	967.908			1.9				55	95	90	4

ΔVm= 24.118 $\overline{\sqrt{\Delta p}}$= – $\overline{\Delta H}$= 1.9 $\overline{Ts}$= – $\overline{Tm}$= 91

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 9-1-3

DATE 5-14-97 Sample Box No. N-5 Job No. 5405.003

SAMPLE LOCATION OVEN #9 OUTLET Filter No. NA

TRAIN PREPARER TA

SAMPLE RECOVERY PERSON PAUL SIEGEL

COMMENTS EPA METHOD 4 MOISTURE TRAIN
No Recovery of impinger contents

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	568.0	570.5	2.5
2	DI H_2O	100	587.4	588.2	0.8
3	Empty	—	492.8	493.4	0.6
4	Silica Gel	200	761.0	765.8	4.8
5					
6					
TOTAL			2409.2	2417.9	8.7

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 9-1-3 DATE: 5-14-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{24.118}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (24.118) \times (0.996) \times \left(\frac{(28.80) + (1.9 / 13.6)}{(551)}\right)$$

$$V_{m_{std}} = \underline{22.256}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (8.7)$$

$$V_{w_{std}} = \underline{0.410}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(0.410)}{(0.410) + (22.256)}$$

$$B_{ws} = \underline{0.018}$$

= 1.8 % MOISTURE

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-14-97
Location: Oven #10 Exhaust
Run #: 10-1-1
Stack I.D.: 15"
Pbar: ~~28.92~~ 28.80
Sample Tube #: 10-1-1A, 10-1-1B
Operators: JA/Dave S
Leak Check: Pre: ✓ Post:

Tested Analyte: Styrene
Orifice Tank #:
Pump/Rotometer #: APEX
Pt: Pretest (mm Hg): .000 @ 15
Post-Test (mm Hg): .000 @ 15
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: ~~0830~~ 1040 Finish: 1140 Total: 60
W/B: D/B: O_2: CO_2:

START VOL 534.18 L.

Time	Gauge Vacuum (Hg)	Flow Setting
~~0830~~ 1040	0	250 cc/min
~~0850~~ 1050	0	250 cc/min
~~0900~~	0	250 cc/min
1110	0	250 cc/min
1120	0	250 cc/min
1130	0	250 cc/min
1140	0	250 cc/min

534.70
539.15
541.80
544.20
546.90
549.68

V = 15.5
n = 84

STATIC -.65

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.13	205
2	.17	215
3	.17	220
4	.19	220
5	.24	222
6	.29	220
B-1	.20	215
2	.23	219
3	.21	220
4	.19	219
5	.18	217
6	.20	216

AVG $\sqrt{\Delta p}$ = 0.4452 218

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$ 81/81

$Md = 28.84$ 80/82

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$ 82/82

$Ms = (28.84) \times (1 - \frac{0.027}{100}) + 18(\frac{.027}{100})$ 84/84

$Ms = 28.55$ 85/85

$Ts = 218\ °F = 678\ °R\ (°F + 460)$ 86/87

$Ps = Pb + \frac{S.P.}{13.6} = (28.80) + \frac{-0.65}{13.6}$ 87/87

$Ps = 28.75$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4452$

$Cp = 0.99$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\cancel{0.4452}\ 0.99) \times (0.4452) \times \sqrt{\frac{678}{28.75 \times 28.55}}$

$Vs = 34.245$ ft/s

$As = 1.227\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2521.5$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 2521.5 \times 17.647 \times \frac{28.75}{678} \times (1 - \frac{.027}{100})$

$Qs_{std} = 1835.9$ dscfm

Moisture 2.7%

BE

FIELD DATA SHEET

Plant: LASCO
Sampling Location: Oven #10 Exhaust
Run Number: 1 Cont-1 Date: 5-14-97
Pretest Leak Rate: .004 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: NA Orsat: —

Sample Type: M-4 Operator: DBS
Pbar: ~~28.92~~ Ps:
CO2: 28.80 O2:
Probe Length/Type: Pitot #: Standard
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: N/A Thermocouple #: —
Assumed Bws: 2.7 Filter #: N/A
Meter Box #: MB-14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: .001 cfm @ 15 in. Hg.
Post-Test Leak Check: Pitot: NA Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	00	1040	895.265										
	10	1050	903.20		1.86						82	81	5
	20	1100	911.10		1.86						85	84	5
	30	1110	919.000		1.86						88	84	5
											81	86	5

ΔVm= 23.735 $\overline{\sqrt{\Delta p}}$= — ΔH= 1.86 Ts= — Tm= 85

BS

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 10-1-1 Cond.

DATE 5-14-97 Sample Box No. N-7 Job No. 5405.003

SAMPLE LOCATION Oven #10 Outlet Filter No. N/A

TRAIN PREPARER TA

SAMPLE RECOVERY PERSON PAUL SIEGEL

COMMENTS Method 4 MOISTURE Train
- No Recovery of contents -

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	552.5	559.2	6.7
2	DI H_2O	100	664.7	665.7	1.0
3	Empty	—	511.6	512.0	0.4
4	Silica Gel	200	834.6	839.4	4.8
5					
6					
TOTAL			2563.4	2576.3	12.9

BE

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 10-1-1 DATE: 5-14-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{23.735}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (23.735) \times (0.966) \times \left(\frac{(28.80) + (1.86 / 13.6)}{(545)}\right)$$

$$V_{m_{std}} = \underline{21.474}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (12.9)$$

$$V_{w_{std}} = \underline{0.607}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(0.607)}{(0.607) + (21.474)}$$

$$B_{ws} = \underline{0.027}$$

2.7 % MOISTURE

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-14-97
Sampling Location: OVEN #10 EXHAUST Clock Time: 1320
Run #: 10-1-2 Operators: TA / DAVE S.
Barometric Pressure, in. Hg: 28.92 Static Pressure, in. H_2O: ~~[illegible]~~ -.95
Moisture, %: 2.3% ave Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: ~~12~~ 15" Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.21	211
2	.22	211
3	.21	212
4	.18	213
5	.18	215
6	.21	215
B-1	.16	215
2	.16	216
3	.17	221
4	.26	220
5	.22	210
6	.23	211
	$\sqrt{\overline{\Delta P}}$ = 0.4553	$\overline{Ts}$ = 214

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$ Moisture = 2.3%

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.59$

$\overline{Ts} = 214$ °F = 674 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{-.95''}{13.6}$

$Ps = 28.85$ in. Hg

$\sqrt{\overline{\Delta P}} = 0.4553$

$Vs = 85.49 \times Cp \times \sqrt{\overline{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.4553) \times \sqrt{\frac{674}{28.85 \times 28.59}}$

$Vs = 34.83$ ft/s

$As = 1.227$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2564.4$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1892.5$ dscfm

RL

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO
Date: 5-14-97
Sampling Location: Oven 10 Exhaust
Clock Time: 1420
Run #: 10-1-3
Operators: DRR / TA
Barometric Pressure, in. Hg: 28.80
Static Pressure, in. H_2O: -.90
Moisture, %: 1.9 %
Molecular wt., Dry: 28.84
Pitot Tube, Cp: 0.99
Stack Dimension, in. Diameter or Side 1: 72"/12 15
Side 2: —
Wet Bulb, °F: —
Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.12	222
2	.18	222
3	.20	222
4	.25	223
5	.23	221
6	.25	220
B 1	.22	220
2	.22	222
3	.22	222
4	.20	223
5	.26	221
6	.20	221
	$\overline{\sqrt{\Delta P}}$ = 0.4539	$\overline{T_s}$ = 222°F
		682°R

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.63$

$\overline{T_s} = 222\ °F = 682\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.73$ in. Hg

$\overline{\sqrt{\Delta P}} = .4539$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 34.980$ ft/s

$As = 1.227\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2575.3$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1878.0$ dscfm

FIELD DATA SHEET

Plant: LASCO
Sampling Location: Oven 10
Run Number: 10-B-3 Date: 5-14-97
Pretest Leak Rate: .002 cfm @ 16 in. Hg.
Pretest Leak Check: Pitot: NA Orsat: –

Sample Type: M-4 Operator: TA
Pbar: 28.8 Ps: 28.7
CO2: 0 O2: 21
Probe Length/Type: — Pitot #: —
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: – Thermocouple #: –
Assumed Bws: 1.95 Filter #: –
Meter Box #: 14 Y: .966 ΔH@: 1.86
Post-Test Leak Rate: .001 cfm @ 16 in. Hg.
Post-Test Leak Check: Pitot: NA Orsat: –

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0	1607	968.267										
	15	1639	979.0			1.5					103	93	7
	37	1655	994.244			1.5					104	95	7
											94	92	15

ΔVm= 25.977 $\overline{\sqrt{\Delta p}}$= – ΔH= 1.5 $\overline{Ts}$= – $\overline{Tm}$= 97

SAMPLE RECOVERY DATA

PLANT LASCO Run No. ~~10-1-3~~ 10-1-3

DATE 5-14-97 Sample Box No. N-6 Job No. 5405.003

SAMPLE LOCATION OVEN #10 outlet Filter No. N/A

TRAIN PREPARER TA

SAMPLE RECOVERY PERSON PAUL SIEGEL

COMMENTS EPA METHOD 4 MOISTURE
No recovery of impinger contents.

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	591.9	595.2	3.3
2	DI H_2O	100	662.3	663.0	0.7
3	Empty	—	455.4	456.0	0.6
4	Silica SG Gel	200	764.5	769.6	5.1
5					
6					
TOTAL			2474.1	2483.8	9.7

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 10-B-R DATE: 5-14-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{25.997}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (25.997) \times (0.966) \times \left(\frac{(28.80) + (1.5 / 13.6)}{(557)}\right)$$

$$V_{m_{std}} = \underline{22.993}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (9.7)$$

$$V_{w_{std}} = \underline{0.457}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(0.457)}{(0.457) + (22.993)}$$

$$B_{ws} = \underline{0.019}$$

= 1.9 % MOISTURE BH, ✓

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-14-97
Location: ~~NDD~~ NDB
Run #: ~~NDD-1-3~~ NDB-1-3
Stack I.D.: ~~32" x 120"~~ BE 0.5" x 72"
Pbar: 28.8
Sample Tube #: ~~NDD-1-3A~~, NDB-1-3B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: VOST #3
Pump/Rotometer #: –
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1540 Finish: 1640 Total: 60 min.
W/B: 64 D/B: 70 O_2: 21 CO_2: 0

Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1321.34/1540	1	21	82
1324.0 1550	1	21	84
1326.53/1600	1	21	86
1329.75/1610	1	21	89
1332.83/1620	1	21	91
1334.53/1630	1	21	93
1337.08/1640	1	21	94

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

AL NV=1524 T-DD.1

METHOD 18 FIELD DATA SHEET

Y = 1.002

Plant: LASCO
Date: 5-14-97
Location: NDO - Location A
Run #: NDA-1-1
Stack I.D.: 32" x 120"
Pbar: 28.92
Sample Tube #: NDA-1-1A, NDA-1-1B
Operators: TH
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: VOST #3
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1035 Finish: 1135 Total: 60 min
W/B: ____ D/B: ____ O_2: 21 CO_2: 0

	Time		Gauge Vacuum (Hg)	Flow Setting	Tm
0	1306.74	1035	2	21	80
10	1309.72	1045	2	21	80
20	1311.71	1055	2	21	84
30	1314.21	1105	2	21	87
40	1317.21	1115	2	21	89
50	1319.74	1125	2	21	89
60	1322.30	1135	2	21	89

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

$\Delta V = 14.56$ $\quad \bar{T} = 85.4$

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: NDD - Location B

Site: ~~NDB~~ Operators: TA Run #: NDB-1-3 Date: 5-14-97

Barometric Pressure, in. Hg = Pbar = 28.80 in. Hg

Static Pressure, in. H_2O = Pg = 0.01 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.80 in. Hg

Wet-Bulb Temperature, °F = Tw = 64 °F

Dry-Bulb Temperature, °F = Td = 70 °F

Temperature Difference, Td - Tw = ΔT = 6 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .6009 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.6009) - \frac{(28.80 - .6009) \times (6)}{2800 - (1.3 \times 64)} = .5386 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.5386)}{(28.80)} = 1.87\% \simeq 1.9\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

APPENDIX A.1.3

Condition 2
(includes flows, moistures, and Method 18)

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5/14/97
Location: Main Exhaust
Run #: ME-2-1
Stack I.D.: 17.5"
Pbar: 28.84
Sample Tube #: ME-2-1
Operators: RH/TA
Leak Check: Pre: ✓ Post: ✓
.001 at 25" .000 at 2.0"

Tested Analyte: Styrene
Orifice Tank #: V13-2
Pump/Rotometer #:
Pt: Pretest (mm Hg):
Post-Test (mm Hg):
Tt: Pretest (°F):
Post-Test (°F):
Time: Start: 0823 Finish: 0923 Total: 60 min
W/B: 68 D/B: 92 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	
0	2023 ~~0823~~ 2275.08	1	0.2 = 250 cc/min	Tm 68
10	2033 ~~0833~~ 2278.05	1	0.2	68
20	2044 ~~0844~~ 2281.05	1	0.2	70
30	2054 ~~0854~~ 2283.95	1	0.2	71

Start 0823
End

Traverse Point Number		Velocity Head In. H_2O	Stack Temp. °F
A	1	0.16	91
	2	0.21	93
	3	0.24	92
	4	0.26	92
	5	0.26	92
	6	0.30	92
	7	0.31	92
	8	0.34	91
B	1	0.20	90
	2	0.22	91
	3	0.26	92
	4	0.28	92
	5	0.28	92
	6	0.27	92
	7	0.27	92
	8	0.24	92
Ave $\sqrt{\Delta P}$		0.5043	92

Static = +.03

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$ G = 0.99

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18(\frac{\quad}{100})$

$Ms = \cancel{28.71}$ 28.68 BE

Moisture = ~~1.2~~ 1.5% BE

$Ts = 92$ °F = 552 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.84$ in. Hg

$\overline{\sqrt{\Delta P}} = .5043$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \cancel{34.85}$ ft/s 34.87 BE

$As = 1.67$ ft²

$Qs = Vs \times As \times 60$ a/m

$Qs = \quad \times \quad \times 60$

$Qs = \cancel{3492}$ acfm 3494 BE

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \cancel{3181}$ dscfm

BE 3173

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Products Location: Florence, Ky

Site: Main Exhaust Operators: [illegible] Run #: ME-2-1 Date: 5/14/97

Barometric Pressure, in. Hg = Pbar = 28.84 in. Hg

Static Pressure, in. H_2O = Pg = +.03 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.84 in. Hg

Wet-Bulb Temperature, °F = Tw = 68 °F

Dry-Bulb Temperature, °F = Td = 92 °F

Temperature Difference, Td - Tw = ΔT = 24 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = ~~.6093~~ BL 0.6903 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\overset{0.6903\ BL}{\cancel{.6093}}) - \frac{(28.84 - \overset{\text{blue BL}}{\cancel{.6093}}) \times (24)}{2800 - (1.3 \times 68)} = \overset{0.4411\ BL}{\cancel{0.3594}} \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\cancel{.3594})\ 0.4411\ BL}{(28.84)} = \cancel{0.012 \sim 1.2\%}\ \ 0.015 \sim 1.5\%\ BL$$

$$\frac{677.5}{2711.6} = 0.2499$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Products- Florence, Ky Date: 5/14/97
Sampling Location: Main Exhaust Clock Time: 2221
Run #: ME-2-2 Operators: RK / TA
Barometric Pressure, in. Hg: 28.84 Static Pressure, in. H_2O: -.03
Moisture, %: 0.8 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 17.5 Side 2: —
Wet Bulb, °F: 61 Dry Bulb, °F: 90

Traverse Point Number		Velocity Head in H_2O	Stack Temp. °F
A	1	0.16	85
	2	0.18	88
	3	0.24	89
	4	0.25	90
	5	0.25	90
	6	0.28	91
	7	0.29	91
	8	0.34	90
B	1	0.22	85
	2	0.27	91
	3	0.24	91
	4	0.23	91
	5	0.24	91
	6	0.22	91
	7	0.20	90
	8	0.25	91
		$\overline{\sqrt{\Delta P}}$ = 0.4893	$\overline{T_s}$ = 89 °F ✓

549

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 28.84

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ 28.75

$\overline{T_s} =$ 89 °F = 549 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 28.84 in. Hg

$\overline{\sqrt{\Delta P}} =$ .4893

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$Vs =$ 33.70 ft/s

$As =$ 1.67 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 3376.7 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 3105 dscfm

BE ✓

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Products Location: Florence, Ky

Site: Main Exhaust Operators: [illegible] Run #: ME-2-2 Date: 5/14/97

Barometric Pressure, in. Hg = Pbar = 28.84 in. Hg

Static Pressure, in. H_2O = Pg = +.03 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.84 in. Hg

Wet-Bulb Temperature, °F = Tw = 61 °F

Dry-Bulb Temperature, °F = Td = 90 °F

Temperature Difference, Td - Tw = ΔT = 29 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .5407 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (.5407) - \frac{(28.84 - .5407) \times (29)}{2800 - (1.3 \times 61)} = 0.2387$ in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.2387)}{(28.84)} = 0.008 \approx 0.8\%$ BS

$\frac{820.7}{2721} = .302$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Products - Florence, Ky Date: 5/14/97
Sampling Location: Main Exhaust Clock Time: 2340
Run #: ME-2-3 Operators: Ah/Tt
Barometric Pressure, in. Hg: 28.84 Static Pressure, in. H_2O: +.02
Moisture, %: 0.9 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 17.5" Side 2: —
Wet Bulb, °F: 61 Dry Bulb, °F: 89

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	0.24	92
2	0.25	90
3	0.26	90
4	0.31	90
5	0.29	90
6	0.29	90
7	0.29	90
8	0.30	89
B 1	0.25	86
2	0.24	88
3	0.25	89
4	0.26	89
5	0.28	89
6	0.29	90
7	0.31	90
8	0.32	89
	$\overline{\sqrt{\Delta P}}$ = .5256	$\overline{T_s}$ = 89

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{0.9}{100}) + 18 (\frac{0.9}{100})$

$Ms = 28.721$

$\overline{T_s} = 89$ °F = 549 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.84) + \frac{.02}{13.6}$

$Ps = 28.84$ in. Hg

$\overline{\sqrt{\Delta P}} = .5256$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\frac{549}{28.84 \times 28.74}}$

$Vs = 36.203$ ft/s

$As = 1.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3627.6$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 3627.6 \times 17.647 \times \frac{28.84}{549} \times (1 - \frac{.9}{100})$

$Qs_{std} = 3333$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main Exhaust

Site: MAIN EXHAUST Operators: TA/RK Run #: ME-2-3 Date: 5-14-97

Barometric Pressure, in. Hg = Pbar = 28.84 in. Hg

Static Pressure, in. H_2O = Pg = .02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.84 in. Hg

Wet-Bulb Temperature, °F = Tw = 61 °F

Dry-Bulb Temperature, °F = Td = 89 °F

Temperature Difference, Td - Tw = ΔT = 28 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .5407 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.5407) - \frac{(28.84 - .5407) \times (28)}{2800 - (1.3 \times 61)} = .2495 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.2495)}{(28.84)} = 0.9\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO Products
Date: 5/14/97
Location: Room Exhaust
Run #: RE-2-1
Stack I.D.: 24 x 28"
Pbar: 28.84
Sample Tube #: RE-2-1
Operators: RK/TA
Leak Check: Pre: ✓ 0.003 @ 16" Post: ✓ 0.000 @ 2"

Tested Analyte: Styrene
Orifice Tank #: VB-1
Pump/Rotometer #:
Pt: Pretest (mm Hg):
Post-Test (mm Hg):
Tt: Pretest (°F):
Post-Test (°F):
Time: Start: 2020 Finish: 2122 Total: 60 min
W/B: 61 D/B: 82 O_2: - CO_2: -

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0	2020 ~~0820~~ 7679.500	1	0.3 = 250 cc/min	69
10	2030 ~~0830~~ 7682.9	1	0.3	70
20	2042 ~~0840~~ 7684.35	1	0.3	70
30	2052 ~~0850~~ 7686.7	1	0.3	71
40	2102 ~~0900~~ 7689.3	1	0.3	71
50	2112 ~~0910~~ 7691.80	1	0.3	72
60	2122 ~~0920~~ 7694.21	1	0.3	72

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	0.07	86
2	0.07	84
3	0.06	83
4	0.07	83
5	0.07	83
6	0.08	82
B 1	0.08	82
2	0.08	82
3	0.08	82
4	0.07	82
5	0.06	82
6	0.07	82
C 1	0.08	82
2	0.09	82
3	0.08	82
4	0.07	82
5	0.06	82
6	0.06	82
D 1	0.06	82
2	0.06	82
3	0.05	82
4	0.05	82
5	0.06	82
6	0.06	82
Ave $\sqrt{\Delta P}$	0.2607	82 °F ✓ 542

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

Moisture = 1.1 %

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.72$

$Ts = 82\ °F = 542\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.79$ in. Hg

$\overline{\sqrt{\Delta P}} = .2607$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 17,864$ ft/s

$As = 4.67\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 5001$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4637.0$ dscfm

Static = -.65"

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Products Location: Florence, Ky

Site: Room Exhaust Operators: RH/TH Run #: RE-2-1 Date: 5/14/97

Barometric Pressure, in. Hg = Pbar = 28.84 in. Hg

Static Pressure, in. H_2O = Pg = -.65 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.79 in. Hg

Wet-Bulb Temperature, °F = Tw = 61 °F

Dry-Bulb Temperature, °F = Td = 82 °F

Temperature Difference, Td - Tw = ΔT = 21 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.5407 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.5407) - \frac{(28.79 - .5407) \times (21)}{2800 - (1.3 \times 61)} = 0.3226 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.3226)}{(28.79)} = 0.011 \text{ or } 1.1\%$$

BH

$$\frac{593.3}{2720.7} = .218$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Products - Florence, Ky Date: 5/14/97
Sampling Location: Room Exhaust Clock Time: 2205
Run #: RE-2-2 Operators: RK/TA
Barometric Pressure, in. Hg: 28.84 Static Pressure, in. H_2O: -.66
Moisture, %: 1.0 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 24" Side 2: 28"
Wet Bulb, °F: 60 Dry Bulb, °F: 82

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	0.07	82
2	0.07	82
3	0.08	81
4	0.08	81
5	0.08	81
6	0.09	81
B 1	0.09	82
2	0.09	82
3	0.08	82
4	0.07	82
5	0.07	82
6	0.07	82
C 1	0.11	83
2	0.11	82
3	0.07	82
4	0.07	82
5	0.06	82
6	0.08	82
D 1	0.10	82
2	0.07	82
3	0.07	82
4	0.06	82
5	0.07	82
6	0.08	82
	$\overline{\sqrt{\Delta P}}$ = 0.2797	$\overline{Ts}$ = 82

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.73$

$\overline{Ts} = 82\ °F = 542\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.79$ in. Hg

$\overline{\sqrt{\Delta P}} = .2797$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 19.16$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 5369$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4983$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Products - Florence Location: Florence, KY

Site: Room Exhaust Operators: [illegible] Run #: RE-2-2 Date: 5/14/97

Barometric Pressure, in. Hg = Pbar = 28.84 in. Hg

Static Pressure, in. H_2O = Pg = -.66 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.79 in. Hg

Wet-Bulb Temperature, °F = Tw = 60 °F

Dry-Bulb Temperature, °F = Td = 82 °F

Temperature Difference, Td - Tw = ΔT = 22 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.5218 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.5218) - \frac{(28.79 - .5218) \times (22)}{2800 - (1.3 \times 60)} = 0.2933 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.2933)}{(28.79)} = 0.010 \text{ or } 1.0\%$$

BL ✓

$\frac{621.9}{2722} = .22$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Products - Florence, Ky Date: 5/14/97
Sampling Location: Room Exhaust Clock Time: 2355
Run #: RE-2-3 Operators: RK / TH
Barometric Pressure, in. Hg: 28.84 Static Pressure, in. H_2O: ⅞ - .65"
Moisture, %: 1.1 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 24 Side 2: 28
Wet Bulb, °F: 60 Dry Bulb, °F: 81

Traverse Point Number		Velocity Head in. H_2O	Stack Temp. °F
A	1	0.07	80
	2	0.04	80
	3	0.08	80
	4	0.08	80
	5	0.09	80
	6	0.08	80
B	1	0.07	80
	2	0.09	80
	3	0.08	80
	4	0.06	80
	5	0.07	80
	6	0.07	80
C	1	0.11	82
	2	0.10	81
	3	0.09	81
	4	0.07	81
	5	0.07	81
	6	0.08	81
D	1	0.10	81
	2	0.10	81
	3	0.08	81
	4	0.07	81
	5	0.06	81
	6	0.07	81
		$\overline{\sqrt{\Delta P}}$ = .2841	$\overline{T_s}$ = 81

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$ % Moisture = 1.1

$Ms = 28.72$

$\overline{T_s} = 81$ °F = 541 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps = 28.79$ in. Hg

$\overline{\sqrt{\Delta P}} = .2841$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 19.45$ ft/s

$As = 4.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 5450$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} = 5062$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Products Location: Florence, Kentucky

Site: Room Exhaust Operators: [illegible] Run #: RE-2-3 Date: 5/14/97

Barometric Pressure, in. Hg = Pbar = 28.84 in. Hg

Static Pressure, in. H_2O = Pg = -.65 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.79 in. Hg

Wet-Bulb Temperature, °F = Tw = 60 °F

Dry-Bulb Temperature, °F = Td = 81 °F

Temperature Difference, Td - Tw = ΔT = 21 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.5218 in. Hg

Vapor Pressure of H_2O = Pva = $(Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$$Pva = (.5218) - \frac{(28.79 - .5218) \times (21)}{2800 - (1.3 \times 60)} = 0.3037 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.3037)}{(28.79)} = 0.011 \approx 1.1\%$$

$\frac{593.7}{2722} = .218$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-14-97
Location: Oxen #9
Run #: 9-2-1
Stack I.D.: 15"
Pbar: 28.92
Sample Tube #: 9-2-1A 9-2-1B
Operators: TA / Pines
Leak Check: Pre: .000/15 Post: .000/15

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 2030 Finish: 2132 Total: 60
W/B: N.A D/B: N.A O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
2020	0	250 cc/min
2030	0	
2035 STOP 2037 RESTART	0	
2042	0	
2052	0	
2102	0	
2112		
2122	STATIC -.65	

866.91
869.56
871.10
874.9
876.35
879.85
881.20
= 14.29
.25

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
A-1	.09	160
2	.16	169
3	.18	172
4	.20	174
5	.22	174
6	.22	164
B-1	.20	173
2	.22	174
3	.22	174
4	.21	174
5	.21	176
6	.22	176

$\overline{\sqrt{\Delta P}}$ = 0.4400 $\overline{T_s}$ = 172

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

83/84
$Md = 28.84$

84/84
$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

85/85
$Ms = (28.84) \times (1 - \frac{1.3}{100}) + 18(\frac{1.3}{100})$

% Moisture = 1.3%

86/86
$Ms = 28.70$

86/86
$Ts = 172$ °F = 632 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{-.65}{13.6}$

$Ps = 28.87$ In. Hg

$\overline{\sqrt{\Delta P}} = 0.4400$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 32.524$ ft/s

$As = 1.227$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2394$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1905$ dscfm

VRD

FIELD DATA SHEET

$\gamma = 0.966$

Plant: LASCO
Sampling Location: Oven # 9
Run Number: 9-2-1 Date: 5/14/97
Pretest Leak Rate: .000 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: NA Orsat: N/A

Sample Type: M-4 Operator: DBD/GG
Pbar: 28.80 Ps: -.65
CO2: — O2: —
Probe Length/Type: 1'35 Pitot #: Standard
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: N/A Thermocouple #: T-6F
Assumed Bws: Filter #: N/A
Meter Box #: M814 Y: ~~.996~~ ΔH@: 1.862
Post-Test Leak Rate: .001 cfm @ 15 in. Hg.
Post-Test Leak Check: Pitot: NA Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	2025	94.428										
	10	2035	102.70	~~.96~~	1.86		171				87	87	4
	20	2045	110.50		1.86						87	87	4
	30	2055	118.347		1.86						89	90	4

ΔVm= 23.919 $\overline{\sqrt{\Delta p}}$= — $\overline{\Delta H}$= 1.86 $\overline{T_s}$= — $\overline{T_m}$= 88°F

[redacted]

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 9-2-1

DATE 5-14-97 Sample Box No. N-5 Job No. S405.003

SAMPLE LOCATION OVEN 9 Filter No. NA

TRAIN PREPARER PAUL SIEGEL

SAMPLE RECOVERY PERSON T. ABERNATHY

COMMENTS EPA METHOD 4 MOISTURE TRAIN

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	570.5	571.8	1.3
2	DI H_2O	100	588.2	588.7	0.5
3	Empty	—	493.4	493.8	0.4
4	SILICA GEL	250	765.8	769.6	3.8
5					
6					
TOTAL			2417.9	2423.9	6.0

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 9-2-1 DATE: 5-14-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = 23.919 \ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m} \right)$$

$$V_{m_{std}} = 17.64 \times (23.919) \times (0.966) \times \left(\frac{(28.80) + (1.86 / 13.6)}{(548)} \right)$$

$$V_{m_{std}} = 21.522 \ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (6.0)$$

$$V_{w_{std}} = 0.282 \ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(0.282)}{(0.282) + (21.522)}$$

B_{ws} = 0.013 or 1.3 % Moisture

JRD

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO — Date: 5-14-97

Sampling Location: OVEN # 9 — Clock Time: [redacted] 2220

Run #: 9-2-2 — Operators: DBS / CC

Barometric Pressure, in. Hg: ~~28.86~~ 28.84 — Static Pressure, in. H_2O: -.64

Moisture, %: (AVG) 1.2% — Molecular wt., Dry: 28.84 — Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 15" — Side 2: —

Wet Bulb, °F: — — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.12	164
2	.14	165
3	.18	165
4	.20	166
5	.21	166
6	.22	166
B1	.12	162
2	.19	165
3	.22	166
4	.22	166
5	.21	167
6	.21	167
	$\overline{\sqrt{\Delta P}}$ = 0.4297	$\overline{T_s}$ = 165 °F

625

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

% Moisture = 1.2% (AVG)

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.71$

$\overline{T_s} = 165$ °F = 625 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.79$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4297$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 31.621$ ft/s

$As = 1.227$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2328$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1870$ dscfm

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO — Date: 5-14-97

Sampling Location: OVEN # ~~10~~ 9 th — Clock Time: 2345

Run #: 18-2-3 — Operators: DBI / CG

Barometric Pressure, in. Hg: 28.80 — Static Pressure, in. H_2O: -.67

Moisture, %: — 1.1% — Molecular wt., Dry: 28.84 — Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 15" — Side 2: —

Wet Bulb, °F: NA — Dry Bulb, °F: NA

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.11	165
2	.14	165
3	.20	166
4	.22	166
5	.24	166
6	.22	166
B-1	.23	159
2	.23	163
3	.22	165
4	.22	165
5	.22	165
6	.22	165
	$\overline{\sqrt{\Delta P}}$ = .4514	$\overline{Ts}$ = 165

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms =$ ~~28.69~~ 28.88

$\overline{Ts} = 165$ °F = 625 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.80) + \frac{-.67}{13.6}$

$Ps = 28.75$ in. Hg

$\overline{\sqrt{\Delta P}} = .4514$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.4514) \times (.99) \times \sqrt{\frac{625}{28.75 \times}}$

$Vs =$ ~~33.256~~ 33.15 ft/s

$As = 1.227$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs =$ x x 60

$Qs = 2416$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} =$ x 17.647 x $\frac{28.75}{625}$ x $(1 - \frac{}{100})$

$Qs_{std} = 1968$ dscfm

FIELD DATA SHEET

Plant: LASCO
Sampling Location: UNIT # 9
Run Number: 9-2-3 Date: 5-14-97
Pretest Leak Rate: .000 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: NA

Sample Type: M-4 Operator: DBS/GG
Pbar: 28.80 Ps: -.83
CO2: — O2: —
Probe Length/Type: 1' 55" Pitot #: ST-3A
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: NA Thermocouple #: T6 F
Assumed Bws: NA Filter #: —
Meter Box #: 14 Y: .960 ΔH@: 1.862
Post-Test Leak Rate: .000 cfm @ 6 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	2330	00	42.761										
	2340	10	50.61		1.86					59	84	83	3
	2350	20	58.40		1.86					50	87	82	3
	2400	30	66.280		1.86					48	87	83	3
				VELOCITY									
A-1				.13	217								
2				.15	217								
3				.16	218								
4				.17	219								
5				.17	221								
6				.23	222								
B-1				.20	216								
2				.22	217								
3				.26	220								
4				.18	221								
5				.22	222								
6				.25	220								

ΔVm= 23.519 $\overline{\sqrt{\Delta p}}$= — $\overline{\Delta H}$= 1.86 $\overline{Ts}$= — $\overline{Tm}$= 83°F / 543°R

BL ✓

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 9-2-3

DATE 5-14-97 Sample Box No. N-1 Job No. S405.003

SAMPLE LOCATION #9 OVEN EXHAUST Filter No. N/A

TRAIN PREPARER PAUL SIEGEL

SAMPLE RECOVERY PERSON T. ABERNATHY

COMMENTS EPA METHOD 4 MOISTURE TRAIN
No sample recovery

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	609.1	610.0	0.9
2	DI H_2O	100	606.8	607.0	0.2
3	Empty	—	497.8	498.0	0.2
4	SILICA GEL	250	831.3	835.1	3.8
5					
6					
TOTAL			2545	2550.1	5.1

BJ

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 9-2-3 DATE: 05/14/97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{23.519}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (23.519) \times (0.966) \times \left(\frac{(28.80) + (1.86 / 13.6)}{(543)}\right)$$

$$V_{m_{std}} = \underline{21.357}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (5.1)$$

$$V_{w_{std}} = \underline{0.2401}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.2401)}{(21.357) + (.2401)}$$

$$B_{ws} = \frac{1.1\%}{0.011}$$

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: CASCO Date: 5-14-97
Sampling Location: Oven 10 Clock Time: 2100
Run #: 10-2-1 Operators: DOB / GG
Barometric Pressure, in. Hg: 28.80 Static Pressure, in. H_2O: -.83
Moisture, %: — Molecular wt., Dry: _____ Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15" Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.17	217
2	.18	217
3	.17	218
4	.17	219
5	.20	221
6	.23	222
B 1	.21	218
2	.21	218
3	.20	219
4	.19	219
5	.18	219
6	.20	220
	$\overline{\sqrt{\Delta P}}$ = 0.4383	$\overline{T_s}$ = 219

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

%H2O: 1.[redacted]

$Ms = 28.69$

$\overline{T_s} = 219$ °F = 679 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.74$ in. Hg

$\overline{\sqrt{\Delta P}} = .4383$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 33.663$ ft/s

$As = 1.227$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2478$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1825$ dscfm

10.M

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-14-97
Location: OVEN #10
Run #: 10-2-2
Stack I.D.: 15
Pbar: 28.80
Sample Tube #: 10-2-2A 10-2-2B
Operators: DAVES / GG
Leak Check: Pre: .000 Post: .000

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: ____ Finish: ____ Total: ____
W/B: NA D/B: NA O_2: ____ CO_2: ____

Time	Gauge Vacuum (Hg)	Flow Setting
2200	0	250 cc/min
2210	0	
2220	0	
2230	0	
2240	0	
2250	0	
2300	0	

STATIC -.83

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
A-1	.10	217
2	.16	217
3	.17	217
4	.18	219
5	.18	221
6	.24	224
B 1	.15	217
2	.22	220
3	.22	220
4	.20	220
5	.15	221
6	.19	221

381.65
[redacted]3.75
586.55
[redacted]9.17
[redacted]1.75
[redacted]94.53
[redacted]7.00

[redacted]=15.35
[redacted]=87

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

85/85 $Md =$ 28.84

87/85

87/86 $Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

88/87 $Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

85/87 $Ms =$ 28.69

88/87 $Ts =$ 220 °F = 680 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.80) + \frac{-.83}{13.6}$

$Ps =$ 28.74 in. Hg

$\overline{\sqrt{\Delta P}} =$ 0.4250

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 32.605 ft/s

$As =$ ____ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs =$ 1.227 x ____ x 60

$Qs =$ 2405 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} =$ ____ x 17.647 x ____ x (1 - ____/100)

$Qs_{std} =$ 1769 dscfm

%H_2O = 1.4

1A M

FIELD DATA SHEET

~~Y=0.996~~ Y=0.966

Plant: LASCO
Sampling Location OVEN #10
Run Number: 10-2-2 Date: 5-14-97
Pretest Leak Rate: .000 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: N/A Orsat: NA

Sample Type: M-4 Operator: DBS/CG
Pbar: 28.80 Ps: 28.74
CO2: — O2: —
Probe Length/Type: 1'SS Pitot #: —
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: NA Thermocouple #: 3A
Assumed Bws: — Filter #: —
Meter Box #: MD-14 Y: ~~.966~~ ΔH@: 1.562
Post-Test Leak Rate: .000 cfm @ 6 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0	2201	18.763										
	10	2211	26.510	NA	1.86					59	91	89	4
	20	2221	34.50	↓	1.86					49	85	86	4
	30	2231	42.518	↓	1.86					53	85	89	5

ΔVm= 23.755 √Δp= — ΔH= 1.86 Ts= — Tm= 87.5

[redacted] 21.422 [redacted] 0.14[redacted]

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 10-2-2

DATE 5/14/97 Sample Box No. N-6 Job No. S405.003

SAMPLE LOCATION Oven 10 Exhaust Filter No. N/A

TRAIN PREPARER PAUL SIEGEL

SAMPLE RECOVERY PERSON R Kolb

COMMENTS EPA METHOD 4

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	595.2	597.7	2.5
2	DI H_2O	100	663.0	663.3	0.3
3	EMPTY	—	456.0	456.1	0.1
4	SILICA GEL	250	769.6	773.4	3.8
5					
6					
TOTAL			2483.8	2490.5	6.7

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 10-2-2 DATE: 5-14-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{23.755}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (23.755) \times (0.966) \times \left(\frac{(28.80) + (1.86 / 13.6)}{(547.50)}\right)$$

$$V_{m_{std}} = \underline{21.394}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (6.7)$$

$$V_{w_{std}} = \underline{0.315}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(0.3154)}{(0.3154) + (21.394)}$$

$B_{ws} = \underline{0.01452} =$ 1.5 % moisture ✓ PTS

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 05/14/97

Sampling Location: UNIT #9/10 Clock Time: 2330

Run #: 10-2-3 Operators: [illegible]

Barometric Pressure, in. Hg: 28.80 Static Pressure, in. H_2O: -.88

Moisture, %: 14% Molecular wt., Dry: 29.0 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 15" Side 2: —

Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.13	212
2	.15	217
3	.16	218
4	.17	219
5	.17	221
6	.23	222
B-1	.20	216
2	.22	217
3	.20	220
4	.18	221
5	.22	222
6	.25	220
	$\overline{\sqrt{\Delta P}}$ = 0.4941	$\overline{Ts}$ = 219

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ ~~28.72~~ 28.85

$\overline{Ts} = 219$ °F = 679 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.80) + \frac{-.88}{13.6}$

$Ps = 28.74$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4341$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ ~~33.323~~ 26 ft/s 33.25

$As = 1.227$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2455$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ ~~1835~~ 1807 dscfm

METHOD 18 FIELD DATA SHEET

Plant: ASCO Products
Date: 5/14/97
Location: NDO-A
Run #: NDA-2-2
Stack I.D.: 32 x 120
Pbar: 28.84
Sample Tube #: NDA-2-2
Operators: RK
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: ~~Apex VB~~ VB-3
Pump/Rotometer #:
Pt: Pretest (mm Hg):
Post-Test (mm Hg):
Tt: Pretest (°F):
Post-Test (°F):
Time: Start: 2200 Finish: 2300 Total: 60 min
W/B: — D/B: — O_2: 21 CO_2: 0

	Time		Gauge Vacuum (Hg)	Flow Setting	T_m
0	2200	1337.15	1	20 = 250 cc	82
10	2210	1340.56	1	20	84
20	2220	1342.21	1	20	85
30	2230	1344.60	1	20	86
40	2240	1347.02	1	20	89
50	2250	1349.49	1	20	90
60	2300	1351.81	1	20	93

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

$\Delta H = 14.66$ $\bar{T}_m = 87$ /RM

METHOD 18 FIELD DATA SHEET

Plant: LASCO Products
Date: 5/14/97
Location: NDB
Run #: NDB-2-3
Stack I.D.: 0.5" x 72"
Pbar: 28.84
Sample Tube #: NDB-2-3
Operators: RL / TA
Leak Check: Pre: ✓ Post: ✓
0.005 at 12" .002 at 5"

Tested Analyte: Styrene
Orifice Tank #: VB #3
Pump/Rotometer #:
Pt: Pretest (mm Hg):
Post-Test (mm Hg):
Tt: Pretest (°F):
Post-Test (°F):
Time: Start: 1130 Finish: 1230 Total: 60 min
W/B: - D/B: - O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0	2330 1352.10	1	20	89
10	2340 1354.68	1	20	90
20	2350 1357.10	1	20	91
30	2400 1359.80	1	20	92
40	2410 1362.80	1	20	93
50	2420 1364.38	1	20	93
60	2430 1366.82	1	20	94

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps = \quad$ In. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} = \quad$ dscfm

$\Delta H = 14.72$ $\overline{T} = 92$ 1.M

APPENDIX A.1.4

Condition 3
(includes flows, moistures, and Method 18)

METHOD 18 FIELD DATA SHEET

Plant: LHSCO
Date: 5-15-97
Location: Main Exhaust
Run #: ME-3-1
Stack I.D.: 17.5"
Pbar: 28.90
Sample Tube #: ME-3-1A, ME-3-1B
Operators: TH/SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: rotor 2
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1425 Finish: 1455 Total: 30
W/B: 59 D/B: 80 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1425	0	2287.47	.05	59
1435	10	2288.31	.05	66
1445	20	2289.45	.05	67
1455	30	2290.49	.05	64
	40			
	50			
	60			

.02

.64

90 cc

static -.09

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.19	76
2	.25	80
3	.30	80
4	.31	81
5	.32	81
6	.34	81
7	.33	81
8	.35	80
1	.26	80
2	.30	80
3	.31	81
4	.30	81
5	.33	81
6	.33	81
7	.35	81
8	.29	80
	.5530	80

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

Moisture = 1.0%

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18(\frac{\quad}{100})$

$Ms = 28.89$

$Ts = 80$ °F $= 540$ °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.89$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.5530$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5530) \times \sqrt{\frac{540}{28.89 \times 28.89}}$

$Vs = 37.65$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3772$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3526$ dscfm

✓RB

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Panel Products Location: Florence Ky

Site: Main Exhaust Operators: TA/SS Run #: ME-3-1 Date: 5/15/97

Barometric Pressure, in. Hg = Pbar = 28.90 in. Hg

Static Pressure, in. H_2O = Pg = -.09 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.89 in. Hg

Wet-Bulb Temperature, °F = Tw = 59 °F

Dry-Bulb Temperature, °F = Td = 80 °F

Temperature Difference, Td - Tw = ΔT = 21 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.5035 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.5035) - \frac{(28.89 - .5035) \times (21)}{2800 - (1.3 \times 59)} = 0.2845 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.2845)}{(28.89)} = 0.010 \text{ or } 1.0\%$$

$$\frac{596.1}{27233} \quad 0.219$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0766	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2116	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3496
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4856	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7646	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.068	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.408
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.758	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.886	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

BE

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: Main Exhaust
Run #: ME-3-2
Stack I.D.: 17.5
Pbar: 28.90
Sample Tube #: ME-3-2A ME-3-2B
Operators: TA
Leak Check: Pre: ✓ Post: ✓
.001 at 20" .000 at 2"

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: Cost 2
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1600 Finish: 1620 Total: 20 min
W/B: 58 D/B: 80 O_2: 21 CO_2: 0

	Time		Gauge Vacuum (Hg)	Flow Setting	Tm
0	1600	2290.74	1	100 cc	56
10	1610	2291.8	1	100 cc	58
20	1620	2292.98	1	100 cc	59

ΔV = 2.17
58
✓

Static pressure = +.02

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
1	0.23	77
2	0.25	79
3	0.31	80
4	0.32	80
5	0.33	80
6	0.34	80
7	0.35	80
8	0.40	80
1	0.16	80
2	0.20	80
3	0.21	80
4	0.26	80
5	0.29	80
6	0.32	80
7	0.34	80
8	0.33	80
Ave √ΔP	0.5350	80°F
		540°R

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

Moisture = 0.9%

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.90$

$Ts = 80$ °F = 540 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.90$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.5350$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5350) \times \sqrt{\quad}$

$Vs = 36.41$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3648$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3414$ dscfm

✓BE

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Panel Products Location: Florence, Ky

Site: Main Exhaust Operators: TA/SS Run #: ME-3-2 Date: 5/15/97

Barometric Pressure, in. Hg = Pbar = 28.90 in. Hg

Static Pressure, in. H_2O = Pg = +.02 in. H_2O

Absolute Pressure of Stack = $Pbar + \frac{Pg}{13.6}$ Ps = 28.90 in. Hg

Wet-Bulb Temperature, °F = Tw = 58 °F

Dry-Bulb Temperature, °F = Td = 80 °F

Temperature Difference, Td - Tw = ΔT = 22 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .4856 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (.4856) - \frac{(28.90 - .4856) \times (22)}{2800 - (1.3 \times 58)} = 0.2562$ in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.2562)}{(28.90)} = 0.009$ or 0.9%

BE

VAPOR PRESSURES OF WATER

In Inches of Mercury

$\frac{625}{2725}$ 0.2294

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0396	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0599
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1876	0.1955	0.2035	0.2116	0.2203	0.2292	0.2383
40	0.2476	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.378	2.448	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.886	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: Main Exhaust
Run #: ME-3-3 SPIKE
Stack I.D.: 17.5
Pbar: 29.1
Sample Tube #: MES-3-3A, MES-3-3B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: VOST 1
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1736 Finish: 1751 Total: 15
W/B: 59 D/B: 80 O_2: 21 CO_2: 0

		Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1736	0	7707.97	1	150 cc	55
1741	5	7708.57	1	150 cc	56
1746	10	7709.24	1	150 cc	55
1751	15	7710.02	1	150 cc	56

V = 2.05

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms =$

$Ts = \quad °F = \quad °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{}{}}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} = \quad$ dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: Main Exhaust
Run #: ME-3-3
Stack I.D.: 17.5
Pbar: 29.1
Sample Tube #: ME-3-3A, ME-3-3B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: vent 2
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1735 Finish: 1750 Total: 15
W/B: 59 D/B: 80 O_2: 0 CO_2: 21

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1735/0	2293.37	1	150 cc	56
1740/5	2293.82	1	150 cc	57
1745/10	2294.32	1	150 cc	57
1550/15	2294.61	1	150 cc	55

ΔV = 1.24
$\bar{T}_m$ = 57

Static → .21

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
1	.19	80
2	.26	79
3	.32	80
4	.31	80
5	.30	80
6	.33	80
7	.35	80
8	.33	79
1	.23	79
2	.24	80
3	.24	79
4	.28	80
5	.30	80
6	.31	80
7	.32	80
8	.31	79
Avg √ΔP	0.5357	80 °F
		540 °R

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18(\frac{\quad}{100})$

$Ms = 28.88$

Moisture = 1.1%

$Ts = 80\ °F = 540\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.08$ in. Hg

$\overline{\sqrt{\Delta P}} = .5357$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5357) \times \sqrt{\frac{540}{29.08 \cdot 28.88}}$

$Vs = 36.36$ ft/s

$As = 1.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3643$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3424$ dscfm

JBE

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Panel Products Location: Florence, Kentucky

Site: Main Exhaust Operators: TA/SS Run #: ME-3-3 Date: 5/15/97

Barometric Pressure, in. Hg = Pbar = 29.10 in. Hg

Static Pressure, in. H_2O = Pg = -.21 in. H_2O

Absolute Pressure of Stack = $Pbar + \frac{Pg}{13.6}$ Ps = 29.08 in. Hg

Wet-Bulb Temperature, °F = Tw = 59 °F

Dry-Bulb Temperature, °F = Td = 80 °F

Temperature Difference, Td - Tw = ΔT = 21 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.5305 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.5305) - \frac{(29.08 - .5305) \times (21)}{2800 - (1.3 \times 59)} = 0.3105 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.3105)}{(29.08)} = 0.011 \approx 1.1\%$$

$\frac{599.6}{2723.3} = .220$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1718	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2578	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4856	0.5036
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.996	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.886	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52

JBE

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: Room Exhaust
Run #: RE-3-1
Stack I.D.: 28" x 24"
Pbar: 28.90
Sample Tube #: RE-3-1A RE-3-1B
Operators: TA/SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: VOST #1
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1425 Finish: 1525 Total: 60
W/B: 56 D/B: 76 O_2: 21 CO_2: 0

		Time	Gauge Vacuum (Hg)	Flow Setting	T_m
1425	0	7694.32	1	.25	58
1435	10	7696.51	1	.25	60
1445	20	7698.54	1	.25	60
1455	30	7700.55	1	.25	60
1505	40	7702.51	1	.25	61
1515	50	7704.37	1	.25	61
1525	60	7706.45	1	.25	61

static −.66

ΔV = 12.13
$\bar{T}_m$ = 60

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.07	76
2	.06	76
3	.05	75
4	.08	75
5	.08	75
6	.09	75
1	.10	76
2	.09	76
3	.07	75
4	.05	75
5	.06	75
6	.10	75
1	.12	76
2	.11	76
3	.07	75
4	.06	75
5	.06	75
6	.12	75
1	.09	76
2	.07	76
3	.05	75
4	.06	75
5	.06	75
6	.10	75
Ave	0.2766	75

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 75)$

$Md =$ ~~28.84~~ 29.0

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{\quad}{100}) + 18(\frac{\quad}{100})$

$Ms = 28.89$

Moisture = 0.8%

$Ts = 75$ °F = 535 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.90) + \frac{-.66}{13.6}$

$Ps = 28.85$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.2766$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\cancel{.84}\ 0.99) \times (\frac{\cancel{.99}}{.2766}) \times \sqrt{\frac{\quad}{28.85}}$

$Vs = 18.76$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs =$ x x 60

$Qs = 5255$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} =$ x 17.647 x $\frac{28.85}{\quad}$ x $(1 - \frac{\quad}{100})$

$Qs_{std} = 4961$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Panel Products Location: Florence, Ky

Site: Room Exhaust Operators: TA/SS Run #: RE-3-1 Date: 5/15/97

Barometric Pressure, in. Hg = Pbar = 28.90 in. Hg

Static Pressure, in. H_2O = Pg = -.66 in. H_2O

Absolute Pressure of Stack = $Pbar - \frac{Pg}{13.6}$ Ps = 28.85 in. Hg

Wet-Bulb Temperature, °F = Tw = 56 °F

Dry-Bulb Temperature, °F = Td = 76 °F

Temperature Difference, Td - Tw = ΔT = 20 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.4520 in. Hg

Vapor Pressure of H_2O = Pva = $(Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

Pva = (0.4520) - $\frac{(28.85 - .4520) \times (20)}{2800 - (1.3 \times 56)}$ = 0.2437 in. Hg

Proportion of Water Vapor by Volume = Bws

Bws = $\frac{(Pva)}{(Ps)}$ = $\frac{(0.2437)}{(28.85)}$ = 0.008 or 0.8%

$\frac{568}{2727}$ = 0.2083

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1718	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2578	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3628	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4856	0.5032
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.378	2.448	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.886	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO
Date: 5-15-97
Sampling Location: Boom Exhaust
Clock Time: 1640
Run #: RE-3-2
Operators: TA/SS
Barometric Pressure, in. Hg: 29.1
Static Pressure, in. H_2O: -.69
Moisture, %: 0.9
Molecular wt., Dry: 28.84
Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 24
Side 2: 26
Wet Bulb, °F: 56
Dry Bulb, °F: 75

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.07	75
2	.06	75
3	.06	75
4	.07	75
5	.07	75
6	.09	75
1	.10	75
2	.08	75
3	.06	75
4	.05	75
5	.06	75
6	.09	75
1	.12	75
2	.11	75
3	.07	75
4	.05	75
5	.06	75
6	.12	75
1	.09	75
2	.08	75
3	.06	75
4	.06	75
5	.07	75
6	.10	75
	$\overline{\sqrt{\Delta P}}$ = .2753	$\overline{T_s}$ = 75

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 29.0

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ 28.89

$\overline{T_s} =$ 75 °F = 535 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 29.05 in. Hg

$\overline{\sqrt{\Delta P}} =$ .2753

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{P_s \times M_s}}$

$Vs = 85.49 \times (.99) \times (.2753) \times \sqrt{\quad}$

$Vs =$ 18.60 ft/s

$As =$ 4.67 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 5213 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 4950 dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Panel Products Location: Florence, Ky

Site: Room Exhaust Operators: TA/SS Run #: RE-3-2 Date: 5/15/97

Barometric Pressure, in. Hg = Pbar = 29.10 in. Hg

Static Pressure, in. H_2O = Pg = -.69 in. H_2O

Absolute Pressure of Stack = $Pbar + \frac{Pg}{13.6}$ Ps = 29.05 in. Hg

Wet-Bulb Temperature, °F = Tw = 56 °F

Dry-Bulb Temperature, °F = Td = 75 °F

Temperature Difference, Td - Tw = ΔT = 19 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.4520 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (0.4520) - \frac{(29.05 - .4520) \times (19)}{2800 - (1.3 \times 56)} = 0.2528$ in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.2528)}{(29.05)} = 0.009$ or 0.9% ✓

VAPOR PRESSURES OF WATER

In Inches of Mercury

$\frac{543.3}{2727} = 0.1992$

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1166	0.1248	0.1302	0.1370	0.1429	0.1502	0.1587
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3496
50	0.3628	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.068	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.886	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.06	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-15-97

Sampling Location: Room Exhaust Clock Time: 1810

Run #: RE-3-3 Operators: TA/SS

Barometric Pressure, in. Hg: 29.1 Static Pressure, in. H_2O: -.61

Moisture, %: 0.8 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 24 Side 2: 28

Wet Bulb, °F: 56 Dry Bulb, °F: 76

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.06	78
2	.07	77
3	.06	77
4	.07	75
5	.08	75
6	.07	75
1	.10	76
2	.08	76
3	.06	76
4	.05	76
5	.05	76
6	.10	76
1	.11	76
2	.10	76
3	.07	76
4	.05	76
5	.06	76
6	.11	76
1	.12	76
2	.10	76
3	.07	76
4	.07	76
5	.06	76
6	.10	76
	$\overline{\sqrt{\Delta P}}$ = 0.2766	$\overline{Ts}$ = 76°F

536°R

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms = 28.89$

$\overline{Ts} = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps = 29.06$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.2766$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 18.71$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 5241$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} = 4974$ dscfm

BR

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Panel Products Location: Florence, Ky

Site: Room Exhaust Operators: TA/SS Run #: RE-3-3 Date: 5/15/97

Barometric Pressure, in. Hg = Pbar = 29.10 in. Hg

Static Pressure, in. H_2O = Pg = -.61 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.06 in. Hg

Wet-Bulb Temperature, °F = Tw = 56 °F

Dry-Bulb Temperature, °F = Td = 76 °F

Temperature Difference, Td - Tw = ΔT = 20 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.4520 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (0.4520) - \frac{(29.06 - .4520) \times (20)}{2800 - (1.3 \times 56)} = 0.242$ in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.242)}{(29.06)} = 0.008$ or 0.8%

$\frac{572}{2727} = 0.2000$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0698	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.876
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.288	4.405
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.98	40.73	41.50

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-15-97
Sampling Location: OVEN #9 Clock Time: 1445
Run #: 9-3-1 Operators: DDS / CG
Barometric Pressure, in. Hg: 28.90 Static Pressure, in. H_2O: -.06
Moisture, %: 1.1% Molecular wt., Dry: ~~28.84~~ Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15 Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.09	166
2	.17	166
3	.16	167
4	.22	165
5	.23	164
6	.23	164
B-1	.17	165
2	.21	165
3	.23	169
4	.22	169
5	.22	167
6	.19	166
	$\overline{\sqrt{\Delta P}}$ = 0.4332	$\overline{T_s}$ = 166

626

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ ~~28.84~~ 29.0

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ 29.88

$\overline{T_s} =$ 166 °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 28.85 in. Hg

$\overline{\sqrt{\Delta P}} =$ 0.4332

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\ .99\ ) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 31,244 ft/s

$As =$ 1.23 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 2306 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 1855 dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: OVEN # 9
Run #: 9-3-3
Stack I.D.: 15"
Pbar: 28.90
Sample Tube #: 9-3-3A 9-3-3B
Operators: DJS / CC
Leak Check: Pre: 0.00 Post: ✓

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: ____ Finish: ____ Total: ____
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
1600	0	950 cc/min
1610	0	↓
1620	0	
1630	0	
1640	0	
1650	0	
1700	0	✓

912.17
[redacted]4.50
916.92
[redacted]919.15
921.67
[redacted]923.98
926.48

[redacted]V = 14.30
T_m = 86

STATIC − .65

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.11	163
2	.12	163
3	.18	167
4	.22	169
5	.23	166
6	.21	165
B 1	.17	165
2	.20	168
3	.22	170
4	.22	171
5	.21	170
6	.19	169
Ave $\sqrt{\Delta P}$	0.4334	167

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

84/55 $Md = 29.0$

85/55 Moisture = 1.1 %

85/55 $Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

86/86 $Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

87/87

88/55 $Ms = 28.88$

$Ts = 167$ °F = 627 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.85$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4334$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 31.820$ ft/s

$As = 1.23$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2348$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1886$ dscfm

RJL

.12

FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN # 9
Run Number: 9-3-2 Date: 5-15-97
Pretest Leak Rate: .001 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DBS/CC
Pbar: 28.90 Ps:
CO2: — O2: —
Probe Length/Type: 1'SS Pitot #: ST-3
Stack Diameter: 15" As: 1.23

Nozzle ID: — Thermocouple #: ~~SOF~~ 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: 1.996 ΔH@: 1.862
Post-Test Leak Rate: .000 cfm @ 15 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	1601	98.100										
	10	1611	106.25		1.86					59	94	92	3
	20	21	113.95		1.86					60	87	88	3
	30	31	121.90		1.86					62	87	92	3
	40	41	129.770		1.86					64	89	95	3

ΔVm= 31.670 $\overline{\sqrt{\Delta p}}$= ~ $\overline{\Delta H}$= 1.86 $\overline{Ts}$= ~ $\overline{Tm}$= 90 °F

[redacted] Vm std= 28.502 [redacted] Vw [redacted] 0.2[redacted] [redacted] Bw [redacted] 0.01[redacted] 1.1% [redacted] 55 [redacted]

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 9-3-2

DATE 5-15-91 Sample Box No. N-7 Job No. 5405.003

SAMPLE LOCATION #9 OVEN OUTLET Filter No. N/A

TRAIN PREPARER PAUL SIEGEL

SAMPLE RECOVERY PERSON PAUL SIEGEL

COMMENTS Method 4 Moisture
No recovery of impinger contents

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	559.2	559.6	0.4
2	DI H_2O	100	665.7	665.7	0.0
3	Empty	–	512.0	512.6	0.6
4	Silica Gel	200	839.4	845.1	5.7
5					
6					
TOTAL			2576.3	2583.0	6.7

44

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: Lasco SOURCE/RUN #: 9-3-2 DATE: 5-15-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{31.670}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (31.670) \times (0.996) \times \left(\frac{(28.90) + (1.86 / 13.6)}{(550)}\right)$$

$$V_{m_{std}} = \underline{29.376}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (6.7)$$

$$V_{w_{std}} = \underline{0.315}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(0.315)}{(0.315) + (29.376)}$$

$B_{ws} =$ 0.011 or 1.1 % moisture ✓PTS

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO — Date: 5-15-97
Sampling Location: OVEN #9 — Clock Time: 1755
Run #: 9-3-3 — Operators: DBS / GC
Barometric Pressure, in. Hg: 28.90 — Static Pressure, in. H_2O: -.66
Moisture, %: — 1.1% Molecular wt., Dry: ~~28.84~~ — Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15" — Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.09	163
2	.17	164
3	.16	167
4	.21	168
5	.23	166
6	.23	164
B-1	.19	169
2	.22	170
3	.22	171
4	.22	171
5	.21	168
6	.21	169
	$\overline{\sqrt{\Delta P}}$ = 0.4353	$\overline{Ts}$ = 167

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ ~~28.84~~ 29.0

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

Moisture = 1.1%

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ ~~28.85~~ 28.88

$\overline{Ts} = 167$ °F = 627 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.85$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4353$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 31.96$ ft/s

$As = 1.23$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2359$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1894$ dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: #10 OVEN
Run #: 10-3-1
Stack I.D.: 15
Pbar: 28.90
Sample Tube #: 10-3-1A 10-3-1B
Operators: DBL / GG
Leak Check: Pre: .000 @ 3 Post: ✓

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1425 Finish: 1525 Total: 60
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
1425	0	950 cc/min
1435	0	
1445	0	
1455	0	
1505	0	
1515	0	
1525	0	

897.94
899.47
901.88
904.31
906.82
909.30
911.91

ΔV = 14.67
T_m = 82

STATIC -.50

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.15	226
2	.16	226
3	.21	227
4	.25	230
5	.28	225
6	.28	226
B-1	.15	230
2	.22	231
3	.22	232
4	.19	234
5	.22	232
6	.24	233
Avg $\sqrt{\Delta P}$	0.4603	229

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

80/80 80/79 81/80 82/82 82/82 85/84 85/85

$Md = 29.0$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

Moisture = 1.1 %

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.88$

$Ts = 229$ °F = 689 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.84$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4603$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 35.433$ ft/s

$As = 1.23$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2615$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1910$ dscfm

FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN # 10
Run Number: 10-3-1 Date: 5-15-97
Pretest Leak Rate: .000 cfm @ 10 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DBS
Pbar: 28.90 Ps:
CO2: — O2: —
Probe Length/Type: 1' SS Pitot #: ST-3
Stack Diameter: 15" As: 1.23

Nozzle ID: — Y = 0.966 Thermocouple #: T6 F
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: ~~.966~~ ΔH@: 1.862
Post-Test Leak Rate: .002 cfm @ 12 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0	1426	66.601										
	10	1436	74.15		1.86					56	81	82	3
	20	1446	82.0		1.86					48	82	81	3
	30	1456	90.2		1.86					52	82	83	3
	40	1506	97.900		1.86					57	84	82	3

ΔVm= 31.299 $\overline{\sqrt{\Delta p}}$= — $\overline{\Delta H}$= 1.86 $\overline{Ts}$= — $\overline{Tm}$= 82°F or 542°R

Vmcstd = 28.584 Vwstd = 0.3247 Bws = 0.011 or 1.1%

BE

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 10-3-1

DATE 5-15-97 Sample Box No. N-5 Job No. S405.003

SAMPLE LOCATION #10 Oven outlet Filter No. NA

TRAIN PREPARER T. Abernathy

SAMPLE RECOVERY PERSON RKlk

COMMENTS

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	571.8	573.1	
2	DI H_2O	100	588.7	589.4	
3	Empty	0	493.8	494.3	
4	Silica Gel	250	769.6	774.6	
5					
6					
TOTAL			2423.9	2431.4	7.5

FIELD DATA SHEET

Plant: LASCO
Sampling Location OVEN # 10
Run Number: 10-3-1 Date: 5-15-97
Pretest Leak Rate: .000 cfm @ 10 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DB
Pbar: 28.90 Ps:
CO2: — O2: —
Probe Length/Type: 1' SS Pitot #: ST-3
Stack Diameter: 15" As: 1.23

Nozzle ID: — Y = 0.966 Thermocouple #: T6 F
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: ~~.966~~ ΔH@: 1.862
Post-Test Leak Rate: .002 cfm @ 12 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	1426	66.601										
	10	1436	74.15		1.86					56	81	82	3
	20	1446	82.0		1.86					48	82	81	3
	30	1456	90.2		1.86					52	82	83	3
	40	1506	97.900		1.86					57	84	82	3

ΔVm= 31.299 $\overline{\sqrt{\Delta p}}$= — $\overline{\Delta H}$= 1.86 $\overline{Ts}$= — $\overline{Tm}$= 82°F or 542°R

Vwstd = 28.584 Vwstd = 0.3247 Bws = 0.011 or 1.1%

BE

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 10-3-1

DATE 5-15-97 Sample Box No. N-5 Job No. S405.003

SAMPLE LOCATION #10 Oven outlet Filter No. NA

TRAIN PREPARER T. Abernathy

SAMPLE RECOVERY PERSON RKlh

COMMENTS

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	571.8	573.1	
2	DI H_2O	100	588.7	589.4	
3	Empty	0	493.8	494.3	
4	Silica Gel	250	769.6	774.6	
5					
6					
TOTAL			2423.9	2431.4	7.5

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-15-97
Sampling Location: OVEN #10 Clock Time: 1630
Run #: 10-3-2 Operators: DB/GG
Barometric Pressure, in. Hg: 28.90 Static Pressure, in. H_2O: -.80
Moisture, %: — Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15" Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.12	230
2	.14	231
3	.16	232
4	.21	234
5	.25	232
6	.27	230
B-1	.17	231
2	.23	232
3	.22	233
4	.19	235
5	.23	235
6	.24	234
	$\overline{\sqrt{\Delta P}}$ = 0.4471	$\overline{T_s}$ = 232

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ ~~28.84~~ 29.0

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

Moisture = 1.1%

$Ms =$ 28.88

$\overline{T_s} =$ 232 °F = 692 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps =$ 28.84 in. Hg

$\overline{\sqrt{\Delta P}} =$ 0.4471

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 34.49 ft/s

$As =$ 1.23 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 2545 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} =$ 1852 dscfm

FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN # 10
Run Number: 10-3-3 Date: 5-15-97
Pretest Leak Rate: .000 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: —

Sample Type: M-4 Operator: DBS/CG
Pbar: 2 Ps: -.81
CO2: — O2: —
Probe Length/Type: 1' SS Pitot #: ST-3
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: .003 cfm @ 10 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	1735	130.042										
	10	45	137.90		1.86					62	99	97	3
	20	55	145.90		1.86					58	93	97	3
	30	1805	153.85		1.86					61	97	100	3
	40	1815	161.750		1.86					63	95	100	3
				VELOCITY			STACK						
A-1				.10			223		Md =	29.0			
2				.13			224		Ms =	28.87			
3				.21			227		Vs =	34.71			
4				.25			220		Ps =	28.84			
5				.27			220						
6				.28			221		acfm	2561			
									dscfm	1871			
B-1				.19			229						
2				.22			234						
3				.21			236						
4				.18			238						
5				.21			237						
6				.23			236						
			Ave √Δp	0.4508									

ΔVm= 31.708 √Δp= 0.4507 ΔH= 1.86 Ts= 229 °F = 689 °R Tm= 97 °F =

[redacted]

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 10-3-3

DATE 5-15.91 Sample Box No. N-1 Job No. 5405.003

SAMPLE LOCATION OVEN #10 OUTLET Filter No. ——

TRAIN PREPARER G Gray

SAMPLE RECOVERY PERSON P. SIEGEL

COMMENTS EPA METHOD 4 - MOISTURE TRAIN
No Recovery of impinger contents

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	610.0	609.9	-0.1
2	DI H_2O	100	607.0	608.0	1.0
3	Empty	0	498.0	498.2	0.2
4	Silica Gel	250	835.1	840.9	5.8
5					
6					
TOTAL			2550.1	2557.0	6.9

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: NDA
Run #: NDA - 3 - 2
Stack I.D.: 32" x 120"
Pbar: 29.1
Sample Tube #: NDA-3 2A, NDA-3-2B
Operators: TA/SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: vost 3
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1557 Finish: 1659 Total: 62 MIN
W/B: — D/B: - O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	T_m
1557 0	1367.17	1	21	81
1607 10	1368.61	1	21	82
1617 20	1370.98	1	21	85
1627 30	1373.63	1	81	88
1637 40	1376.23	1	21	90
1647 50	1378.91	1	21	92
1659 60	1382.08	1	21	93

ΔV: 14.91
$\bar{T}_m$ = 87

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

JBE

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: NDB
Run #: NDB-3-3
Stack I.D.: 0.5" x 72"
Pbar: 29.1
Sample Tube #: NDB-3-3A, NDB-3-3B
Operators: TA/SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: VOST 3
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1735 Finish: 1838 Total: 63 min
W/B: — D/B: — O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1735 0	1382.16	1	21	90
[redacted]745 10	1384.99	1	21	90
1755 20	1387.49	1	21	91
[redacted]806 21	1390.65	1	21	92
[redacted]816 40	1392.93	1	21	94
1826 50	1395.68	1	21	95
[redacted]838 62	1399.04	1	21	16

[redacted] 16.88
T_m = 93

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

✓BE

APPENDIX A.1.5

Condition 4
(includes flows, moistures, and Method 18)

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-15-97
Sampling Location: Main Exhaust Clock Time: 2025
Run #: ME-4-1 Operators: TA/SS
Barometric Pressure, in. Hg: 29.2 Static Pressure, in. H_2O: .12
Moisture, %: .94 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 17.5 Side 2:
Wet Bulb, °F: 58 Dry Bulb, °F: 78

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.27	78
2	.34	78
3	.36	78
4	.36	79
5	.37	78
6	.38	78
7	.38	78
8	.42	78
1	.30	78
2	.30	78
3	.33	78
4	.35	79
5	.37	79
6	.40	79
7	.41	78
8	.41	78
	$\overline{\sqrt{\Delta P}}$ = .5984	$\overline{Ts}$ = 78

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{.94}{100}) + 18 (\frac{.94}{100})$

$Ms = 28.90$

$\overline{Ts} = 78$ °F = 538 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.2) + \frac{.12}{13.6}$

$Ps = 29.21$ in. Hg

$\overline{\sqrt{\Delta P}} = .5984$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5984) \times \sqrt{\frac{538}{29.21 \cdot 28.90}}$

$Vs = 40.44$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 40.44 \times 1.67 \times 60$

$Qs = 4053$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 4053 \times 17.647 \times \frac{29.21}{538} \times (1 - \frac{.94}{100})$

$Qs_{std} = 3846$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: Lasco Products Location: Main Exhaust

Site: MAIN EXHAUST Operators: TM/SS Run #: ME-4-1 Date: 5/15/97

Barometric Pressure, in. Hg = Pbar = 29.7 in. Hg

Static Pressure, in. H_2O = Pg = .12 in. H_2O

Absolute Pressure of Stack = $Pbar - \frac{Pg}{13.6}$ Ps = 29.21 in. Hg

Wet-Bulb Temperature, °F = Tw = 58 °F

Dry-Bulb Temperature, °F = Td = ~~77~~ SS 78 °F

Temperature Difference, Td - Tw = ΔT = 20 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .4556 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (.4556) - \frac{(29.21 - .4556) \times (20)}{2800 - (1.3 \times 58)} = .275$ in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(.275)}{(29.21)} = .94\%$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0378	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0698	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2116	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3908	0.4062	0.4203	0.4358	0.4520	0.4688	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.876
100	1.932	1.990	2.052	2.114	2.178	2.243	2.310	2.378	2.448	2.521
110	2.596	2.672	2.749	2.828	2.911	2.996	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.288	4.405
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.758	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	23.00
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: Main Exhaust
Run #: ME-4-2
Stack I.D.: 17.5
Pbar: 29.2
Sample Tube #: ME-4-2A, ME-4-2B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost 2
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: ____ Finish: ____ Total: ____
W/B: 59 D/B: 78 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
2130	2296.54	1	150 cc	51
2135 5	2297.30	1	150 cc	51
2140 10	2297.87	1	150 cc	51
2145 15	2298.54	1	150 cc	51
200				

$\bar{T}_m$ = 51

Static = 1.03

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
1	.27	78
2	.31	78
3	.35	78
4	.37	78
5	.37	78
6	.38	78
7	.39	78
8	.41	78
1	.28	78
2	.31	78
3	.33	78
4	.36	78
5	.37	78
6	.39	79
7	.40	78
8	.40	78
Total Ave	.5952	78

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.0}{100}) + 18 (\frac{1.0}{100})$

$Ms = 28.89$

$Ts = 78$ °F $= 538$ °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.20$ In. Hg

$\overline{\sqrt{\Delta P}} = .5952$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5952) \times \sqrt{\frac{538}{29.20 \cdot 28.89}}$

$Vs = 40.23$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 40.23 \times 1.67 \times 60$

$Qs = 4032$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 4032 \times 17.647 \times \frac{29.20}{538} \times (1 - \frac{1.0}{100})$

$Qs_{std} = 3823$ dscfm

Br

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: Lasco Products Location: Main Exhaust

Site: Main Exhaust Operators: SS/TA Run #: ME-H-2 Date: 5/15/97

Barometric Pressure, in. Hg = Pbar = 29.2 in. Hg

Static Pressure, in. H_2O = Pg = +.03 in. H_2O

Absolute Pressure of Stack = $Pbar + \frac{Pg}{13.6}$ Ps = 29.20 in. Hg

Wet-Bulb Temperature, °F = Tw = 59 °F

Dry-Bulb Temperature, °F = Td = 78 °F

Temperature Difference, Td - Tw = ΔT = 19 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .5035 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (.5035) - \frac{(29.20 - .5035) \times (19)}{2800 - (1.3 \times 59)} = .303$ in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(.303)}{(29.20)} = 1.0\%$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0378	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0698	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9669	0.9993
80	1.032	1.068	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.876
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	23.00
200	23.47	23.96	24.46	24.97	25.49	26.03	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.76	32.39	33.03	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	[illegible]	[illegible]	40.98	41.72

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: Room Exhaust
Run #: RES-4-1 SPIKE
Stack I.D.: [illegible]
Pbar: 29.2
Sample Tube #: RES-4-1A, RES-4-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost 1
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): -
Time: Start: 2006 Finish: 2021 Total: 15
W/B: – D/B: – O_2: 21 CO_2: 0

		Time	Gauge Vacuum (Hg)	Flow Setting	Tm
2006	0	7710.10	1	150cc	50
[redacted]011	5	7710.64	1	150cc	50
2016	10	7711.49	1	150cc	53
[redacted]021	15	7712.11	1	150cc	52

[redacted] 95
$\bar{T}_m = 51$

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad {}^{\circ}F = \quad {}^{\circ}R \; ({}^{\circ}F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ In. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,({}^{\circ}R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

✓ bl

53

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: Room Exhaust
Run #: RE-4-1
Stack I.D.: 24" x 28"
Pbar: 29.20
Sample Tube #: RE-4-1A, RE-4-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost 2
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 2005 Finish: 2020 Total: 15
W/B: 56 D/B: 75 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
2005	2294.61	1	150 cc	53
2010	2295.26	1	150 cc	54
2015	2296.91	1	150 cc	56
2020	2296.43	1	150 cc	56

ΔV = 1.82
$\bar{T}_m$ = 55

static = -.64

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.08	74
2	.05	74
3	.05	74
4	.06	74
5	.07	74
6	.07	74
1	.09	75
2	.07	75
3	.06	75
4	.05	75
5	.05	75
6	.10	75
1	.12	75
2	.10	75
3	.07	75
4	.05	75
5	TA ~~.11~~ .07	75
6	TA ~~.08~~ .11	75
1	.08	75
2	.08	75
3	.06	75
4	.06	75
5	.07	75
6	.10	75
	0.2692	~~28~~ 75

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (28.9) \times (1 - \frac{.86}{100}) + 18(\frac{.86}{100})$

$Ms = 28.91$

$Ts = 75\ °F = 535\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (29.2 + \frac{-.64}{13.6}$

$Ps = 29.15$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.2692$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2692) \times \sqrt{\frac{535}{29.15 \cdot 28.91}}$

$Vs = 18.15$ ft/s

$As = 4.67\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = 18.15 \times 4.67 \times 60$

$Qs = 5083$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 5083 \times 17.647 \times \frac{29.15}{535} \times (1 - \frac{.86}{100})$

$Qs_{std} = 4846$ dscfm

✓BL

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: Laser Products Location: Room Exhaust

Site: Room Exhaust Operators: SS/TA Run #: RE-4-1 Date: 5/19/97

Barometric Pressure, in. Hg = Pbar = 29.3 in. Hg

Static Pressure, in. H_2O = Pg = -.64 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.15 in. Hg

Wet-Bulb Temperature, °F = Tw = 56 °F

Dry-Bulb Temperature, °F = Td = 75 °F

Temperature Difference, Td - Tw = ΔT = 19 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .4520 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (.4520) - \frac{(29.15 - .4520) \times (19)}{2800 - (1.3 \times 56)} = .252$ in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(.252)}{(29.15)} = .86\%$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2578	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3628	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4688	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.996	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.408
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.586	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.886	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.76	32.39	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-15-97

Sampling Location: Room Exhaust Clock Time: 2205

Run #: RE-4-2 Operators: TA/SS

Barometric Pressure, in. Hg: 29.2 Static Pressure, in. H_2O: -.64

Moisture, %: .95 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 24" Side 2: 28"

Wet Bulb, °F: 57 Dry Bulb, °F: 75

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.06	74
2	.05	74
3	.06	74
4	.07	74
5	.07	74
6	.07	74
1	.08	75
2	.08	75
3	.07	75
4	.05	75
5	.06	74
6	.10	74
1	.13	75
2	.09	75
3	.06	74
4	.05	74
5	.05	74
6	.11	74
1	.11	75
2	.09	75
3	.06	75
4	.05	75
5	.07	75
6	.12	75
	$\overline{\sqrt{\Delta P}}$ = .2716	$\overline{Ts}$ = 75

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{.95}{100}) + 18 (\frac{.95}{100})$

$Ms = 28.90$

$\overline{Ts} = 75$ °F = 535 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.2) + \frac{-.64}{13.6}$

$Ps = 29.15$ in. Hg

$\overline{\sqrt{\Delta P}} = .2716$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2716) \times \sqrt{\frac{535}{29.15 \cdot 28.90}}$

$Vs = 18.32$ ft/s

$As = \cancel{3.14}\ 55\ ft^2\ 4.67$

$Qs = Vs \times As \times 60$ s/m

$Qs = 18.32 \times \cancel{3.14}\ 55\ 4.67 \times 60$

$Qs = \cancel{3453}$ cs actm 5129

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \cancel{3453}\ 5129\ cs \times 17.647 \times \frac{29.15}{535} \times (1 - \frac{.95}{100})$

$Qs_{std} = \cancel{3389}\ 55$ dscfm 4486

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: Laser Products Location: Room Exhaust

Site: Room Exhaust Operators: SMM Run #: RE-4-2 Date: 5/15/97

Barometric Pressure, in. Hg = Pbar = 29.2 in. Hg

Static Pressure, in. H_2O = Pg = -.64 in. H_2O

Absolute Pressure of Stack = $Pbar - \frac{Pg}{13.6}$ Ps = 29.15 in. Hg

Wet-Bulb Temperature, °F = Tw = 57 °F

Dry-Bulb Temperature, °F = Td = 75 °F

Temperature Difference, Td - Tw = ΔT = 18 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .4666 in. Hg

Vapor Pressure of H_2O = Pva = $(Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

Pva = $(.4666) - \frac{(29.15 - .4666) \times (18)}{2800 - (1.3 \times 57)}$ = .277 in. Hg

Proportion of Water Vapor by Volume = Bws

Bws = $\frac{(Pva)}{(Ps)}$ = $\frac{(.277)}{(29.15)}$ = ~~[illegible]~~ 55 .95%

VAPOR PRESSURES OF WATER

In Inches of Mercury

VBE

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0698	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1718	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2578	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3496
50	0.3628	0.3784	0.3908	0.4062	0.4203	0.4358	0.4520	0.4688	0.4858	0.5036
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9668	0.9993
80	1.032	1.068	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.988	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.828	2.911	2.996	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.288	4.405
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.886	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-15-
Sampling Location: OVEN #9 Clock Time: 2005
Run #: 9-4-1 Operators: DBS / GG
Barometric Pressure, in. Hg: 28.90 Static Pressure, in. H_2O: -.67
Moisture, %: — Molecular wt., Dry: — Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15" Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.04	161
2	.13	162
3	.17	164
4	.21	164
5	.23	163
6	.22	163
B-1	.18	161
2	.22	166
3	.22	166
4	.22	167
5	.21	166
6	.20	165
	$\overline{\sqrt{\Delta P}}$ = .4347	$\overline{T_s}$ = 164

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.2}{100}) + 18 (\frac{1.2}{100})$

$Ms = 28.87$

$\overline{T_s} = 164$ °F = 624 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.85$ in. Hg

$\overline{\sqrt{\Delta P}} = .4347$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.4347) \times \sqrt{\frac{624}{28.85 \cdot 28.87}}$

$Vs = 31.85$ ft/s

$As = 1.23$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 31.85 \times 1.23 \times 60$

$Qs = 2345$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 2345 \times 17.647 \times \frac{28.85}{624} \times (1 - \frac{1.2}{100})$

$Qs_{std} = 1890$ dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: OVEN # 9
Run #: 9-4-2
Stack I.D.: 15
Pbar: 28.90
Sample Tube #: 9-4-2A 9-4-2B
Operators: DAL / GG
Leak Check: Pre: 1200 @ 1 Post:

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 0930 Finish: 2230 Total: 60
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
~~0930~~ 2130	0	250 cc/min
2140	0	
2150	0	
2200	0	
2210	0	
2220	0	
2230		

STATIC -.66

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A - 1	.09	161
2	.14	162
3	.15	163
4	.23	162
5	.23	161
6	.22	160
B - 1	.17	160
2	.21	163
3	.25	166
4	.23	167
5	.22	164
6	.21	162
Total Avg	.4403	163

941.12
3.46
945.46
8.60
950.56
3.65
56.55

Y = 15.43
Tm = 90

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

Md = 29

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.2}{100}) + 18 (\frac{1.2}{100})$

Ms = 28.87

Ts = 163 °F = 623 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

Ps = 28.85 in. Hg

$\overline{\sqrt{\Delta P}} = .4403$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.4403) \times \sqrt{\frac{623}{28.85 \cdot 28.87}}$

Vs = 32.22 ft/s

As = 1.23 ft^2

Qs = Vs x As x 60 s/m

Qs = 32.22 x 1.23 x 60

Qs = 2372 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 2372 \times 17.647 \times \frac{28.85}{623} \times (1 - \frac{1.2}{100})$

Qs_{std} = 1917 dscfm

FIELD DATA SHEET

Plant: LASCO
Sampling Location OVEN #9
Run Number: 9-4-2 Date: 5-15-97
Pretest Leak Rate: .002 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DDS/GG
Pbar: 28.90 Ps: -.66
CO2: — O2: —
Probe Length/Type: 1.5' Pitot #: 513
Stack Diameter: 15" As: 1.23

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: 1.966 ΔH@: 1.862
Post-Test Leak Rate: .000 cfm @ 5 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	2130	193.235										
	10	2140	201.90		1.86					59	96	94	3
	20	2150	209.10		1.86					54	86	88	3
	30	2200	217.0		1.86					56	86	90	3
	40	2210	224.855		1.86					60	90	94	3

ΔVm= 31.65 $\overline{\sqrt{\Delta p}}$= — $\overline{\Delta H}$= 1.86 $\overline{Ts}$= — $\overline{Tm}$= 91

[redacted]

SAMPLE RECOVERY DATA

Plant: LASCO Run No.: 97-8

Date: 9-15-97 Sample Box No.: N-1 Job No.: 5405.003

Sample Location: #9 OVEN OUTLET

Sample Type: EPA METHOD 4 MOISTURE Filter No.: NA

Sample Recovery Person: R Kelly

Comments: —

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	609.9	611.3	1.4
2	DI H_2O	100	608.0	608.6	0.6
3	Empty	—	498.2	498.7	0.5
4	SILICA GEL	250	840.9	845.7	4.8
5					
6					
TOTAL			2557	2564.3	7.3

Description of Impinger Catch: —

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: Lasco SOURCE/RUN #: 9-4-2 DATE: 5/19/97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad\quad) - (\quad\quad - 0.02) \times (\quad\quad)$$

$$V_{mc} = \_\_\_\_\_ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (\ \cancel{551}\ 31.65\ ) \times (\ .966\ ) \times \left(\frac{(\ 28.90) + (1.86\ / 13.6)}{(\ 551\ )}\right)$$

$$V_{m_{std}} = 28.42 \text{ dscf}$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (\ 7.3\ )$$

$$V_{w_{std}} = .344 \text{ scf}$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(\ .344\ )}{(\ .344) + (\ 28.42\ )}$$

$$B_{ws} = 1.2\%$$

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: OVEN #10
Run #: 10-4-1
Stack I.D.: 15"
Pbar: 28.90
Sample Tube #: 10-4-1A 10-4-1B
Operators: DBJ / GG
Leak Check: Pre: .000 @1 Post: .000 @1

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 2005 Finish: 2105 Total: 60
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
2005	0	850cc/min
2015	0	
2025	0	
2035	0	
2045	0	
2055	0	
2105	0	

STATIC -.80

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.14	223
2	.18	226
3	.17	228
4	.21	231
5	.26	231
6	.27	229
B-1	.21	228
2	.23	230
3	.22	232
4	.19	234
5	.22	230
6	.24	231
Total Ave	.4583	229

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$

$$Md = (0.44 \times 0) + (0.32 \times .21) + (0.28 \times .79)$$

$$Md = .29$$

$$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$$

$$Ms = (.29) \times (1 - \frac{1.1}{100}) + 18(\frac{1.1}{100})$$

$$Ms = 28.88$$

$$Ts = 229\ °F = 689\ °R\ (°F + 460)$$

$$Ps = Pb + \frac{S.P.}{13.6} = (28.9) + \frac{-.80}{13.6}$$

$$Ps = 28.84 \text{ in. Hg}$$

$$\overline{\sqrt{\Delta P}} = .4583$$

$$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$$

$$Vs = 85.49 \times (.99) \times (.4583) \times \sqrt{\frac{689}{28.84 \times 28.88}}$$

$$Vs = 35.29 \text{ ft/s}$$

$$As = 1.23 \text{ ft}^2$$

$$Qs = Vs \times As \times 60 \text{ s/m}$$

$$Qs = 35.29 \times 1.23 \times 60$$

$$Qs = 2599 \text{ acfm}$$

$$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$$

$$Qs_{std} = 2599 \times 17.647 \times \frac{28.84}{689} \times (1 - \frac{1.1}{100})$$

$$Qs_{std} = 1897 \text{ dscfm}$$

FIELD DATA SHEET

Plant: DASCO
Sampling Location: OVEN #10
Run Number: 10-4-1 Date: 5-15-97
Pretest Leak Rate: .002 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: —

Sample Type: M-4 Operator: DGS/CG
Pbar: 28.90 Ps: —
CO2: — O2: —
Probe Length/Type: 1'55 Pitot #: ST-3
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.869
Post-Test Leak Rate: .000 cfm @ 14 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0	2006	169.000										
	10	2016	169.45		1.86					60	85	58	5
	20	2026	177.40		1.86					57	84	86	5
	30	2036	185.15		1.86					59	90	93	5
	40	2046	193.100		1.86					59	89	94	5

ΔVm= 31.100 $\sqrt{\Delta p}$= — $\overline{\Delta H}$= 1.86 [redacted]= — $\overline{Tm}$= 89

[redacted]49[redacted]

SAMPLE RECOVERY DATA

Plant: LASCO Products Run No.: 10-4-1

Date: 5/15/97 Sample Box No.: N-6 Job No.: 5405.003

Sample Location: 10 Oven Exhaust

Sample Type: Moisture Filter No.: —

Sample Recovery Person: _____

Comments: _____

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	597.7	598.1	0.4
2	DI H_2O	100	663.3	663.3	0.0
3	Empty	0	456.1	456.4	0.3
4	Silica Gel	250	773.4	779.1	5.7
5					
6					
TOTAL			2490.5	2496.9	6.4

Description of Impinger Catch: _____

✓BE

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: Lasco Products SOURCE/RUN #: 10-4-1 DATE: 5/15/97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\qquad) - (\qquad - 0.02) \times (\qquad)$$

$$V_{mc} = \_\_\_\_\_ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (31.100) \times (.966) \times \left(\frac{(28.90) + (1.86 / 13.6)}{(549)}\right)$$

$$V_{m_{std}} = 28.03 \text{ dscf}$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (6.4)$$

$$V_{w_{std}} = .301 \text{ scf}$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.301)}{(.301) + (\qquad)}$$

$$B_{ws} = 1.1\%$$

VBL

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-15-97
Sampling Location: OVEN # 10 Clock Time: 0155
Run #: 10-4-2 Operators: DB/GG
Barometric Pressure, in. Hg: 28.90 Static Pressure, in. H_2O: -.81
Moisture, %: — Molecular wt., Dry: — Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15" Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.10	222
2	.16	225
3	.17	227
4	.20	231
5	.26	231
6	.28	230
B-1	.16	229
2	.23	232
3	.22	233
4	.19	234
5	.22	230
6	.25	231
	$\overline{\sqrt{\Delta P}}$ = .4474	$\overline{T_s}$ = 230

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.2}{100}) + 18 (\frac{1.2}{100})$

$Ms = 28.87$

$\overline{T_s} = 230$ °F = 690 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.9) + \frac{-.81}{13.6}$

$Ps = 28.84$ in. Hg

$\overline{\sqrt{\Delta P}} = .4474$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{P_s \times M_s}}$

$Vs = 85.49 \times (.99) \times (.4474) \times \sqrt{\frac{690}{28.84 \cdot 28.87}}$

$Vs = 34.46$ ft/s

$As = 1.23$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = 34.46 \times 1.23 \times 60$

$Qs = 2537$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 2537 \times 17.647 \times \frac{28.84}{690} \times (1 - \frac{1.2}{100})$

$Qs_{std} = 1850$ dscfm

JBE

METHOD 18 FIELD DATA SHEET

Plant: Lasco
Date: 5/15/97
Location: NDO - A
Run #: NDA - 4 - 1
Stack I.D.: 32" x 12.0"
Pbar: 29.2
Sample Tube #: NDA - 4 - 1 A B
Operators: 26 / 55
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: VOST #3
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 2005 Finish: 2105 Total: 60 min.
W/B: — D/B: — O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	
2005	0	1399.22	1	21	86
2015	10	1401.65	1	21	87
2025	20	1404.18	1	21	88
2035	30	1406.60	1	21	90
2045	40	1409.17	1	21	91
2055	53	1412.07	1	21	92
2105	60	1413.68	1	21	93

$\Delta V = 14.4$
$\overline{T_m} = 90$

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-15-97
Location: NDB
Run #: NDB-4-2
Stack I.D.: 0.5" x 72"
Pbar: 29.2
Sample Tube #: NDB-4-2A, NDB-4-2B
Operators: SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: 1054
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 2130 Finish: 2220 Total: 50
W/B: – D/B: – O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	T_m
2130 0	1413.94	1	21	91
2140 10	1416.59	1	21	91
2150 20	1419.18	1	21	91
2200 30	1422.37	1	21	92
2210 40	1424.31	1	21	93
2220 50	1426.99	1	21	93
60	1429.57	1	21	94

Δ = 15.63
T_m = 92

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{}{}}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} = \quad$ dscfm

APPENDIX A.1.6

Condition 5
(includes flows, moistures, and Method 18)

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: Main Exhaust
Run #: ME-5-1
Stack I.D.: 17.5
Pbar: 28.85
Sample Tube #: ME-5-1A, ME-5-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: Vost # 2
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 0905 Finish: 0920 Total: 15
W/B: 70 D/B: 87 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	T_m
0905	0 2298.73	1	150 cc	72
0910	5 2299.17	1	150 cc	74
0915	10 2299.62	1	150 cc	76
0920	15 2300.27	1	150 cc	78

ΔV = 1.54
T_m = 75

Static = .02

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	87
2	.26	87
3	.27	87
4	.26	87
5	.29	87
6	.32	87
7	.36	87
8	.38	87
1	.28	87
2	.30	87
3	.29	87
4	.27	87
5	.26	86
6	.26	87
7	.27	86
8	.26	86
	0.5327	87°F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.78$

$Ts = 87\ °F = 547\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.85$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.5327$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 36.59$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3667$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3345$ dscfm

.1A.D

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main Exhaust

Site: Main Exhaust Operators: JH/JS Run #: ME-5-1 Date: 5-19-97

Barometric Pressure, in. Hg = Pbar = 28.85 in. Hg

Static Pressure, in. H_2O = Pg = -.02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.85 in. Hg

Wet-Bulb Temperature, °F = Tw = 70 °F

Dry-Bulb Temperature, °F = Td = 87 °F

Temperature Difference, Td - Tw = ΔT = 17 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.7392 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.7392) - \frac{(28.85 - .7392) \times (17)}{2800 - (1.3 \times 70)} = 0.5628 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.5628)}{(28.85)} = 0.020 \text{ or } 2.0\%$$

$\frac{477.9}{2709} = 0.1764$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97

Sampling Location: Main Exhaust Clock Time: 1115

Run #: ME-5-2 Operators: TH/SS

Barometric Pressure, in. Hg: 28.8 Static Pressure, in. H_2O: -.03

Moisture, %: 2.1 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 17.5 Side 2: -

Wet Bulb, °F: 72 Dry Bulb, °F: 90

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.22	90
2	.25	90
3	.25	90
4	.25	90
5	.30	90
6	.33	90
7	.35	90
8	.39	90
1	.26	90
2	.30	90
3	.29	90
4	.28	90
5	.26	89
6	.27	89
7	.27	90
8	.25	90
	$\overline{\sqrt{\Delta P}}$ = .5301	$\overline{Ts}$ = 90

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 29

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms =$ 28.77

$\overline{Ts} =$ 90 °F = 550 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps =$ 28.90 in. Hg

$\overline{\sqrt{\Delta P}} =$ .5301

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 36.55 ft/s

$As =$ 1.67 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 3663 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} =$ 3314 dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main Exhaust

Site: MAIN Exhaust Operators: TH/SS Run #: ME-S-2 Date: 5-15-87

Barometric Pressure, in. Hg = Pbar = 28.8 in. Hg

Static Pressure, in. H_2O = Pg = -.03 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.80 in. Hg

Wet-Bulb Temperature, °F = Tw = 72 °F

Dry-Bulb Temperature, °F = Td = 90 °F

Temperature Difference, Td - Tw = ΔT = 18 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .7912 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\quad) - \frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)} = .6049 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\quad)}{(\quad)} = 2.10\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97

Sampling Location: Main Exhaust Clock Time: 1357

Run #: ME-5-3 Operators: TA/SS

Barometric Pressure, in. Hg: 28.65 Static Pressure, in. H_2O: .02

Moisture, %: 2.4 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 17.5 Side 2: –

Wet Bulb, °F: 75 Dry Bulb, °F: 92

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	91
2	.25	92
3	.26	93
4	.25	93
5	.31	92
6	.33	92
7	.36	92
8	.39	92
1	.28	92
2	.30	92
3	.30	92
4	.28	93
5	.25	93
6	.27	93
7	.26	93
8	.25	93
	$\overline{\sqrt{\Delta P}}$ = 0.5330	$\overline{Ts}$ = 92

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.74$

$\overline{Ts} = 92$ °F = 552 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.65$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.5330$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 36.935$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3701$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3308$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main Exhaust

Site: Main Exhaust Operators: TA/SS Run #: ME-5-3 Date: 5-15-97

Barometric Pressure, in. Hg = Pbar = 28.65 in. Hg

Static Pressure, in. H_2O = Pg = +.02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.65 in. Hg

Wet-Bulb Temperature, °F = Tw = 75 °F

Dry-Bulb Temperature, °F = Td = 92 °F

Temperature Difference, Td - Tw = ΔT = 17 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.8750 in. Hg

Vapor Pressure of H_2O = Pva = $(Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

Pva = $(0.8750) - \frac{(28.65 - .8750) \times (17)}{2800 - (1.3 \times 75)}$ = 0.7003 in. Hg

Proportion of Water Vapor by Volume = Bws

Bws = $\frac{(Pva)}{(Ps)}$ = $\frac{(0.7003)}{(28.65)}$ = 0.024 or 2.4% Ms

VAPOR PRESSURES OF WATER

In Inches of Mercury

$\frac{472.2}{2703} = .0.1747$

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: Room Exhaust
Run #: RE-5-1
Stack I.D.: 28" x 24"
Pbar: 28.85
Sample Tube #: RE-5-1A, RE-5-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost 2 1
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 0904 Finish: 0949 Total: 45
W/B: 70 D/B: 82 O_2: 20 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0904 0	7713.90	1	150cc	71
[redacted] 10	7715.45	1	150cc	75
0924 20	7716.92	1	150cc	79
[redacted] 30	7718.37	1	150cc	82
[redacted] 0944 40	7719.85	1	150cc	84
[redacted] 0949 45	7720.65	1	150cc	85
ΔV = 6.75				

T_m = 79

Start Z = [redacted] – .60

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
1	~~.83~~ .05	82
2	~~.86~~ .05	82
3	~~.87~~ .05	80
4	~~.86~~ .06	80
5	~~.89~~ .07	80
6	~~.82~~ .07	80
1	.07	80
2	.08	80
3	.05	80
4	.04	80
5	.05	80
6	.08	80
1	.10	81
2	.09	81
3	.05	80
4	.04	80
5	.05	80
6	.10	80
1	.08	80
2	.06	80
3	.05	80
4	.04	80
5	.05	80
6	.10	80
	.3497	80

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{2.1}{100}) + 18 (\frac{2.1}{100})$

$Ms = \cancel{28.81}\ 28.77$

$Ts = 80\ °F = 540\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.81$ in. Hg

$\overline{\sqrt{\Delta P}} = .3497$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \cancel{14.70}$ ft/s 17.06

$As = 4.67\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \cancel{4.67}$ acfm ~~4,058~~ 4777

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{2.1}{100})$

$Qs_{std} = \cancel{3735}$ dscfm 4402

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: JA Run #: RE-5-1 Date: 5-19-97

Barometric Pressure, in. Hg = Pbar = 28.85 in. Hg

Static Pressure, in. H_2O = Pg = -.60 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.81 in. Hg

Wet-Bulb Temperature, °F = Tw = 70 °F

Dry-Bulb Temperature, °F = Td = 82 °F

Temperature Difference, Td - Tw = ΔT = 12 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .7392 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\quad) - \frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)} = .6149 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\quad)}{(\quad)} = 2.13\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

✓ 68

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97
Sampling Location: Boom Exhaust Clock Time: 1142
Run #: RE-5-2 Operators: TA/SS
Barometric Pressure, in. Hg: 28.0 Static Pressure, in. H_2O: -.62
Moisture, %: 2.3 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 28 Side 2: 24
Wet Bulb, °F: 71 Dry Bulb, °F: 83

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.05	81
2	.05	83
3	.05	83
4	.06	83
5	.06	83
6	.06	83
1	.06	84
2	.07	84
3	.05	83
4	.04	83
5	.05	83
6	.08	83
1	.11	84
2	.10	84
3	.06	83
4	.05	83
5	.05	83
6	.10	83
1	.06	83
2	.06	83
3	.05	83
4	.05	83
5	.05	83
6	.09	83
	$\overline{\sqrt{\Delta P}}$ = 0.2484	$\overline{Ts}$ = 83

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.75$

$\overline{Ts} = 83$ °F = 543 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 27.95$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.2484$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 17.282$ ft/s

$As = 4.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 4842$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4297$ dscfm

MD.5

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: TH/SS Run #: RE-5-2 Date: 5-19-97

Barometric Pressure, in. Hg = Pbar = 28.00 in. Hg

Static Pressure, in. H_2O = Pg = -.62 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 27.95 in. Hg

Wet-Bulb Temperature, °F = Tw = 71 °F

Dry-Bulb Temperature, °F = Td = 83 °F

Temperature Difference, Td - Tw = ΔT = 12 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.7648 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.7648) - \frac{(27.95 - .7648) \times (12)}{2800 - (1.3 \times 71)} = 0.6438 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.6438)}{(27.95)} = 0.023 \text{ or } 2.3\%$$

$$\frac{326.3}{2707.7} = 0.121$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97
Sampling Location: Beam Exhaust Clock Time: 1410
Run #: BE-5-3 Operators: TA/SS
Barometric Pressure, in. Hg: 28.63 Static Pressure, in. H_2O: -.67
Moisture, %: 2.2 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 28 Side 2: 24
Wet Bulb, °F: 71 Dry Bulb, °F: 85

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.08	85
2	.07	85
3	.06	85
4	.06	85
5	.08	85
6	.08	85
1	.07	85
2	.09	85
3	.06	85
4	.06	85
5	.06	85
6	.08	85
1	.10	86
2	.08	85
3	.05	85
4	.05	85
5	.05	85
6	.10	85
1	.09	86
2	.07	85
3	.05	85
4	.05	85
5	.06	85
6	.10	85
	$\overline{\sqrt{\Delta P}}$ = .2643	$\overline{Ts}$ = 85

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 29

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ 28.76

$\overline{Ts} =$ 85 °F = 545 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 29.60 in. Hg

$\overline{\sqrt{\Delta P}} =$ .2643

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 18.71 ft/s

$As =$ 4.67 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 5099 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 4619 dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: SS Run #: RE-5-3 Date: 5-19-97

Barometric Pressure, in. Hg = Pbar = 28.65 in. Hg

Static Pressure, in. H_2O = Pg = -.67 in. H_2O

Absolute Pressure of Stack = $Pbar \mp \frac{Pg}{13.6}$ Ps = 28.60 in. Hg

Wet-Bulb Temperature, °F = Tw = 71 °F

Dry-Bulb Temperature, °F = Td = 85 °F

Temperature Difference, Td - Tw = ΔT = 14 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .7648 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\quad) - \frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)} = .6209 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\quad)}{(\quad)} = 2.17$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0766	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4856	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: HASCO Date: 5-19-97
Sampling Location: Auxillary Fan Clock Time: 1020
Run #: AF-5-1 Operators: TH/SS
Barometric Pressure, in. Hg: 28.85 Static Pressure, in. H_2O: -.77
Moisture, %: 2.1 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 19.75 Side 2: -
Wet Bulb, °F: 70 Dry Bulb, °F: 83

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.30	82
2	.39	83
3	.42	82
4	.42	82
5	.36	83
6	.34	83
7	.34	83
8	.30	83
1	.23	82
2	.30	83
3	.36	83
4	.46	83
5	.43	83
6	.37	83
7	.36	83
8	.34	83
	$\overline{\sqrt{\Delta P}}$ = .5959	$\overline{Ts}$ = 83

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 29.0

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ ~~28.79~~ 28.77

$\overline{Ts} =$ 83 °F = 543 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 28.79 in. Hg

$\overline{\sqrt{\Delta P}} =$ 0.5959

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5959) \times \sqrt{543}$

$Vs =$ 40.835 ft/s

$As =$ 2.13 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 5218.7 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 4780 dscfm

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WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Aux. Heat Fan

Site: Auxiliary Fan Operators: JH Run #: AF-5-1 Date: 5-15-97

Barometric Pressure, in. Hg = Pbar = 28.85 in. Hg

Static Pressure, in. H_2O = Pg = -.77 in. H_2O

Absolute Pressure of Stack = $Pbar \mp \frac{Pg}{13.6}$ Ps = 28.79 in. Hg

Wet-Bulb Temperature, °F = Tw = 70 °F

Dry-Bulb Temperature, °F = Td = 83 °F

Temperature Difference, Td - Tw = ΔT = 13 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.7392 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.7392) - \frac{(28.79 - .7392) \times (13)}{2800 - (1.3 \times 70)} = 0.6046 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.6046)}{(28.79)} = 0.021 \sim 2.1\%$$

$\frac{3646.6}{2709} = 0.1346$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: Auxiliary Exhaust
Run #: AFS-5-2 SPIKE
Stack I.D.: 19.75
Pbar: 28.8
Sample Tube #: AFS-5-2A, AFS-5-2B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: Vost # 2
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1108 Finish: ____ Total: 60
W/B: - D/B: - O_2: ~~21~~ CO_2: ~~0~~

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1108 0	2300.34	1	150cc	91
1118 10	2301.42	1	150cc	94
1128 20	2302.87	1	150cc	97
1138 30	2304.23	1	150 cc	99
1148 40	2305.51	1	150 cc	102
1158 50	2306.90	1	150 cc	102
208 60	2308.23	1	150 cc	103

= 7.89

= 98

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

1.8

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: Auxiliary Exhaust
Run #: AF-5-7
Stack I.D.: 19.75
Pbar: 28.8
Sample Tube #: AF-5-2A, AF-5-2B
Operators: TA/SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: VOST #1
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1108 Finish: ____ Total: 60
W/B: 70 D/B: 84 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1109	0 7721.07	1	150cc	88
1118	10 7722.26	1	150cc	91
1128	20 7723.49	1	150cc	92
1138	30 7724.84	1	150cc	94
1148	40 7726.10	1	150cc	95
1158	50 7727.50	1	150cc	96
1208	60 7728.80		150cc	10

Static -.85

$\Delta V = 7.73$
$\bar{T}_m = 93$

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
1	.28	83
2	.36	83
3	.40	82
4	.43	83
5	.40	84
6	.35	85
7	.32	85
8	.30	85
1	.27	84
2	.28	84
3	.34	84
4	.37	84
5	.41	84
6	.38	84
7	.32	84
8	.29	84
	.5847	84

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{2.1}{100}) + 18 (\frac{2.1}{100})$

$Ms = 28.77$

$Ts = 84\ °F = 544\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.74$ In. Hg

$\overline{\sqrt{\Delta P}} = .5847$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 40.14$ ft/s

$As = 2.13$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 5124$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4677$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: Lasco Location: Auxiliary Exhaust

Site: Auxiliary Fan Operators: SS/FA Run #: AF-5-2 Date: 5/19/97

Barometric Pressure, in. Hg = Pbar = 28.8 in. Hg

Static Pressure, in. H_2O = Pg = -.85 in. H_2O

Absolute Pressure of Stack = $Pbar \mp \frac{Pg}{13.6}$ Ps = 28.74 in. Hg

Wet-Bulb Temperature, °F = Tw = 70 °F

Dry-Bulb Temperature, °F = Td = 84 °F

Temperature Difference, Td - Tw = ΔT = 14 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .7392 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\quad) - \frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)} = .5945 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\quad)}{(\quad)} = 2.07$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97
Sampling Location: Auxiliary Fan Clock Time: 1403
Run #: AF-5-3 Operators: TA/SS
Barometric Pressure, in. Hg: 28.65 Static Pressure, in. H_2O: -.83
Moisture, %: 2.1 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 19.75 Side 2: -
Wet Bulb, °F: 71 Dry Bulb, °F: 87

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.21	85
2	.35	85
3	.45	86
4	.43	86
5	.36	87
6	.28	87
7	.27	87
8	.21	87
1	.21	87
2	.26	86
3	.33	85
4	.35	86
5	.41	86
6	.42	86
7	.37	86
8	.36	86
	$\overline{\sqrt{\Delta P}}$ = 0.5696	$\overline{Ts}$ = 86

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 29

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ 28.77

$\overline{Ts} =$ 86 °F = 546 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 28.59 in. Hg

$\overline{\sqrt{\Delta P}} =$ 0.5696

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 39.277 ft/s

$As =$ 2.13 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 5020 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 4541 dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Auxiliary Fan

Site: Auxiliary Fan Operators: SS Run #: AF-5-3 Date: 5-19-97

Barometric Pressure, in. Hg = Pbar = 28.65 in. Hg

Static Pressure, in. H_2O = Pg = -.83 in. H_2O

Absolute Pressure of Stack = $Pbar \mp \frac{Pg}{13.6}$ Ps = 28.59 in. Hg

Wet-Bulb Temperature, °F = Tw = 71 °F

Dry-Bulb Temperature, °F = Td = 87 °F

Temperature Difference, Td - Tw = ΔT = 16 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.7648 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.7648) - \frac{(28.59 - .7648) \times (16)}{2800 - (1.3 \times 71)} = 0.6004 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.6004)}{(28.59)} = 0.021 \approx 2.1\%$$

$$\frac{445.2}{2707.7} = .1644$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2116	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4856	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: OUBN #9
Run #: 9-5-1
Stack I.D.: 15"
Pbar: 29.25
Sample Tube #: 9-5-1A - 9-5-1B
Operators: DB / GG
Leak Check: Pre: .000 @1 Post: .000 @1

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 0904 Finish: 1004 Total: 60
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
0904	0	250 cc/min
0919	0	
0934	0	
0949	0	
1004	0	

957.558
960.0
964.01
68.75
972.610
15.06 Hg

$\Delta V = 15.06$
$T_{in} = 82$

STATIC - .06

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
A-1	.18	161
2	.16	163
3	.22	163
4	.22	163
5	.23	163
6	.21	162
B-1	.14	162
2	.21	165
3	.22	166
4	.21	167
5	.22	167
6	.20	166
	.439	164 Avg

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 31/5C 84/53

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{2.8}{100}) + 18 (\frac{2.8}{100})$

$Ms = 28.54$

$Ts = 164\ °F = 624\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (29.25) + \frac{-.06}{13.6}$

$Ps = 29.20$ in. Hg

$\overline{\sqrt{\Delta P}} = .4390$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.4346) \times (.99) \times \sqrt{\frac{624}{29.20 \times 28.54}}$

$Vs = 31.83$ ft/s

$As = 1.23$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = 31.83 \times 1.23 \times 60$

$Qs = 2{,}349$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 2349 \times 17.647 \times \frac{29.20}{624} \times (1 - \frac{2.8}{100})$

$Qs_{std} = 1821$ dscfm

FIELD DATA SHEET

y=0.966

Plant: CASCO
Sampling Location: BOILER OVEN # 9
Run Number: 9-5-1 Date: 5-19-92
Pretest Leak Rate: .001 cfm @ 12 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DBS/KG
Pbar: 29.05 Ps:
CO2: — O2: —
Probe Length/Type: 1' SS Pitot #: ST-3
Stack Diameter: 15" As: —

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 ~~Y: .996~~ ΔH@: 1.862
Post-Test Leak Rate: .002 cfm @ 12 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading 225 (Vm) ft³ /20	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	0905	225.020										
	10	0915	233.10		1.86					60	86	87	3
	20	0925	241.1		1.86					56	85	87	3
	30	0935	248.55		1.86					58	86	91	3
	40	0945	254.70		1.86					60	88	93	3
	45	0950	260.410		1.86					61	89	95	3

ΔVm= 35.290 $\sqrt{\Delta p}$= — ΔH= 1.86 Ts= — Tm= 88.6

Vm std 33.189

JPD

PES

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 9-5-1

DATE 5-19-97 Sample Box No. N-1 Job No. S405.003

SAMPLE LOCATION #9 OVEN OUTLET Filter No. ——

TRAIN PREPARER R Kolde

SAMPLE RECOVERY PERSON R Kolde

COMMENTS Moisture Train

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	611.3	628.7	17.4
2	DI H_2O	100	603.6	598.8	-4.8
3	Empty	0	498.7	499.4	0.7
4	Silica Gel	250	845.7	852.0	6.3
5					
6					
TOTAL					19.6

Description of Impinger Contents

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5/18/97
Sampling Location: OVEN # 9 Clock Time: 1100
Run #: 9-5-2 Operators: DB / CG
Barometric Pressure, in. Hg: 29.25 Static Pressure, in. H_2O: -.67
Moisture, %: — Molecular wt., Dry: — Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15" Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.10	160
2	.15	163
3	.22	164
4	.23	162
5	.24	160
6	.23	161
B-1	.16	164
2	.20	166
3	.22	167
4	.22	167
5	.21	167
6	.20	164
	$\overline{\sqrt{\Delta P}}$ = .446 .4458	$\overline{Ts}$ = 164

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md =$ ~~28.84~~ 29.0

Moisture average from 1 + 3 = 2.5%

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29.84) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ 28.73

$\overline{Ts} =$ 164 °F = 624 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.25) + \frac{-.67}{13.6}$

$Ps =$ 29.2 in. Hg

$\overline{\sqrt{\Delta P}} =$ .4458

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.4458) \times \sqrt{\frac{624}{29.2}}$

$Vs =$ 32.54 ft/s

$As =$ 1.23 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs =$ x x 60

$Qs =$ 2401 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} =$ x 17.647 x $\frac{29.2}{624}$ x $(1 - \frac{\quad}{100})$

$Qs_{std} =$ 1934 dscfm

FIELD DATA SHEET

Plant: LASCO
Sampling Location: Oven # 9
Run Number: 9-5-3 Date: 5-19-97
Pretest Leak Rate: .000 cfm @ 12 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DK/GG
Pbar: 29.20 Ps: -.66
CO2: — O2: —
Probe Length/Type: 1'55 Pitot #: ST-3
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: .000 cfm @ 10 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	1353	292.223										
	10	1403	301.20		1.86					60	102	102	3
	20	1413	309.15		1.86					59	99	102	3
	30	1423	317.15		1.86					60	99	104	3
	40	1433	325.192		1.86					60	100	105	3

VELOCITY #3 Oven #9

	ΔP	STACK Temp
A-1	.11	164
2	.12	165
3	.16	166
4	.22	167
5	.23	165
6	.23	164
B 1	.12	163
2	.21	166
3	.22	167
4	.21	168
5	.21	164
6	.19	163

Md = 29.0
Ms = 28.76
Ps = 29.15
Vs = 31.28
acfm = 2308
dscfm = 1858

ΔVm = 32.649 $\overline{\sqrt{\Delta p}}$ = .428 $\overline{\Delta H}$ = 1.86 $\overline{Ts}$ = 165 °F or 625 °R $\overline{Tm}$ = 102

[redacted]

SAMPLE RECOVERY DATA

PLANT LASCO Products Run No. 95-3

DATE 5-19-97 Sample Box No. N-1 Job No. 5405.003

SAMPLE LOCATION #4 Oven outlet Filter No. NA

TRAIN PREPARER R Kolch

SAMPLE RECOVERY PERSON S. Simon

COMMENTS Moisture train

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	~~628.7~~ 100	628.7	636.8	8.1
2	DI H_2O	~~598.8~~ 100	598.8	600.1	1.3
3	Empty	~~499.4~~ 0	499.4	499.3	-0.1
4	Silica Gel	~~746.2~~ 250	746.2	751.1	4.9
5					
6					
TOTAL					14.2

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 9-5-1 DATE: 5-19-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{35.290}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (35.290) \times (0.966) \times \left(\frac{(29.25) + (1.862 / 13.6)}{(549)}\right)$$

$$V_{m_{std}} = \underline{32.189}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (19.6)$$

$$V_{w_{std}} = \underline{0.923}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(0.923)}{(0.923) + (32.189)}$$

$B_{ws} =$ 0.028 or 2.8 % moisture

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LA SCO Date: 5-19-97
Sampling Location: OVEN # 10 Clock Time: 1020
Run #: 10-5-1 Operators: DBS / CC
Barometric Pressure, in. Hg: 29.25 Static Pressure, in. H_2O: -.79
Moisture, %: 2.5% Molecular wt., Dry: — Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15" Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.13	218
2	.17	219
3	.16	221
4	.20	224
5	.27	220
6	.28	219
B-1	.17	220
2	.22	224
3	.22	226
4	.19	227
5	.20	224
6	.23	223
	$\overline{\sqrt{\Delta P}}$ = .448	$\overline{Ts}$ = 222

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$ M

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms = 28.72$

$\overline{Ts} = 222\ °F = 682\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps = 29.19$ in. Hg

$\overline{\sqrt{\Delta P}} = .4480$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 34.20$ ft/s

$As = 1.23\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2524$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} = 1859$ dscfm

AD

FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN # 10
Run Number: 10-5-2 Date: 5-19-97
Pretest Leak Rate: _____ cfm @ ___ in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DBS/KG
Pbar: 29.25 Ps: -0.81
CO2: — O2: —
Probe Length/Type: 1'SS Pitot #: ST-3
Stack Diameter: 15" As: 1.22 sq ft

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: .003 cfm @ 13 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	1109	260.628										
	10	1119	268.60		1.86					59	91	91	3
	20	1129	276.55		1.86					55	91	92	3
	30	1139	284.50		1.86					58	91	94	3
	40	1149	292.420		1.86					59	92	96	3

ΔVm= 31.792 $\overline{\sqrt{\Delta p}}$= — $\overline{\Delta H}$= 1.86 $\overline{T_s}$= — $\overline{T_m}$= 92 °F

[redacted] 28.8[redacted] [redacted] 7343 [redacted] B[redacted] 0[redacted]5 [redacted] 5% [redacted] 552 °R [redacted]

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: OVEN # 10
Run #: 10-5-2
Stack I.D.: 15"
Pbar: 29.25
Sample Tube #: 10-5-2A 10-5-2B
Operators: DDS · CG
Leak Check: Pre: .000 @ 1 Post: .000 @ 1

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1105 Finish: 1305 Total: 60
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
1108	0	250 cc/min
1118	0	
1128	0	
1138	0	
1148	0	
1158	0	
1208	0	

STATIC -.31

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
A-1	.15	219
2	.16	220
3	.18	224
4	.26	220
5	.27	220
6	.25	220
B-1	.18	219
2	.21	225
3	.22	227
4	.18	229
5	.21	225
6	.22	222
	TSP .456	223 AVG

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$

$$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$$

$$Md = 29.0$$

Moisture = 2.5%

$$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$$

$$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$$

$$Ms = 28.72$$

$$Ts = 223\ °F = 683\ °R\ (°F + 460)$$

$$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$$

$$Ps = 29.19 \text{ in. Hg}$$

$$\overline{\sqrt{\Delta P}} = 0.456$$

$$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$$

$$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$$

$$Vs = 34.84 \text{ ft/s}$$

$$As = 1.23 \text{ ft}^2$$

$$Qs = Vs \times As \times 60 \text{ s/m}$$

$$Qs = \quad \times \quad \times 60$$

$$Qs = 2571 \text{ acfm}$$

$$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$$

$$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$$

$$Qs_{std} = 1890 \text{ dscfm}$$

[redacted]
[redacted].26
[redacted].15
[redacted].68
[redacted].88
[redacted].70
[redacted].82
[redacted]5.17
[redacted]91 °F

SAMPLE RECOVERY DATA

PLANT LASCO Products Run No. 10-5-8

DATE 5.19.97 Sample Box No. N-5 Job No. 5465.003

SAMPLE LOCATION #10 oven outlet Filter No. —

TRAIN PREPARER R Kolch

SAMPLE RECOVERY PERSON TA/GG

COMMENTS Moisture train

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	573.1	5[illegible].5	9.4
2	DI H_2O	100	589.4	5[illegible].9	1.5
3	Empty	0	494.3	494.3	0
4	Silica Gel	250	774.6	779.3	4.7
5					
6					
TOTAL					15.6

Description of Impinger Contents

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97
Sampling Location: OVEN #10 Clock Time: 1445
Run #: 10-5-3 Operators: DBB/GG
Barometric Pressure, in. Hg: 29.25 Static Pressure, in. H_2O: -.81
Moisture, %: 2.5% Molecular wt., Dry: — Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15" Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A - 1	.12	221
2	.16	224
3	.16	226
4	.19	227
5	.26	224
6	.28	222
B - 1	.20	227
2	.23	230
3	.23	232
4	.20	233
5	.23	228
6	.24	223
	$\overline{\sqrt{\Delta P}}$ = .455	$\overline{T_s}$ = 226

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 29.0

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ 28.72

$\overline{T_s} =$ 226 °F = 686 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 29.19 in. Hg

$\overline{\sqrt{\Delta P}} =$ .455

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{P_s \times M_s}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 34.83 ft/s.

$As =$ 1.23 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 2571 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 1882 dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: NDA
Run #: NDA-5-1
Stack I.D.: 32" x 120"
Pbar: 28.95
Sample Tube #: NDA-5-1A, NDA-5-1B
Operators: SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: VOST #3
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 0902 Finish: 1002 Total: 60
W/B: - D/B: - O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0902	1429.79	1	21	81
0912 10	1432.33	1	21	83
0922 20	1435.12	1	21	71
0932 30	1437.52	1	21	75
0944 40	1440.12	1	21	90
0952 50	1442.69	1	21	92
1002 60	1445.29	1	21	97

$\Delta V = 15.5$
$\overline{T}_{p1} = 84$

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-14-97
Location: NDB
Run #: NDB-5-2
Stack I.D.: 0.5" x 72"
Pbar: 28.8
Sample Tube #: NDB-5-2A, NDB-5-2B
Operators: SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost #3
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1108 Finish: 1208 Total: 60
W/B: – D/B: – O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	T_m
1108	0 1445.42	1	21	93
1118	10 1447.85	1	21	94
1128	20 1450.25	1	21	97
1138	30 1452.59	1	21	99
1148	40 1454.97	1	21	100
1158	50 1457.53	1	21	99
1208	60 1459.99	1	21	98

$\Delta V = 14.57$
$T_m = 97$

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

APPENDIX A.1.7

Condition 6
(includes flows, moistures, and Method 18)

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97
Sampling Location: Main Exhaust Clock Time: 1700
Run #: ME-6-1 Operators: TA/BS
Barometric Pressure, in. Hg: 28.78 Static Pressure, in. H_2O: .02
Moisture, %: 2.2 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 17.5 Side 2: —
Wet Bulb, °F: 73 Dry Bulb, °F: 88

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.25	88
2	.27	88
3	.30	88
4	.30	88
5	.34	88
6	.37	88
7	.37	88
8	.41	88
1	.26	88
2	.30	88
3	.31	88
4	.33	88
5	.32	88
6	.32	88
7	.31	88
8	.28	88
	$\overline{\sqrt{\Delta P}}$ = .5601	$\overline{Ts}$ = 88

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{2.2}{100}) + 18 (\frac{2.2}{100})$

$Ms = 28.60$

$\overline{Ts} = 88$ °F = 548 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.75) + \frac{.02}{13.6}$

$Ps = 28.78$ in. Hg

$\overline{\sqrt{\Delta P}} = .5601$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5601) \times \sqrt{\frac{548}{28.78 \times 28.60}}$

$Vs = 38.68$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 38.68 \times 1.67 \times 60$

$Qs = 3{,}876$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 3{,}876 \times 17.647 \times \frac{28.78}{548} \times (1 - \frac{2.2}{100})$

$Qs_{std} = 3{,}513$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main ~~[illegible]~~ Exhaust Fan

Site: MAIN Exhaust Operators: TH Run #: ME-6-1 Date: 5-19-97

Barometric Pressure, in. Hg = Pbar = 28.79 in. Hg

Static Pressure, in. H_2O = Pg = .02 in. H_2O

Absolute Pressure of Stack = $Pbar \mp \frac{Pg}{13.6}$ Ps = 28.78 in. Hg

Wet-Bulb Temperature, °F = Tw = 73 °F

Dry-Bulb Temperature, °F = Td = 88 °F

Temperature Difference, Td - Tw = ΔT = 15 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .8183 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.8183) - \frac{(28.78 - .8183) \times (15)}{2800 - (1.3 \times 73)} = .6322 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.6322)}{(28.78)} = 2.2$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7646	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-23-97
Location: Main Exhaust
Run #: MES 11-2 SPIKE
Stack I.D.: 17.5
Pbar: 29.48
Sample Tube #: MES-11-2A, MES-11-2B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: VOST #1
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1039 Finish: 1059 Total: 20
W/B: — D/B: — O_2: 021 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1039 0	7760.25	1	150cc	68
1049 10	7761.49	1	150cc	71
1059 20	7762.87	1	160cc	74
	2.62		AVG	71

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts =$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\quad}$

$Vs =$ ft/s

$As =$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-23-97
Location: ME-11-2 Main Exhaust
Run #: ME-11-2
Stack I.D.: 17.5
Pbar: 29.48
Sample Tube #: ME-11-2A, ME-11-2B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: Vost #2
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1039 Finish: 1059 Total: 20
W/B: 66 D/B: 79 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1039 0	2325.50	1	150cc	71
1049 10	2326.87	1	150cc	75
1059 20	2328.03	1	150cc	78

ΔV = 2.53

$\bar{T}_m$ = 75

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.25	79
2	.30	79
3	.32	79
4	.32	79
5	.35	79
6	.38	79
7	.40	79
8	.42	79
1	.27	79
2	.30	79
3	.31	79
4	.32	79
5	.30	79
6	.31	79
7	.32	79
8	.32	79
	0.5683	79

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{1.7}{100}) + 18 (\frac{1.7}{100})$ $B_{ws} = 1.7\%$

$Ms = 28.66$

$Ts = 79$ °F = 539 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.48) + \frac{.03}{13.6}$

$Ps = 29.48$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.5683$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\frac{\quad}{29.48}}$

$Vs = 38.42$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ ~~3848~~ acfm 3849

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.48}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3652$ dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: Main Exhaust
Run #: MES-6-2 SPIKE
Stack I.D.: 17.5
Pbar: 28.78
Sample Tube #: MES-6-2A, MES-6-2B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: LOST # 1
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1733 Finish: 1743 Total: 10
W/B: 73 D/B: 89 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1733	0	7735.86	1	150 cc	83
1738	5	7736.67	1	150 cc	81
1743	10	7737.38	1	150 cc	82

ΔV = 1.52
T = 82

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

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METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: Main Exhaust
Run #: ME-6-2
Stack I.D.: 17.5
Pbar: 28.78
Sample Tube #: ME-6-2A, ME-6-2B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: VOST 2
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1733 Finish: 1743 Total: 10
W/B: 73 D/B: 89 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1733	0 2308.46	1	150 cc	77
1738	5 2309.44	1	150 "	78
1743	10 2310.28	1	150 cc	78
ΔV = 1.82				
$\bar{T}_m$ = 78				

Hctic = -.03

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	89
2	.26	89
3	.28	89
4	.31	89
5	.33	89
6	.36	89
7	.37	89
8	.40	90
1	.24	89
2	.27	89
3	.29	89
4	.31	89
5	.30	89
6	.31	89
7	.33	89
8	.32	89
	0.5525	89 °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md =$ ~~28.84~~ 29.0

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

Moisture = 2.3%

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ 28.75

$Ts =$ 89 °F = 549 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 28.78 in. Hg

$\overline{\sqrt{\Delta P}} =$ 0.5525

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 38.089 ft/s

$As =$ 1.67 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 3816.5 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 3449 dscfm

JA

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Products Location: Florence, KY

Site: Main Exhaust Operators: TA Run #: ME-6-2 Date: 5/19/97

Barometric Pressure, in. Hg = Pbar = 28.78 in. Hg

Static Pressure, in. H_2O = Pg = -.03 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.78 in. Hg

Wet-Bulb Temperature, °F = Tw = 73 °F

Dry-Bulb Temperature, °F = Td = 89 °F

Temperature Difference, Td - Tw = ΔT = 16 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.8183 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.8183) - \frac{(28.78 - .8183) \times (16)}{2800 - (1.3 \times 73)} = 0.6529 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.6529)}{(28.78)} = 0.023 \text{ or } 2.3\%$$

$\frac{447.4}{2705.1} = 0.1654$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1876	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4856	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

RD

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97
Sampling Location: Main Exhaust Clock Time: 1940
Run #: MB-6-3 Operators: TA/SS
Barometric Pressure, in. Hg: 28.84 Static Pressure, in. H_2O: 03
Moisture, %: 1.9 % Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 17.5 Side 2: —
Wet Bulb, °F: 69 Dry Bulb, °F: 86

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	86
2	.27	86
3	.28	86
4	.29	86
5	.33	86
6	.35	86
7	.37	86
8	.39	86
1	.25	85
2	.27	86
3	.28	86
4	.32	86
5	.33	86
6	.33	86
7	.32	86
8	.31	86
	$\overline{\sqrt{\Delta P}}$ = 0.5532	$\overline{Ts}$ = 86

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.63$

$\overline{Ts} = 86$ °F = 546 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.84) + \frac{0.03}{13.6}$

$Ps = 28.84$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.5532$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\quad}$

$Vs = 38.073$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3815$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3488$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Panel Products Location: Florence, Ky

Site: Main Exhaust Operators: TA/SJ Run #: ME-6-3 Date: 5/15/97

Barometric Pressure, in. Hg = Pbar = 28.84 in. Hg

Static Pressure, in. H_2O = Pg = -.03 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.84 in. Hg

Wet-Bulb Temperature, °F = Tw = 69 °F

Dry-Bulb Temperature, °F = Td = 86 °F

Temperature Difference, Td - Tw = ΔT = 17 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.7144 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.7144) - \frac{(28.84 - .7144) \times (17)}{2800 - (1.3 \times 69)} = 0.5380 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.5380)}{(28.84)} = 0.019 \approx 1.9\%$$

$$\frac{478.1}{2710.3} = 0.1764$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: Room Exhaust
Run #: RE-6-1
Stack I.D.: 28 x 24
Pbar: 28.78
Sample Tube #: RE-6-1A, RE-6-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: Unit # 1
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1606 Finish: 1651 Total: 45
W/B: 71 D/B: 83 O_2: 21 CO_2: 0

		Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1606	0	7729.04	1	150 cc	85
1616	10	7730.72	1	150 cc	84
1626	20	7731.95	1	150 cc	84
1636	30	7733.57	1	150 cc	86
1646	40	7735.03	1	150 cc	87
1651	45	7735.75	1	150 cc	87

ΔV = 6.71
$\bar{T}_m$ = 86

Static = .02

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.05	82
2	.05	82
3	.06	82
4	.06	82
5	.06	82
6	.07	83
1	.08	84
2	.07	84
3	.06	84
4	.05	83
5	.06	83
6	.08	83
1	.10	84
2	.09	83
3	.07	83
4	.05	83
5	.06	83
6	.11	83
1	.10	84
2	.09	84
3	.07	84
4	.06	83
5	.06	83
6	.10	83
	.2649	83

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{2.2}{100}) + 18 (\frac{2.2}{100})$

$Ms = 28.6$

$Ts = .2649\ °F = 543\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (28.78) + \frac{-.02}{13.6}$

$Ps = 28.73$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2649) \times \sqrt{\frac{543}{28.73 \times 28.6}}$

$Vs = 18.23$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 18.23 \times 4.67 \times 60$

$Qs = 5107$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{28.73}{543} \times (1 - \frac{2.2}{100})$

$Qs_{std} = 4663$ dscfm

MM

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: JA Run #: RE-6-1 Date: 5-17-97

Barometric Pressure, in. Hg = Pbar = 28.78 in. Hg

Static Pressure, in. H_2O = Pg = -.62 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.73 in. Hg

Wet-Bulb Temperature, °F = Tw = 71 °F

Dry-Bulb Temperature, °F = Td = 83 °F

Temperature Difference, Td - Tw = ΔT = 12 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .7648 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.7648) - \frac{(28.73 - .7648) \times (12)}{2800 - (1.3 \times 71)} = .6409 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.6409)}{(28.73)} = 2.2$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Products Location: Florence, KY

Site: Room Exhaust Operators: TA Run #: RE-6-2 Date: 5/19/97

Barometric Pressure, in. Hg = Pbar = 28.78 in. Hg

Static Pressure, in. H_2O = Pg = -.62 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.73 in. Hg

Wet-Bulb Temperature, °F = Tw = 71 °F

Dry-Bulb Temperature, °F = Td = 83 °F

Temperature Difference, Td - Tw = ΔT = 12 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.7648 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.7648) - \frac{(28.73 - .7648) \times (12)}{2800 - (1.3 \times 71)} = 0.6414 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.6414)}{(28.73)} = 0.022 \sim 2.2\%$$

$$\frac{335.6}{2707.7} = 0.1234$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97

Sampling Location: Room Exhaust Clock Time: 1755

Run #: RE-6-2 Operators: TA/SS

Barometric Pressure, in. Hg: 28.78 Static Pressure, in. H_2O: -.62

Moisture, %: 2.2 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 26 Side 2: 24

Wet Bulb, °F: 71 Dry Bulb, °F: 83

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.06	83
2	.07	83
3	.06	83
4	.07	83
5	.07	83
6	.08	83
1	.09	83
2	.08	83
3	.07	83
4	.06	83
5	.06	83
6	.10	83
1	.13	83
2	.11	83
3	.07	83
4	.06	83
5	.06	83
6	.12	83
1	.11	83
2	.08	83
3	.06	83
4	.06	83
5	.05	83
6	.10	83
	$\overline{\sqrt{\Delta P}}$ = 0.2773	$\overline{T_s}$ = 83

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.76$

$\overline{T_s} = 83$ °F = 543 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.73$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.2773$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 19.03$ ft/s

$As = 4.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 5331$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4868.0$ dscfm

JAD

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97
Sampling Location: Room Exhaust Clock Time: 1950
Run #: RE-6-3 Operators: TA/SS
Barometric Pressure, in. Hg: 28.84 Static Pressure, in. H_2O: -.64
Moisture, %: 1.9 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 28 Side 2: 24
Wet Bulb, °F: 68 Dry Bulb, °F: 81

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.06	81
2	.07	81
3	.07	81
4	.08	81
5	.09	81
6	.09	81
1	.09	81
2	.10	81
3	.08	81
4	.08	81
5	.08	81
6	.10	81
1	.11	81
2	.10	81
3	.08	81
4	.07	81
5	.06	81
6	.10	81
1	.07	81
2	.05	81
3	.05	81
4	.05	81
5	.06	81
6	.10	81
	$\overline{\sqrt{\Delta P}}$ =	$\overline{Ts}$ = 81

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.80$

$\overline{Ts} = 81$ °F = 541 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.79$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.2788$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 19.06$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 5341$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4920$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Panel Products Location: Florence, Ky

Site: Room Exhaust Operators: TA/SS Run #: RE-6-3 Date: 5/19/97

Barometric Pressure, in. Hg = Pbar = 28.84 in. Hg

Static Pressure, in. H_2O = Pg = -.64 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.79 in. Hg

Wet-Bulb Temperature, °F = Tw = 68 °F

Dry-Bulb Temperature, °F = Td = 81 °F

Temperature Difference, Td - Tw = ΔT = 13 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6903 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.6903) - \frac{(28.79 - .6903) \times (13)}{2800 - (1.3 \times 68)} = 0.5556 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.5556)}{(28.79)} = 0.019 \text{ or } 1.9\%$$

$$\frac{365.3}{2712} = 0.1347$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97
Sampling Location: OWEN #9 Clock Time: 1635
Run #: 9-6-1 Operators: DBS/GG
Barometric Pressure, in. Hg: 29.25 Static Pressure, in. H_2O: -.65
Moisture, %: 2.2 Molecular wt., Dry: 29.0 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15 Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.12	159
2	.13	164
3	.19	165
4	.22	166
5	.24	164
6	.21	163
B-1	.24	164
2	.21	167
3	.22	166
4	.24	167
5	.20	164
6	.21	161
	$\overline{\sqrt{\Delta P}}$ = .448	$\overline{Ts}$ = 164

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.76$

$\overline{Ts} = 164$ °F = 624 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.20$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.448$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 32.68$ ft/s

$As = 1.23$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2412$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1948$ dscfm

RM

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: OWPT # [redacted] 4
Run #: [redacted] 9-6-2
Stack I.D.: 15"
Pbar: 29.20
Sample Tube #: 9-6-2A 9-6-2B
Operators: DBS
Leak Check: Pre: .000 @ 2 Post: ✓

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1733 Finish: 1833 Total: 60
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
1733	0	250 cc/min
1743	0	↓
1753	0	↓
1803	0	↓
1813	0	↓
1823	0	↓
1833	0	↓

1001.46
[redacted]03.8
1006.25
[redacted]08.55
1011.37
[redacted]13.75
1016.29
[redacted]1.83

STATIC -.66 Avg

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
A 1	.11	159
2	.14	163
3	.15	165
4	.23	166
5	.23	164
6	.22	163
B-1	.23	164
2	.22	167
3	.23	165
4	.22	168
5	.21	164
6	.20	160
	$\overline{\sqrt{\Delta P}}$ .447	164 Avg

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

93/93 $Md =$ 29.0

95/94 $Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

95/96 $Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

95/97 $Ms =$ 28.76

95/97 $Ts =$ 164 °F = 624 °R (°F + 460)

96 $Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 29.15 In. Hg

$\overline{\sqrt{\Delta P}} =$ 0.447

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 32.64 ft/s

$As =$ 1.23 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 2409 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 1942 dscfm

Moisture = 2.2%

FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN # 9
Run Number: 9-6-2 Date: 5-19-97
Pretest Leak Rate: .000 cfm @ 10 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DDS/GG
Pbar: 29.20 Ps: -0.66
CO2: — O2: —
Probe Length/Type: 1' SS Pitot #: ST-3
Stack Diameter: 15" As:

Nozzle ID: — Thermocouple #: 4-B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: 000 cfm @ 12 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	1740	357.560										
	10	1750	365.20		1.86					60	94	95	4
	20	1800	373.110		1.86					60	96	96	4
	30	1810	381.30		1.86					59	95	95	4
	40	1820	389.261		1.86					59	100	104	4
				~~VELOCITY~~			~~START Temp~~						
			A										
			B										

ΔVm= 31.701 $\overline{\sqrt{\Delta p}}$= — $\overline{\Delta H}$= 1.86 $\overline{Ts}$= $\overline{Tm}$= 98 °F

Vm std= 28.112 Vwsd= 0.0449 Pw= 0.022 Bws= 0.2 %

558.0

SAMPLE RECOVERY DATA

PLANT LASCO Products Run No. 9-6-2

DATE 5-13-97 Sample Box No. N-6 Job No. 5405.003

SAMPLE LOCATION #9 OVEN OUTLET Filter No. —

TRAIN PREPARER R Kolb

SAMPLE RECOVERY PERSON R Kolb

COMMENTS Moisture train

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	598.1	668.0	69.9
2	DI H_2O	100	663.3	600.1	-63.2
3	Empty	0	456.4	457.0	0.6
4	Silica Gel	250	779.1	785.5	6.4
5					
6					
TOTAL					13.7

✓ RD

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97
Sampling Location: OVEN # 9 Clock Time: 0900
Run #: 9-6-3 Operators: DBS / GG
Barometric Pressure, in. Hg: 29.00 Static Pressure, in. H_2O: -.66
Moisture, %: — Molecular wt., Dry: — Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15" Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.10	155
2	.14	159
3	.18	162
4	.22	163
5	.23	161
6	.22	158
B-1	.18	164
2	.22	165
3	.23	166
4	.22	166
5	.23	165
6	.21	164
	$\sqrt{\Delta P}$ = .442	$\overline{Ts}$ = 162

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 29.0

Moisture = 2.2%

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ 28.76

$\overline{Ts} =$ 162 °F = 622 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 29.15 in. Hg

$\overline{\sqrt{\Delta P}} =$ 0.442

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$Vs =$ 32.22 ft/s

$As =$ 1.23 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 2378 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 1923 dscfm

.11 M

METHOD 18 FIELD DATA SHEET

Plant: CASCO
Date: 5-19-97
Location: Oven 10
Run #: 10-6-1
Stack I.D.: 15
Pbar: 29.20
Sample Tube #: 10-6-1A 10-6-1B
Operators: DBB/C.C.
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1605 Finish: 1658 Total: 53 ← 53 minutes
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
1605	0	850 cc/min
1615	0	
1625	0	
1635	0	
1645	0	
1655	0	
~~1225~~ 1658		

Avg = 93

STATIC = .82

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.11	220
2	.15	221
3	.16	223
4	.20	226
5	.25	228
6	.27	222
B-1	.15	222
2	.21	226
3	.26	228
4	.19	224
5	.22	224
6	.23	227
	$\sqrt{\Delta P}$ .438	225

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

91/91 93/92 93/93 94/93 95/93 95/94

$Md =$ 29.0

Moisture = 2.3%

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms =$ 28.75

$Ts =$ 225 °F = 685 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps =$ 29.14 in. Hg

$\overline{\sqrt{\Delta P}} =$ 0.438

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 33.52 ft/s

$As =$ 1.23 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 2474 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} =$ 1814 dscfm

157.85
[redacted].52
999.98
[redacted]5.5
998.15
[redacted].68
[redacted]1.42
[redacted]3.57

FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN # 10
Run Number: 10-6-1 Date: 5-19-97
Pretest Leak Rate: .001 cfm @ 11 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DBB/CC
Pbar: 29.20 Ps: -0.82
CO2: — O2: —
Probe Length/Type: 1'35 Pitot #: ST-3
Stack Diameter: 15" As:

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.86
Post-Test Leak Rate: .000 cfm @ 10 in. Hg.
Post-Test Leak Check: Pitot: ___ Orsat: ___

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	1606	325.323										
	10	1616	333.26		1.86					60	100	100	3
	20	1626	341.30		1.86					58	97	97	3
	30	1636	349.30		1.86					59	95	97	3
	40	1646	357.425		1.86					60	95	98	3

~~VELOCITY~~ ~~STAC TEMP~~

A-1
2
3
4
5
6
B-

ΔVm= 32.102 √Δp= ___ ΔH= 1.86 Ts= ___ Tm= 97 °F

[redacted] Vmstd=28.823 [redacted] V[redacted]= 0.6919 [redacted] s= [redacted] 02 [redacted] 2.2% [redacted] 557.8 [redacted]

SAMPLE RECOVERY DATA

PLANT Lasco Products Run No. 10-6-1

DATE 5-19-97 Sample Box No. W-5 Job No. 5405.003

SAMPLE LOCATION #10 oven outlet Filter No. —

TRAIN PREPARER R Kolpe

SAMPLE RECOVERY PERSON S Simon

COMMENTS —

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H_2O	100	582.5	590.6	8.1
2	H_2O	100	590.9	591.2	0.3
3	Empty	0	494.3	494.6	0.3
4	6/6	750	779.3	785.3	6.0
5					
6					
TOTAL					14.7

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-19-97

Sampling Location: Oven #10 Clock Time: 1800

Run #: [redacted] 10-6-[redacted] Operators: DB / CG

Barometric Pressure, in. Hg: 29.25 Static Pressure, in. H_2O: -.81

Moisture, %: — Molecular wt., Dry: 29.0 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 15 Side 2: —

Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.13	216
2	.15	215
3	.16	217
4	.19	222
5	.25	222
6	.29	221
B-1	.15	219
2	.21	223
3	.21	225
4	.19	227
5	.21	227
6	.23	226
	$\overline{\sqrt{\Delta P}}$ = .441	$\overline{Ts}$ = 222

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

Moisture average of Run 1 + 3 = 2.1 %

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.77$

$\overline{Ts} = 222$ °F = 682 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.19$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.441$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 33.64$ ft/s

$As = 1.23$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2482$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1835$ dscfm

1 of 2

FIELD DATA SHEET

$\gamma = 0.966$

Plant: LASCO
Sampling Location: OVEN #10
Run Number: 90-6-3 Date: 5-19-97
Pretest Leak Rate: .001 cfm @ 12 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DBS/GC
Pbar: 29.20 Ps: -.81
CO2: — O2: —
Probe Length/Type: 1' SS Pitot #: ST-3
Stack Diameter: 15" As:

Nozzle ID: — Thermocouple #: B-4
Assumed Bws: — Filter #: —
Meter Box #: 14 ~~Y: .966~~ ΔH@: 1.862
Post-Test Leak Rate: .000 cfm @ 10 in. Hg.
Post-Test Leak Check: Pitot: .001 Orsat: 15

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	1937	390.245										
	10	1947	398.20		1.86					60	94	94	9
	20	1957	406.30		1.86					52	93	93	9
	30	2007	413.60		1.86					55	92	94	9
	40	2017	421.460		1.86					56	92	95	9

	VELOCITY	STACK Temp
A-1	.09	217
2	.16	220
3	.16	222
4	.19	225
5	.24	217
6	.27	217
B-1	.16	217
2	.24	225
3	.23	227
4	.20	228
5	.21	228
6	.23	225

Md = 29.0
Ms = 28.79
ρs = 29.14
Vs = 33.65
acfm = 2484
dscfm = 1837

ΔVm = 31.215 $\overline{\sqrt{\Delta p}}$ = .4411 $\overline{\Delta H}$ = 1.86 $\overline{Ts}$ = 222 °F or 682 °R $\overline{Tm}$ = 93 °F or 553 °R

Vmstd = 28.229 Vwstd = 0.5460 Bws = 0.019 or 1.9%

JPD

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 10-6-3

DATE 5-19-97 Sample Box No. N-7 Job No. 5405.003

SAMPLE LOCATION #10 OVEN OUTLET Filter No. NA

TRAIN PREPARER PAUL SIEGEL

SAMPLE RECOVERY PERSON S. Simon

COMMENTS EPA METHOD 4 - MOISTURE TRAIN

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	559.6	565.7	6.1
2	DI H_2O	100	665.7	666.1	0.4
3	Empty	—	512.6	512.6	0
4	SILICA GEL	250	845.1	850.2	5.1
5					
6					
TOTAL					11.6

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 10-6-3 DATE: 5-19-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = 31.215 \ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m} \right)$$

$$V_{m_{std}} = 17.64 \times (31.215) \times (0.966) \times \left(\frac{(29.20) + (1.86 / 13.6)}{(553)} \right)$$

$$V_{m_{std}} = 28.218 \ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (11.6)$$

$$V_{w_{std}} = 0.546 \ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(0.546)}{(0.546) + (28.218)}$$

B_{ws} = 0.019 or 1.9% moisture

JLM

90

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: NDA
Run #: NDA-6-1
Stack I.D.: 32" x 120"
Pbar: 28.84
Sample Tube #: NDA-6-1A, NDA-6-1B
Operators: SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: Vost #3
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1605 Finish: 1705 Total: 60
W/B: — D/B: — O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1605 0	1460.09	1	21	95
1615 10	1462.40	1	21	94
1625 20	1465.06	1	21	95
1635 30	1467.64	1	21	97
1645 40	1470.28	1	21	98
1655 50	1472.77	1	21	100
1705 60	1475.64	1	21	101

$\Delta V = 15.55$
$T_m = 97$

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ In. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-19-97
Location: NDA
Run #: NDA-6-3
Stack I.D.: 32" x 120"
Pbar: 28.94
Sample Tube #: NDA-6-3A, NDA-6-3B
Operators: SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #:
Pump/Rotometer #: 6034 #3
Pt: Pretest (mm Hg):
Post-Test (mm Hg):
Tt: Pretest (°F):
Post-Test (°F):
Time: Start: 1937 Finish: 2017 Total: 40
W/B: ____ D/B: ____ O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1937	0	1475.69	1	88
1947	10	1477.93	1	88
1957	20	1480.15	1	89
2007	30	1482.94	1	92
2017	40	1485.63	1	94
	50			
	60			

[illegible] 994

$\bar{T}_m$ = 90

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

APPENDIX A.1.8

Condition 7
(includes flows, moistures, and Method 18)

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-20-97
Location: Main Exhaust
Run #: ME-7-1
Stack I.D.: 17.5'
Pbar: 28.92
Sample Tube #: ME-7-1A, ME-7-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Post #7
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1449 Finish: 1504 Total: 15
W/B: 68 D/B: 94 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	T_m
1449 0	2310.34	1	150cc	75
1454 5	2311.00	1	150cc	78
1459 10	2311.92	1	150cc	78
1504 15	2312.66	1	150cc	79
Vm = 2.32			Ave	77

Static = .02

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.24	84
2	.28	84
3	.30	84
4	.31	84
5	.36	84
6	.37	84
7	.39	84
8	.41	83
1	.28	84
2	.29	85
3	.32	85
4	.32	85
5	.30	84
6	.33	84
7	.34	84
8	.31	81

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.8}{100}) + 18(\frac{1.8}{100})$

$Ms = 28.64$

$Ts = 84$ °F $= 544$ °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{.02}{13.6}$

$Ps = 28.92$ in. Hg

$\overline{\sqrt{\Delta P}} = .5661$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5661) \times \sqrt{\frac{544}{28.92 \times 28.64}}$

$Vs =$ ~~38.17~~ 38.82 ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 38.17 \times 1.67 \times 60$

$Qs =$ ~~3825~~ 3891 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 3825 \times 17.647 \times \frac{28.92}{544} \times (1 - \frac{1.8}{100})$

$Qs_{std} =$ ~~3524~~ 3585 dscfm

92

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main Exhaust

Site: Main Exhaust Operators: JH Run #: ME-7-1 Date: 5-20-97

Barometric Pressure, in. Hg = Pbar = 28.92 in. Hg

Static Pressure, in. H_2O = Pg = .02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.92 in. Hg

Wet-Bulb Temperature, °F = Tw = 68 °F

Dry-Bulb Temperature, °F = Td = 84 °F

Temperature Difference, Td - Tw = ΔT = 16 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .6903 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.6903) - \frac{(28.92 - .6903) \times (16)}{2800 - (1.3 \times 68)} = .5237 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.5237)}{(28.92)} = 1.8$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-20-97

Sampling Location: Main Exhaust Clock Time: 1721

Run #: ME-7[redacted]-2 Operators: TA/SS

Barometric Pressure, in. Hg: 28.92 Static Pressure, in. H_2O: .02

Moisture, %: 1.5 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 17.5 Side 2: —

Wet Bulb, °F: 65 Dry Bulb, °F: 83

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.22	84
2	.29	84
3	.31	83
4	.33	83
5	.36	83
6	.38	83
7	.40	83
8	.42	83
1	.26	83
2	.28	83
3	.28	83
4	.32	83
5	.31	83
6	.34	83
7	.34	83
8	.31	83
	$\overline{\sqrt{\Delta P}}$ = .5656	$\overline{Ts}$ = 83

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.5}{100}) + 18 (\frac{1.5}{100})$

$Ms = 28.68$

$\overline{Ts} = 83$ °F = 543 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{.02}{13.6}$

$Ps = 28.92$ in. Hg

$\overline{\sqrt{\Delta P}} = .5656$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5656) \times \sqrt{\frac{543}{28.92 \times 28.68}}$

$Vs = 38.73$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 38.73 \times 1.67 \times 60$

$Qs = 3881$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 3881 \times 17.647 \times \frac{28.92}{543} \times (1 - \frac{1.5}{100})$

$Qs_{std} = 3593$ dscfm

JRD

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main Exhaust

Site: Main Exhaust Operators: SS Run #: ME-7-2 Date: 5-20-97

Barometric Pressure, in. Hg = Pbar = 28.92 in. Hg

Static Pressure, in. H_2O = Pg = .02 in. H_2O

Absolute Pressure of Stack = $Pbar + \frac{Pg}{13.6}$ Ps = 28.92 in. Hg

Wet-Bulb Temperature, °F = Tw = ~~83~~ 65 °F

Dry-Bulb Temperature, °F = Td = ~~65~~ 83 °F

Temperature Difference, Td - Tw = ΔT = 18 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .6222 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (.6222) - \frac{(28.92 - .6222) \times (18)}{2800 - (1.3 \times 65)} = .4346$ in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(.4346)}{(28.92)} = 1.5\%$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0698	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3496
50	0.3628	0.3764	0.3908	0.4062	0.4203	0.4358	0.4520	0.4688	0.4858	0.5036
60	0.5218	0.5407	0.5601	0.5802	0.6008	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.990	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.996	3.081	3.169	3.259	3.351
120	3.446	3.545	3.642	3.744	3.848	3.954	4.063	4.174	4.288	4.408
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.886	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.28	15.62	15.96	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	23.00
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-20-97
Location: Main Exhaust
Run #: ME-7-3
Stack I.D.: 17.5
Pbar: 28.92
Sample Tube #: ME-7-3A, ME-7-3B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: Vost #2
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1913 Finish: 1928 Total: 15
W/B: 64 D/B: 83 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1913	0	2312.90	1	150cc 64
18	5	2313.67	1	150cc 65
1923	10	2314.33	1	150cc 67
28	15	2315.10	1	150cc 68

ΔH = 2.3
T_m = 66

Static = .03

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	83
2	.28	83
3	.30	83
4	.32	83
5	.36	83
6	.38	83
7	.40	83
8	.42	83
1	.28	83
2	.28	83
3	.30	83
4	.33	83
5	.32	83
6	.32	83
7	.34	83
8	.32	83

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.4}{100}) + 18(\frac{1.4}{100})$

$Ms = 28.69$

$Ts = 83\ °F = 543\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{.03}{13.6}$

$Ps = 28.92$ in. Hg

$\overline{\sqrt{\Delta P}} = .5675$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5675) \times \sqrt{\frac{543}{28.92 \times 28.69}}$

$Vs = 38.86$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 38.86 \times 1.67 \times 60$

$Qs = 3893$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 3893 \times 17.647 \times \frac{28.92}{543} \times (1 - \frac{1.4}{100})$

$Qs_{std} = 3,408$ dscfm

JLP 94

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main Exhaust

Site: Main Exhaust Operators: [illegible] Run #: MF-7-3 Date: 5-20-97

Barometric Pressure, in. Hg = Pbar = 28.92 in. Hg

Static Pressure, in. H_2O = Pg = .03 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.92 in. Hg

Wet-Bulb Temperature, °F = Tw = 64 °F

Dry-Bulb Temperature, °F = Td = 83 °F

Temperature Difference, Td - Tw = ΔT = 19 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .6009 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.6009) - \frac{(28.92 - .6009) \times (19)}{2800 - (1.3 \times 64)} = .4028 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.4028)}{(28.92)} = 1.4\%$$

JAD

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1876	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4856	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-20-97
Location: Room Exhaust
Run #: RE-7-1
Stack I.D.: 28" x 24"
Pbar: 28.92
Sample Tube #: RE-7-1A RE-7-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost # 1
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1449 Finish: 1519 Total: 30
W/B: 59 D/B: 77 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1449 0	7737.46	1	150cc	71
1459 10	7738.97	1	150cc	71
1509 20	7740.27	1	150cc	71
1519 30	7741.65	1	150cc	72
Vm	= 4.19		Avg =	71

Static -.65

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
1	.06	76
2	.06	77
3	.07	77
4	.07	77
5	.07	77
6	.08	77
1	.11	77
2	.09	77
3	.06	77
4	.05	77
5	.05	77
6	.04	77
1	.11	77
2	.08	77
3	.06	77
4	.05	77
5	.06	77
6	.12	77
1	.06	77
2	.07	77
3	.05	77
4	.05	77
5	.07	77
6	.11	77
	.2674	77

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{11}{100}) + 18 (\frac{11}{100})$

$Ms = 28.88$

$Ts = 77\ °F = 537\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{-.65}{13.6}$

$Ps = 28.87$ In. Hg

$\overline{\sqrt{\Delta P}} = .2674$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2674) \times \sqrt{\frac{537}{28.87 \cdot 28.88}}$

$Vs = 18.16$ ft/s

$As = 4.67\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = 18.16 \times 4.67 \times 60$

$Qs = 5085$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 5085 \times 17.647 \times \frac{28.87}{537} \times (1 - \frac{11}{100})$

$Qs_{std} = 4772$ dscfm

✓ AP

QC

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: Lasco Location: Room Exhaust

Site: Room Exhaust Operators: SS/TA Run #: RE-7-1 Date: 5/2/97

Barometric Pressure, in. Hg = Pbar = 28.92 in. Hg

Static Pressure, in. H_2O = Pg = -.65 in. H_2O

Absolute Pressure of Stack = $Pbar - \frac{Pg}{13.6}$ Ps = 28.87 in. Hg

Wet-Bulb Temperature, °F = Tw = 59 °F

Dry-Bulb Temperature, °F = Td = 77 °F

Temperature Difference, Td - Tw = ΔT = 18 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .5035 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (.5035) - \frac{(28.87 - .5035) \times (18)}{2800 - (1.3 \times 59)} = .316$ in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(.316)}{(28.87)} = 1.1\%$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6008	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.876
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.996	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.886	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	23.00
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-20-97
Sampling Location: Room Exhaust Clock Time: 1710
Run #: RE-7-2 Operators: TA/SS
Barometric Pressure, in. Hg: 28.92 Static Pressure, in. H_2O: -.63
Moisture, %: 0.8 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 28 Side 2: 24
Wet Bulb, °F: 56 Dry Bulb, °F: 77

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.06	76
2	.08	76
3	.07	76
4	.07	76
5	.07	76
6	.08	76
1	.11	77
2	.09	77
3	.07	77
4	.05	77
5	.05	77
6	.10	77
1	.11	77
2	.11	77
3	.07	77
4	.06	77
5	.06	77
6	.11	77
1	.11	77
2	.08	77
3	.06	77
4	.05	77
5	.06	77
6	.10	77
	$\overline{\sqrt{\Delta P}}$ = .2774	$\overline{Ts}$ = 77

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{.8}{100}) + 18 (\frac{.8}{100})$

$Ms =$ ~~28.83~~ 28.75

$\overline{Ts} = 77$ °F = 537 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{-.63}{13.6}$

$Ps = 28.87$ in. Hg

$\overline{\sqrt{\Delta P}} = .2774$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2774) \times \sqrt{\frac{537}{28.87 \times 28.83}}$

$Vs = 18.88$ ft/s

$As = 4.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = 18.88 \times 4.67 \times 60$

$Qs =$ ~~5284~~ acfm 5291

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 5284 \times 17.647 \times \frac{28.87}{537} \times (1 - \frac{.08}{100})$

$Qs_{std} =$ ~~5,009~~ 4979 dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: [illegible] Run #: RE-7-2 Date: 5-20-97

Barometric Pressure, in. Hg = Pbar = 29.92 in. Hg

Static Pressure, in. H_2O = Pg = -.03 in. H_2O

Absolute Pressure of Stack = $P_{bar} - \frac{P_g}{13.6}$ Ps = 28.87 in. Hg

Wet-Bulb Temperature, °F = Tw = ~~101~~ 56 °F

Dry-Bulb Temperature, °F = Td = ~~86~~ 77 °F

Temperature Difference, Td - Tw = ΔT = 21 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .4520 in. Hg

$$\text{Vapor Pressure of } H_2O = P_{va} = (P_{vw}) - \frac{(P_s - P_{vw}) \times (\Delta T)}{2800 - (1.3 \times T_w)}$$

$$P_{va} = (.4520) - \frac{(28.87 - .4520) \times (21)}{2800 - (1.3 \times 56)} = .2332 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$B_{ws} = \frac{(P_{va})}{(P_s)} = \frac{(.2332)}{(28.87)} = \text{~~0.08~~ } 0.008 \simeq 0.8\%$$

BR

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0698	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1246	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2578	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3495
50	0.3628	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.996	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.288	4.403
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.886	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.95
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	23.00
200	23.47	23.96	24.46	24.97	25.49	26.02	26.55	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-20-97
Sampling Location: Room Exhaust Clock Time: 1945
Run #: RE-7-3 Operators: TA/SS
Barometric Pressure, in. Hg: 28.92 Static Pressure, in. H_2O: -.63
Moisture, %: 1.0 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 28" Side 2: 24"
Wet Bulb, °F: 58 Dry Bulb, °F: 77

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.06	77
2	.07	77
3	.06	77
4	.06	77
5	.07	76
6	.08	76
1	.09	77
2	.08	77
3	.06	77
4	.05	77
5	.05	77
6	.10	76
1	.12	76
2	.08	76
3	.06	76
4	.05	76
5	.05	76
6	.10	76
1	.10	76
2	.07	77
3	.05	77
4	.05	77
5	.06	77
6	.10	77
	$\overline{\sqrt{\Delta P}}$ = .2652	$\overline{T_s}$ = 77

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$

$$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$$

$$Md = 28.84$$

$$Ms = Md \times \left(1 - \frac{\%H_2O}{100}\right) + 18\left(\frac{\%H_2O}{100}\right)$$

$$Ms = (28.84) \times \left(1 - \frac{1.0}{100}\right) + 18\left(\frac{1.0}{100}\right)$$

$$Ms = 28.73$$

$$\overline{T_s} = 77\ °F = 537\ °R\ (°F + 460)$$

$$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{-.63}{13.6}$$

$$Ps = 28.87 \text{ in. Hg}$$

$$\overline{\sqrt{\Delta P}} = .2652$$

$$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$$

$$Vs = 85.49 \times (.99) \times (.2652) \times \sqrt{\frac{537}{28.87 \times 28.73}}$$

$$Vs = 18.06 \text{ ft/s}$$

$$As = 4.67 \text{ ft}^2$$

$$Qs = Vs \times As \times 60 \text{ s/m}$$

$$Qs = 18.06 \times 4.67 \times 60$$

$$Qs = 5060 \text{ acfm}$$

$$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times \left(1 - \frac{\%H_2O}{100}\right)$$

$$Qs_{std} = 5060 \times 17.647 \times \frac{28.87}{537} \times \left(1 - \frac{1.0}{100}\right)$$

$$Qs_{std} = 4753 \text{ dscfm}$$

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: TA Run #: RE-1-3 Date: 5-20-97

Barometric Pressure, in. Hg = Pbar = 28.92 in. Hg

Static Pressure, in. H_2O = Pg = -.13 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 28.87 in. Hg

Wet-Bulb Temperature, °F = Tw = 58 °F

Dry-Bulb Temperature, °F = Td = 77 °F

Temperature Difference, Td - Tw = ΔT = 19 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = ~~.7352~~ .4458 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\ \overset{.4458}{\cancel{.9352}}\ ) - \frac{(\ 28.87 - \overset{.4458}{\cancel{.9352}}\ ) \times (\ 19\ )}{2800 - (1.3 \times 58\ )} = \overset{.2879}{\cancel{.7404}} \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\ \overset{.2879}{\cancel{.7404}}\ )}{(\ 28.87\ )} = \cancel{.26}\ 1.0$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-20-97
Location: OVEN #9
Run #: 9-7-1
Stack I.D.: 15"
Pbar: 28.92
Sample Tube #: 9-7-1A 9-7-1B
Operators: MS/GG
Leak Check: Pre: .000 @1 Post: .000 @2

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1449 Finish: 1549 Total: 60
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
1449	0	250 cc/min
1504	0	
1519	0	
1534	0	
1549	0	

16:32
[redacted] .03
23.40
[redacted] 26.96
28.13
[redacted] 81

92/91
92/91
92/91
92/92
92/92
Avg. 92

STATIC -.65

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.09	163
2	.13	165
3	.18	166
4	.23	166
5	.24	165
6	.23	162
B-1	.13	163
2	.22	164
3	.23	165
4	.23	166
5	.22	164
6	.21	163
	$\overline{\sqrt{\Delta P}}$ = .437	164

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

Moisture = 1.2%

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.87$

$Ts = 164$ °F = 624 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 28.87$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.437$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 32.00$ ft/s

$As = 1.23$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2362$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1905$ dscfm

MLD.

FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN # 9
Run Number: 9-7-1 Date: 5-20-97
Pretest Leak Rate: .000 cfm @ 12 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DJS/BG
Pbar: 28.92 Ps: — 0.08
CO2: — O2: —
Probe Length/Type: 1'SS Pitot #: ST-3
Stack Diameter: 15 As: 1.23 ft²

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: .000 cfm @ 15 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in°F)	Outlet (Tm out°F)	
	0	1450	421.645										
	10	1500	429.50		1.86					60	91	91	5
	20	1510	437.45		1.86					51	89	89	4
	30	1520	445.35		1.86					56	88	85	4
	40	1530	453.245		1.86					57	85	80	4

ΔVm= 31.550 $\overline{\sqrt{\Delta p}}$= — $\overline{\Delta H}$= 1.86 $\overline{T_s}$= — $\overline{T_m}$= 89 °F

Vm std= 28.466 Vw std= 0.3577 Bws= .012 1.2 %

549 °R

VRD

SAMPLE RECOVERY DATA

PLANT LASCO Products Run No. 9-7-1

DATE 5-20-97 Sample Box No. N-6 Job No. 5405.003

SAMPLE LOCATION Oven #9 OUTLET Filter No. —

TRAIN PREPARER R Kolb

SAMPLE RECOVERY PERSON JA

COMMENTS Moisture train

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	668.0	670.3	2.3
2	DI H_2O	100	600.1	600.6	0.5
3	Empty	0	457.0	456.8	-0.2
4	Silicabel	250	711.5	716.5	5.0
5					
6					
TOTAL					7.6

3577 VIC 99

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: Lasco SOURCE/RUN #: 9-7-1 DATE: 5/20/97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \_\_\_\_\_ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m} \right)$$

$$V_{m_{std}} = 17.64 \times (31.550) \times (.966) \times \left(\frac{(28.72) + (1.86 / 13.6)}{(549)} \right)$$

$$V_{m_{std}} = \underline{28.450} \text{ dscf}$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (7.6)$$

$$V_{w_{std}} = \underline{.358} \text{ scf}$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.358)}{(.358) + (28.450)}$$

$$B_{ws} = \underline{1.2\%}$$

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO
Date: 5-20-97
Sampling Location: OVEN #9
Clock Time: 1800
Run #: 97-2
Operators: DBS / GG
Barometric Pressure, in. Hg: 28.92
Static Pressure, in. H_2O: -.68
Moisture, %: —
Molecular wt., Dry: —
Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15"
Side 2: —
Wet Bulb, °F: —
Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.11	166
2	.19	167
3	.17	169
4	.22	170
5	.24	162
6	.23	163
B-1	.17	167
2	.20	169
3	.22	170
4	.22	171
5	.22	170
6	.21	168
	$\overline{\sqrt{\Delta P}}$ = .4375	$\overline{T_s}$ = 168

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.6}{100}) + 18 (\frac{1.6}{100})$

$Ms = 28.67$

$\overline{T_s} = 168$ °F = 628 °R (°F + 460)

$P_s = P_b + \frac{S.P.}{13.6} = (28.92) + \frac{-.68}{13.6}$

$P_s = 28.87$ in. Hg

$\overline{\sqrt{\Delta P}} = .4378$

$V_s = 85.49 \times C_p \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{P_s \times M_s}}$

$V_s = 85.49 \times (.99) \times (.4378) \times \sqrt{\frac{628}{28.87 \times 28.67}}$

$V_s = 32.27$ ft/s

$A_s = 1.23$ ft²

$Q_s = V_s \times A_s \times 60$ s/m

$Q_s = 32.27 \times 1.23 \times 60$

$Q_s = 2376$ acfm

$Q_{s_{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{\%H_2O}{100})$

$Q_{s_{std}} = 2376 \times 17.647 \times \frac{28.87}{628} \times (1 - \frac{1.6}{100})$

$Q_{s_{std}} = 1898$ dscfm

100

JM

FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN #9
Run Number: 9-7-3 Date: 5-20-97
Pretest Leak Rate: .000 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DGB/CG
Pbar: 28.92 Ps: -.607
CO2: — O2: —
Probe Length/Type: 1'SS Pitot #: ST-3
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: .002 cfm @ 15 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	00	1911	485.642										
	10	1921	493.578		1.86					60	88	88	3
	20	1931	501.413		1.86					49	88	88	3
	30	1941	509.475		1.86					53	87	89	3
	40	1951	517.357		1.86					54	87	90	3
				VELOCITY		STACK Temp							
			A-1	.09		167		V_s =	32.56				
			2	.13		169							
			3	.17		171		ACFM =	2397				
			4	.23		171							
			5	.24		170		DSCFM =	1905				
			6	.23		169							
			B-1	.16		167							
			2	.22		170							
			3	.24		171							
			4	.20		171							
			5	.23		169							
			6	.21		169							
				$\overline{\sqrt{\Delta p}}$ = 0.4406		$\overline{T_s}$ = 169							

ΔVm= 31.615 $\overline{\sqrt{\Delta p}}$= .441 $\overline{\Delta H}$= 1.86 $\overline{T_s}$= 169 = 629 R $\overline{T_m}$= 88

[redacted]

SAMPLE RECOVERY DATA

PLANT Laseco Products Run No. 9-7-3

DATE 5-20-97 Sample Box No. N-5 Job No. 5405.003

SAMPLE LOCATION #9 oven outlet Filter No. –

TRAIN PREPARER S.S. mon

SAMPLE RECOVERY PERSON

COMMENTS Moisture Train - M4

FRONT HALF

Acetone Container No. Liquid Level Marked Sealed

Filter Container No. Sealed

Description of Filter

Samples Stored and Locked

BACK HALF/MOISTURE

Container No.

Liquid Level Marked Sealed

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	590.6	598.1	7.5
2	DI H_2O	100	591.2	589.5	-1.7
3	Empty	–	494.6	495.1	0.5
4	Silica Gel	250	785.3	790.6	5.3
5					
6					
TOTAL					11.6

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EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: Lasco SOURCE/RUN #: 9-7-3 DATE: 5/20/97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \_\_\_\_\_ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m} \right)$$

$$V_{m_{std}} = 17.64 \times (31.615) \times (.966) \times \left(\frac{(28.92) + (1.86 / 13.6)}{(548)} \right)$$

$$V_{m_{std}} = 28.565 \text{ dscf}$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (11.6)$$

$$V_{w_{std}} = .546 \text{ scf}$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.546)}{(.546) + (28.565)}$$

$$B_{ws} = 1.9\%$$

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-20-97
Sampling Location: OVEN #10 Clock Time: 1545
Run #: 10-2-1 Operators: DB/GG
Barometric Pressure, in. Hg: 28.92 Static Pressure, in. H_2O: -.81
Moisture, %: — Molecular wt., Dry: — Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15" Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.12	225
2	.12	227
3	.12	228
4	.14	227
5	.15	226
6	.18	225
B-1	.21	225
2	.24	231
3	.23	233
4	.20	235
5	.22	233
6	.24	230
	$\overline{\sqrt{\Delta P}}$ = .421	$\overline{Ts}$ = 229

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.3}{100}) + 18 (\frac{1.3}{100})$

$Ms = 28.70$

$\overline{Ts} = 229$ °F = 689 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{-.81}{13.6}$

$Ps = 28.86$ in. Hg

$\overline{\sqrt{\Delta P}} = .421$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.421) \times \sqrt{\frac{689}{28.86 \times 28.70}}$

$Vs = 32.50$ ft/s

$As = 1.23$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 32.50 \times 1.23 \times 60$

$Qs = 2393$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 2393 \times 17.647 \times \frac{28.86}{689} \times (1 - \frac{1.3}{100})$

$Qs_{std} = 1746$ dscfm

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METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-20-97
Location: OVEN #10
Run #: 10-7-2
Stack I.D.: 15"
Pbar: 28.92
Sample Tube #: 10-7-2A 10-7-2B
Operators: DB CG
Leak Check: Pre: .000 @ 2 Post: .000 @ 1

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1703 Finish: 1803 Total: 60
W/B: — D/B: — O_2: — CO_2: —

	Time	Gauge Vacuum (Hg)	Flow Setting
28.95	1703	0	250 cc/min 87/87
30.60	1713	0	88/87
33.19	1723	0	89/88
35.73	1733	0	90/89
38.43	1743	0	92/91
41.10	1753	0	92/91
43.62	1803	0	92/91

15.47

STATIC = .81

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.10	221
2	.13	221
3	.16	225
4	.22	224
5	.25	226
6	.27	224
B-1	.16	230
2	.22	235
3	.21	237
4	.19	238
5	.20	238
6	.24	233
	$\overline{\sqrt{\Delta P}}$ = .441	229

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$

$$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$$

$$Md = 28.84$$

$$Ms = Md \times \left(1 - \frac{\%H_2O}{100}\right) + 18\left(\frac{\%H_2O}{100}\right)$$

$$Ms = (28.84) \times \left(1 - \frac{1.3}{100}\right) + 18\left(\frac{1.3}{100}\right)$$

$$Ms = 28.70$$

$$Ts = 229\ °F = 689\ °R\ (°F + 460)$$

$$Ps = Pb + \frac{S.P.}{13.6} = (28.92) + \frac{-.81}{13.6}$$

$$Ps = 28.86 \text{ in. Hg}$$

$$\overline{\sqrt{\Delta P}} = .441$$

$$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$$

$$Vs = 85.49 \times (.99) \times (.441) \times \sqrt{\frac{689}{28.86 \cdot 28.70}}$$

$$Vs = 34.04 \text{ ft/s}$$

$$As = 1.23 \text{ ft}^2$$

$$Qs = Vs \times As \times 60 \text{ s/m}$$

$$Qs = 34.04 \times 1.23 \times 60$$

$$Qs = 2507 \text{ acfm}$$

$$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times \left(1 - \frac{\%H_2O}{100}\right)$$

$$Qs_{std} = 2507 \times 17.647 \times \frac{28.86}{689} \times \left(1 - \frac{1.3}{100}\right)$$

$$Qs_{std} = 1829 \text{ dscfm}$$

ICM

FIELD DATA SHEET

Plant: LASCO
Sampling Location: BURN #10
Run Number: 10-7-2 Date:
Pretest Leak Rate: .000 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DOB/GG
Pbar: 28.92 Ps: -0.81
CO2: — O2: —
Probe Length/Type: 1' SS Pitot #: ST-3
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: .002 cfm @ 10 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	00	1704	453.420										
	10	1714	461.50		1.86					60	90	90	4
	20	1724	469.60		1.86					52	90	90	4
	30	1734	477.75		1.86					54	89	91	4
	40	1744	485.300		1.86					55	91	96	4

ΔVm= 31.880 $\overline{\sqrt{\Delta p}}$= — $\overline{\Delta H}$= 1.86 $\overline{Ts}$= — $\overline{Tm}$= 91 °F

Vmstd= 28.648 Vwstd= 391 Bws= 1.3% 551°R

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SAMPLE RECOVERY DATA

PLANT Lasco Products Run No. 10-7-2

DATE 5-20-97 Sample Box No. N-1 Job No. 5405.003

SAMPLE LOCATION #10 oven outlet Filter No. NA

TRAIN PREPARER S. Simon

SAMPLE RECOVERY PERSON T. Abernathy

COMMENTS Moisture train

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	636.8	638.9	2.1
2	DI H_2O	100	600.1	600.6	0.5
3	Empty	–	499.3	499.7	0.4
4	Silica Gel	250	751.1	756.4	5.3
5					
6					
TOTAL					8.3

VAI

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: Lasco SOURCE/RUN #: 10-7-2 DATE: 5/20/97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \_\_\_\_\_ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m} \right)$$

$$V_{m_{std}} = 17.64 \times (31.880) \times (.966) \times \left(\frac{(28.92) + (1.86 / 13.6)}{(551)} \right)$$

$$V_{m_{std}} = 28.648 \text{ dscf}$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (8.3)$$

$$V_{w_{std}} = .391 \text{ scf}$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.391)}{(.391) + (28.648)}$$

$$B_{ws} = 1.3$$

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GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO
Date: 5-20-97
Sampling Location: OVEN #10
Clock Time: 2000
Run #: 10-7-3
Operators: DB/CG
Barometric Pressure, in. Hg: 28.92
Static Pressure, in. H_2O: -.81
Moisture, %: —
Molecular wt., Dry: —
Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15"
Side 2: —
Wet Bulb, °F: —
Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.10	227
2	.15	230
3	.16	232
4	.19	234
5	.25	238
6	.28	237
B-1	.20	231
2	.21	235
3	.21	236
4	.19	235
5	.21	234
6	.24	230
	$\overline{\sqrt{\Delta P}}$ = .443	$\overline{T_s}$ = 232

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$

$$M_d = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$$

$$M_d = 28.84$$

$$M_s = M_d \times \left(1 - \frac{\%H_2O}{100}\right) + 18\left(\frac{\%H_2O}{100}\right)$$

$$M_s = (28.84) \times \left(1 - \frac{1.3}{100}\right) + 18\left(\frac{1.3}{100}\right)$$

$$M_s = 28.70$$

$$\overline{T_s} = 232\ °F = 692\ °R\ (°F + 460)$$

$$P_s = P_b + \frac{S.P.}{13.6} = (28.92) + \frac{-.81}{13.6}$$

$$P_s = 28.86 \text{ in. Hg}$$

$$\overline{\sqrt{\Delta P}} = .443$$

$$V_s = 85.49 \times C_p \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s\,(°R)}{P_s \times M_s}}$$

$$V_s = 85.49 \times (.99) \times (.443) \times \sqrt{\frac{692}{28.86 \cdot 28.70}}$$

$$V_s = 34.27 \text{ ft/s}$$

$$A_s = 1.23 \text{ ft}^2$$

$$Q_s = V_s \times A_s \times 60 \text{ s/m}$$

$$Q_s = 34.27 \times 1.23 \times 60$$

$$Q_s = 2523 \text{ acfm}$$

$$Q_{s_{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times \left(1 - \frac{\%H_2O}{100}\right)$$

$$Q_{s_{std}} = 2523 \times 17.647 \times \frac{28.86}{692} \times \left(1 - \frac{1.3}{100}\right)$$

$$Q_{s_{std}} = 1833 \text{ dscfm}$$

11.5

METHOD 18 FIELD DATA SHEET

Plant: LASLO
Date: 5-20-97
Location: NDA
Run #: NDA-7-1
Stack I.D.: 32" x 120"
Pbar: 28.92
Sample Tube #: NDA-7-1A, NDA-7-1B
Operators: [redacted]-SS
Leak Check: Pre: ✓ Post: –

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost #3
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1450 Finish: 1550 Total: 60
W/B: – D/B: – O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1450 0	1485.67	1	21	83
[redacted] 1500 10	1488.20	1	21	84
1510 20	1490.72	1	21	86
1520 30	1493.3	1	21	88
1530 40	1495.78	1	21	90
1540 50	1498.25	1	21	91
1550 60	1500.69	1	21	93

ΔV: 15.02
T_m = 88

[redacted]

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-20-97
Location: NDB
Run #: NDB-7-2
Stack I.D.: 0.5" x 72"
Pbar: 28.92
Sample Tube #: NDB-7-2A, NDB-7-2B
Operators: SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: Jost #3
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1703 Finish: 1803 Total: 60
W/B: — D/B: — O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1703 0	1500.77	1	21	86
1713 10	1503.27	1	21	86
1723 20	1505.83	1	21	88
33 30	1508.39	1	21	90
1743 40	1511.80	1	21	92
1753 50	1513.29	1	21	93
1803 60	1515.80	1	21	95

$\Delta V = 15.03$

$\overline{T_m} = 90$

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

APPENDIX A.1.9

Condition 8
(includes flows, moistures, and Method 18)

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-22-97
Location: Main Exhaust
Run #: ME-8-1
Stack I.D.: 17.5
Pbar: 29.50
Sample Tube #: ME-8-1A, ME-8-1B
Operators: TA
Leak Check: Pre: ✓ Post:

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: vost #2
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 0758 Finish: 0813 Total: 15
W/B: 59 D/B: 74 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0758	0	2315.23	1	150cc 46
0803	5	2316.35	1	150cc 48
0808	10	2317.55	1	150cc 49
0813	15	2318.43	1	150cc 52
		V_m = 3.2 ℓ/n		~ 49°F

Slic = .02

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.27	73
2	.31	73
3	.33	74
4	.33	74
5	.34	74
6	.37	74
7	.39	74
8	.43	74
1	.28	73
2	.30	74
3	.32	74
4	.33	74
5	.32	74
6	.32	74
7	.33	74
8	.32	74
$\overline{\sqrt{\Delta P}}$ =	0.5741	T_s = 74°F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.2}{100}) + 18 (\frac{1.2}{100})$

$Ms = 28.71$

$Ts = 74\ °F = 534\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (29.5) + \frac{.02}{13.6}$

$Ps = 29.5$ in. Hg

$\overline{\sqrt{\Delta P}} = .5741$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5741) \times \sqrt{\frac{534}{29.5 \times 28.71}}$

$Vs = 38.58$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 38.58 \times 1.67 \times 60$

$Qs = 3866$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 3866 \times 17.647 \times \frac{29.5}{534} \times (1 - \frac{1.2}{100})$

$Qs_{std} = 3724$ dscfm

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WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: MAIN ~~Room~~ Exhaust

Site: MAIN EXHAUST Operators: TH Run #: ME-8-1 Date: 5-22-97

Barometric Pressure, in. Hg = Pbar = 29.5 in. Hg

Static Pressure, in. H_2O = Pg = .02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.5 in. Hg

Wet-Bulb Temperature, °F = Tw = 59 °F

Dry-Bulb Temperature, °F = Td = 74 °F

Temperature Difference, Td - Tw = ΔT = 15 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .5035 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.5035) - \frac{(29.5 - .5035) \times (15)}{2800 - (1.3 \times 59)} = .3438 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.3438)}{(29.5)} = 1.2\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

✓ 55

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-22-97
Sampling Location: Main Exhaust Clock Time: 0945
Run #: ME-8-2 Operators: TM/SS
Barometric Pressure, in. Hg: 29.5 Static Pressure, in. H_2O: .02
Moisture, %: 1.5 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 17.5 Side 2: —
Wet Bulb, °F: 63 Dry Bulb, °F: 77

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.24	77
2	.31	77
3	.32	77
4	.31	77
5	.36	77
6	.38	77
7	.40	77
8	.44	77
1	.28	77
2	.30	77
3	.32	77
4	.32	77
5	.30	77
6	.31	77
7	.33	77
8	.31	77
	$\overline{\sqrt{\Delta P}}$ = ~~.6444~~ .5703	$\overline{Ts}$ = 77

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.5}{100}) + 18 (\frac{1.5}{100})$

$Ms = 28.68$

$\overline{Ts} = 77$ °F = 537 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.5) + \frac{.02}{13.6}$

$Ps = 29.5$ in. Hg

$\overline{\sqrt{\Delta P}} = \cancel{.6444}$ SS .5703

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\cancel{.6444}$ SS $.5703) \times \sqrt{\frac{537}{29.5 \times 28.68}}$

$Vs = \cancel{43.45}$ SS ft/s 38.45

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \cancel{43.45}$ 38.45 $\times 1.67 \times 60$

$Qs = \cancel{4354}$ acfm 3853

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \cancel{4354}$ 3853 $\times 17.647 \times \frac{29.5}{537} \times (1 - \frac{1.5}{100})$

$Qs_{std} = \cancel{4157}$ dscfm

3679

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WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: ME-8-2 Main Exhaust

Site: Main Exhaust Operators: TA Run #: ME-8-2 Date: 5-22-97

Barometric Pressure, in. Hg = Pbar = 29.5 in. Hg

Static Pressure, in. H_2O = Pg = .02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.5 in. Hg

Wet-Bulb Temperature, °F = Tw = ~~27~~ 63 °F

Dry-Bulb Temperature, °F = Td = 77 °F

Temperature Difference, Td - Tw = ΔT = 14 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .5802 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.5802) - \frac{(29.5 - .5802) \times (14)}{2800 - (1.3 \times 63)} = .4312 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.4312)}{(29.5)} = 1.5$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-22-97
Sampling Location: Main Exhaust Clock Time: 1203
Run #: MF 8-3 Operators: TA/SS
Barometric Pressure, in. Hg: 29.5 Static Pressure, in. H_2O: .03
Moisture, %: 1.5 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 17.5 Side 2: —
Wet Bulb, °F: 63 Dry Bulb, °F: 80

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	83
2	.31	80
3	.33	80
4	.33	80
5	.36	80
6	.38	80
7	.41	80
8	.42	80
1	.26	80
2	.28	80
3	.28	80
4	.32	80
5	.30	80
6	.33	80
7	.34	80
8	.33	80
	$\overline{\sqrt{\Delta P}}$ = .5690	$\overline{Ts}$ = 80

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.5}{100}) + 18 (\frac{1.5}{100})$

$Ms = 28.68$

$\overline{Ts} = 80$ °F = 540 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.5) + \frac{.03}{13.6}$

$Ps = 29.5$ in. Hg

$\overline{\sqrt{\Delta P}} = .5690$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5690) \times \sqrt{\frac{540}{29.5 \times 28.68}}$

$Vs = 38.47$ ft/s

$As = 1.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = 38.47 \times 1.67 \times 60$

$Qs = 3855$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 3855 \times 17.647 \times \frac{29.5}{540} \times (1 - \frac{1.5}{100})$

$Qs_{std} = 3661$ dscfm

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WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main Exhaust

Site: Main Exhaust Operators: [illegible] Run #: ME-[illegible]-3 Date: [illegible]-22-97

Barometric Pressure, in. Hg = Pbar = 29.5 in. Hg

Static Pressure, in. H_2O = Pg = .63 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.5 in. Hg

Wet-Bulb Temperature, °F = Tw = 63 °F

Dry-Bulb Temperature, °F = Td = 80 °F

Temperature Difference, Td - Tw = ΔT = 13 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .5802 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.5802) - \frac{(29.5 - .5802) \times (13)}{2800 - (1.3 \times 63)} = .4419 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.4419)}{(29.5)} = 1.5$$

JPD

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: CASCO
Date: 5-22-97
Location: Room Exhaust
Run #: RE-8-1
Stack I.D.: ~~3'~~ 28" x 20"
Pbar: 29.5
Sample Tube #: RE-8-1A, RE-8-1B
Operators: TH
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: Cost #1
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 0758 Finish: 0835 Total: 30
W/B: 56 D/B: 79 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0758 0	7741.94	1	150cc	45
0805 10	7743.82	1	150cc	48
0815 20	7744.95	1	150cc	51
0828 30	7746.40	1	150cc	53
	V_m: 4.46 ft³		$\bar{x}$	49

Static = -.62

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.08	71
2	.07	71
3	.07	71
4	.07	71
5	.08	71
6	.08	71
1	.12	71
2	.09	71
3	.06	70
4	.05	70
5	.07	70
6	.11	70
1	.13	71
2	.10	71
3	.06	71
4	.06	71
5	.07	71
6	.11	71
1	.11	71
2	.06	71
3	.06	71
4	.07	71
5	.07	71
6	.10	71

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1}{100}) + 18(\frac{1}{100})$

$Ms = 28.73$

$Ts = 71$ °F $= 531$ °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.5) + \frac{-.62}{13.6}$

$Ps = 29.45$ in. Hg

$\overline{\sqrt{\Delta P}} = .2826$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2826) \times \sqrt{\frac{531}{29.45 \times 28.73}}$

$Vs = 18.95$ ft/s

$As = 4.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = 18.95 \times 4.67 \times 60$

$Qs = 5,309$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 5,309 \times 17.647 \times \frac{29.45}{531} \times (1 - \frac{1}{100})$

$Qs_{std} = 5,144$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: RE-8-1 Room Exhaust

Site: _____ Operators: TK Run #: RE-8-1 Date: 5-22-97

Barometric Pressure, in. Hg = Pbar = 29.5 in. Hg

Static Pressure, in. H_2O = Pg = -.62 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.45 in. Hg

Wet-Bulb Temperature, °F = Tw = 56 °F

Dry-Bulb Temperature, °F = Td = 71 °F

Temperature Difference, Td - Tw = ΔT = 15 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .4520 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.4520) - \frac{(29.45 - .4520) \times (15)}{2800 - (1.3 \times 56)} = 2964 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.2964)}{(29.45)} = 1.0$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-22-97
Sampling Location: Beam Exhaust Clock Time: 09 36
Run #: RE-8-2 Operators: TA/SS
Barometric Pressure, in. Hg: 29.5 Static Pressure, in. H_2O: -.64
Moisture, %: 1.0 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: ~~17.5~~ 28" Side 2: 24"
Wet Bulb, °F: 56 Dry Bulb, °F: 71

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.08	71
2	.08	71
3	.07	71
4	.07	71
5	.08	71
6	.08	71
1	.10	71
2	.10	71
3	.07	71
4	.06	71
5	.08	71
6	.10	71
1	.13	71
2	.09	71
3	.07	71
4	.06	71
5	.07	71
6	.12	71
1	.12	71
2	.09	71
3	.07	71
4	.06	71
5	.07	71
6	.12	71
	$\overline{\sqrt{\Delta P}}$ = .2896	$\overline{Ts}$ = 71

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.0}{100}) + 18 (\frac{1.0}{100})$

$Ms = 28.73$

$\overline{Ts} = 71$ °F = 531 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.5) + \frac{-.64}{13.6}$

$Ps = 29.45$ in. Hg

$\overline{\sqrt{\Delta P}} = .2896$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2896) \times \sqrt{\frac{531}{29.45 \times 28.73}}$

$Vs = 19.42$ ft/s

$As = 4.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = 19.42 \times 4.67 \times 60$

$Qs = 5441$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 5441 \times 17.647 \times \frac{29.45}{531} \times (1 - \frac{1.0}{100})$

$Qs_{std} = 5272$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: TH Run #: 2E-8-2 Date: 5-22-97

Barometric Pressure, in. Hg = Pbar = 29.5 in. Hg

Static Pressure, in. H_2O = Pg = -.64 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.45 in. Hg

Wet-Bulb Temperature, °F = Tw = 56 °F

Dry-Bulb Temperature, °F = Td = 71 °F

Temperature Difference, Td - Tw = ΔT = 15 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .4520 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.4520) - \frac{(29.45 - .4520) \times (15)}{2800 - (1.3 \times 56)} = .2925 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.2925)}{(29.45)} = 1.0$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-22-97
Sampling Location: Room Exhaust Clock Time: 1153
Run #: RE-8-3 Operators: JH/SS
Barometric Pressure, in. Hg: 29.5 Static Pressure, in. H_2O: -.64
Moisture, %: .98 Molecular wt., Dry: 28.85 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 28" Side 2: 24"
Wet Bulb, °F: 57 Dry Bulb, °F: 74

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.06	74
2	.07	74
3	.06	74
4	.06	74
5	.08	74
6	.07	74
1	.10	74
2	.09	74
3	.07	74
4	.06	74
5	.07	74
6	.09	74
1	.13	74
2	.10	74
3	.06	74
4	.06	74
5	.07	74
6	.11	74
1	.10	74
2	.06	74
3	.06	74
4	.06	74
5	.07	74
6	.10	
	$\overline{\sqrt{\Delta P}}$ = .2763	$\overline{Ts}$ = 74

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{.98}{100}) + 18 (\frac{.98}{100})$

$Ms = 28.73$

$\overline{Ts} = 74$ °F = 534 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.5) + \frac{-.64}{13.6}$

$Ps = 29.45$ in. Hg

$\overline{\sqrt{\Delta P}} = .2763$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2763) \times \sqrt{\frac{534}{29.45 \times 28.73}}$

$Vs = 18.58$ ft/s

$As = 4.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = 18.58 \times 4.67 \times 60$

$Qs = 5202$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = 5202 \times 17.647 \times \frac{29.45}{534} \times (1 - \frac{.98}{100})$

$Qs_{std} = 5013$ dscfm

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JLM

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: Losco Location: Room Exhaust

Site: Room Exhaust Operators: TA/SS Run #: RE-8-3 Date: 5/22/97

Barometric Pressure, in. Hg = Pbar = 29.5 in. Hg

Static Pressure, in. H_2O = Pg = -.64 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.45 in. Hg

Wet-Bulb Temperature, °F = Tw = 57 °F

Dry-Bulb Temperature, °F = Td = 74 °F

Temperature Difference, Td - Tw = ΔT = 17 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .4686 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (.4686) - \frac{(29.45 - .4686) \times (17)}{2800 - (1.3 \times 57)} = .2878$ in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(.2878)}{(29.45)} = .98\%$

JRD

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO — Date: 5-22-97

Sampling Location: Oven #9 — Clock Time: 0830

Run #: 9-8-1 — Operators: DBJ / GG

Barometric Pressure, in. Hg: 29.50 — Static Pressure, in. H_2O: -.69

Moisture, %: — Molecular wt., Dry: — Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 15" — Side 2: —

Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.09	161
2	.13	163
3	.17	165
4	.23	169
5	.24	168
6	.24	168
B-1	.17	163
2	.21	167
3	.23	170
4	.22	169
5	.22	170
6	.22	167
	$\overline{\sqrt{\Delta P}}$ = .440	$\overline{Ts}$ = 167

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.7}{100}) + 18 (\frac{1.7}{100})$

wet Bwo = 1.7 from Run 2

$Ms = 28.66$

$\overline{Ts} = 167$ °F = 627 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.45$ in. Hg

$\overline{\sqrt{\Delta P}} = .440$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 32.096$ ft/s

$As = \cancel{1.391}\ 1.227$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \cancel{2363}$ 2363 x x 60

$Qs = 2363$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1926$ dscfm

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DJ

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-22-97
Location: OVEN #9
Run #: 9-5-2
Stack I.D.: 15"
Pbar: 29.50
Sample Tube #: 9-5-2A 9-5-2B
Operators: DBB/CG
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 0921 Finish: 1021 Total: 60
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
0921	0	250 cc/min
0931	0	
0945	0	
0955	0	
1005	0	
1011	0	
1021	0	✓

Volume
56.36
58.77
61.05
63.47
66.91
68.52
71.53
15.17

STATIC −.69

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
A-1	.09	161
2	.13	164
3	.17	166
4	.23	168
5	.24	168
6	.24	168
B-1	.17	163
2	.21	167
3	.22	169
4	.22	170
5	.22	167
6	.22	165
	$\overline{\sqrt{\Delta P}}$ .440	166

AVG = 82.8

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

80/80

$Md = 28.81$

83/83

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$ 1.7 %

84/83

84/84

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

84/84

$Ms = 28.66$

84/83

$Ts = 166$ °F $= 626$ °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{-.69}{13.6}$

$Ps = 29.45$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.440$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 32.071$ ft/s

$As = 1.227$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2361$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1927$ dscfm

VLE

FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN #9
Run Number: 9-8-3 Date: 5-22-97
Pretest Leak Rate: .002 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DGS/CC
Pbar: 24.50 Ps: -.69
CO2: — O2: —
Probe Length/Type: 1' SS Pitot #: TS-3
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: — Thermocouple #: 40
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.86
Post-Test Leak Rate: .000 cfm @ 5 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0	0932	549.875										
	10	0942	557.97		1.86					60	89	88	4
	20	0942	566.00		1.86					46	83	86	4
	30	0952	573.40		1.86					50	83	87	4
	40	1002	—		1.86					51	84	85	4
	43	1005	583.724										

43 min ΔVm= 33.849 $\sqrt{\Delta p}$= ____ $\overline{\Delta H}$= 1.86 $\overline{Ts}$= 166 $\overline{Tm}$= 86 · 546 R

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VLD

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 9-8-2

DATE 5-22-97 Sample Box No. N-6 Job No. 5405.003

SAMPLE LOCATION #9 OVEN OUTLET Filter No. N/A

TRAIN PREPARER T. Abernathy

SAMPLE RECOVERY PERSON G. Gray

COMMENTS M4- Moisture Train

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	601.4	611.7	10.3
2	DI H_2O	100	643.5	639.[illegible]	-4.3
3	Empty	—	456.0	456.0	—
4	Silica Gel	200	716.5	721.9	5.4
5					
6					
TOTAL			2417.4	2428.8	11.4

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: ASCO SOURCE/RUN #: 1-8-2 DATE: 5-22-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{33.849}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (33.849) \times (\cancel{29.50}\ 29.96) \times \left(\frac{(29.50) + (1.862 / 13.6)}{(546)}\right)$$

$$V_{m_{std}} = \underline{31.308}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (11.4)$$

$$V_{w_{std}} = \underline{.5366}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.5366)}{(.5366) + (31.308)}$$

$$B_{ws} = \underline{0.0169} \simeq 1.72$$

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1A)

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO
Date: 5-22-97
Sampling Location: OVEN #9
Clock Time: 1215
Run #: 9-8-3
Operators: DBB / CG
Barometric Pressure, in. Hg: 29.50
Static Pressure, in. H_2O: -.69
Moisture, %: —
Molecular wt., Dry: _____
Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15"
Side 2: —
Wet Bulb, °F: —
Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.09	162
2	.13	164
3	.17	166
4	.23	167
5	.24	163
6	.24	161
B 1	.17	164
2	.22	167
3	.21	163
4	.22	169
5	.22	170
6	.22	169
	$\overline{\sqrt{\Delta P}}$ = .4408	$\overline{T_s}$ = 167

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18(\frac{\quad}{100})$

use Ms from Run 2

$Ms = 28.46$

$\overline{T_s} = 167\ °F = 627\ °R\ (°F + 460)$

$P_s = P_b + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$P_s = 29.45$ in. Hg

$\overline{\sqrt{\Delta P}} = .4408$

$V_s = 85.49 \times C_p \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s\,(°R)}{P_s \times M_s}}$

$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$V_s = 32.155$ ft/s

$A_s = 1.227\ ft^2$

$Q_s = V_s \times A_s \times 60$ s/m

$Q_s = \cancel{2368}\ \times \quad \times 60$

$Q_s = 2367$ acfm

$Q_{std} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{\%H_2O}{100})$

$Q_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-22-97
Location: #10 OVEN OUTLET
Run #: 10-8-1
Stack I.D.: 15"
Pbar: 29.50
Sample Tube #: 10-8-1 A & B
Operators: MJ/CG
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 0754 Finish: 0846 Total: 52
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
0754	0	250 cc/min
0804	0	
0814	0	
0824	0	
0834	0	
0844	0	
0846	0	✓

STATIC -.82

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
A-1	.11	213
2	.14	213
3	.15	214
4	.19	215
5	.28	213
6	.29	213
B-1	.23	213
2	.24	214
3	.23	215
4	.19	217
5	.22	218
6	.24	213
	$\overline{\sqrt{\Delta P}}$: .453	Avg 214

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{1.3}{100}) + 18 (\frac{1.3}{100})$

$Ms = 28.70$

$Ts = 214$ °F = 674 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.5) + \frac{-.82}{13.6}$

$Ps = 29.44$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.453$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 34.243$ ft/s

$As = 1.227$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2521$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1918$ dscfm

Sample Time 52 Min.

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RM

FIELD DATA SHEET

Plant: LASCO
Sampling Location #10 OVEN
Run Number: 10-8-1 Date: 5-22-97
Pretest Leak Rate: .001 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: NA

Sample Type: M-4 Operator: DB/GW
Pbar: 29.50 Ps: -0.82
CO2: — O2: —
Probe Length/Type: 1' SS Pitot #: ST-3.94
Stack Diameter: 15" As: ~~1.23~~ ft²

Nozzle ID: N/A Thermocouple #: 4B
Assumed Bws: Filter #: N/A
Meter Box #: 14 Y: .966 ΔH@: 1.86
Post-Test Leak Rate: .000 cfm @ 7 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	0754	517.684										
	10	0804	525.50		1.86					50	75	77	3
	20	0814	533.00		1.86					51	72	75	3
	30	0824	541.10		1.86					53	74	79	3
	40	0834	—		1.86					56	76	83	3
	42	0836	549.750										

ΔVm= 32.066 $\overline{\sqrt{\Delta p}}$= — ΔH= 1.86 [redacted] Ts= 214 Tm= 76 = 536R

[redacted]

SAMPLE RECOVERY DATA

PLANT LASCO Run No. 10-8-1

DATE 5-22-97 Sample Box No. N-1 Job No. S405 003

SAMPLE LOCATION # 10 OVEN OUTLET Filter No. —

TRAIN PREPARER J. Abernathy

SAMPLE RECOVERY PERSON GGan

COMMENTS M4- MOISTURE TRAIN

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	638.9	651.0	12.1
2	DI H_2O	100	600.6	591.8	- 8.8
3	Empty	—	499.7	499.9	.2
4	Silica Gel	200	756.4	761.5	5.1
5					
6					
TOTAL			2496.5	2504.2	8.6

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EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCD SOURCE/RUN #: 10-8-1 DATE: 5-22-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = 32.066 \ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m} \right)$$

$$V_{m_{std}} = 17.64 \times (32.066) \times (.966) \times \left(\frac{(29.50) + (1.86 / 13.6)}{(536)} \right)$$

$$V_{m_{std}} = 30.212 \ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (8.6)$$

$$V_{w_{std}} = 0.4048 \ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(\quad)}{(\quad)+(\quad)}$$

$$B_{ws} = 0.013 \simeq 1.3\%$$

10 M

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO — Date: 5-22-97
Sampling Location: OVEN #10 — Clock Time: 1023
Run #: 10-8-2 — Operators: DBL/GG
Barometric Pressure, in. Hg: 29.50 — Static Pressure, in. H_2O: -.84
Moisture, %: — Molecular wt., Dry: — Pitot Tube, Cp: .88
Stack Dimension, in. Diameter or Side 1: 15" — Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.12	205
2	.14	210
3	.16	211
4	.20	214
5	.27	216
6	.25	215
B-1	.16	210
2	.23	213
3	.23	216
4	.20	216
5	.23	213
6	.26	213
	$\sqrt{\Delta P}$ = .451	$\bar{T}_s$ = 213

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$B_{ws} = 3.1\%$ (Avg. of Bwl)

$Ms = 28.50$

$\bar{T}_s = 213$ °F = 673 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.5) + \frac{-.84}{13.6}$

$Ps = 29.44$ in. Hg

$\overline{\sqrt{\Delta P}} = .451$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{P_s \times M_s}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 34.19$ ft/s

$As = 1.227$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2517$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

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FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN #10
Run Number: 10.B.3 Date: 5-27-97
Pretest Leak Rate: .002 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: MS/GG
Pbar: 29.50 Ps: -.83
CO2: — O2: —
Probe Length/Type: 1'5.5 Pitot #: [illegible]
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .986 ΔH@: 1.862
Post-Test Leak Rate: .00 cfm @ 6 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	1140	583.810										
	10	1150	591.610		1.86					60	85	86	5
	20	1200	599.60		1.86					52	83	82	5
	30	1210	607.457		1.86					53	82	85	5
	40	1220	615.504		1.86					53	82	87	5
				VELOCITY		STACK TEMP							
			A-1	.11			210						
			2	.14			213						
			3	.15			214						
			4	.19			215						
			5	.27			215						
			6	.28			215						
			B 1	.22			214						
			2	.23			215						
			3	.23			215						
			4	.20			214						
			5	.22			216						
			6	.25			216						

V_s = 34.41 fps
Q_s = 2533 acfm
Q_{std} = 1854 dscfm

ΔVm = 31.694 $\overline{\sqrt{\Delta p}}$ = .4518 $\overline{\Delta H}$ = 1.86 $\overline{T_s}$ = 215 $\overline{T_m}$ = 84 → 544

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 10-8-3 DATE: 5-22-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad\quad) - (\quad\quad - 0.02) \times (\quad\quad)$$

$$V_{mc} = \underline{31.694}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (31.694) \times (.966) \times \left(\frac{(29.5) + (1.86 / 13.6)}{(544)}\right)$$

$$V_{m_{std}} = \underline{29.42}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (32.2)$$

$$V_{w_{std}} = \underline{1.516}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(\quad\quad)}{(\quad\quad) + (\quad\quad)}$$

$$B_{ws} = \underline{0.0489} \ \underline{1}\ 4.9\%$$

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SAMPLE RECOVERY DATA

PLANT Lasco Run No. 10-8-3

DATE 5-22-97 Sample Box No. N-1 Job No. 5405.003

SAMPLE LOCATION #10 oven outlet Filter No. —

TRAIN PREPARER GGay

SAMPLE RECOVERY PERSON GGay

COMMENTS M4- Moisture Train

FRONT HALF

Acetone Container No. _____ Liquid Level Marked _____ Sealed _____

Filter Container No. _____ Sealed _____

Description of Filter _____

Samples Stored and Locked _____

BACK HALF/MOISTURE

Container No. _____

Liquid Level Marked _____ Sealed _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H2O	100	651.0	688.6	37.6
2	H2O	100	591.8	557.2	-34.6
3	Empty	—	499.9	514.3	14.4
4	S/G	250	761.5	776.3	14.8
5					
6					
TOTAL			2504.2	2536.4	32.2

Description of Impinger Contents —

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-22-97
Location: NDA
Run #: NDA-8-1
Stack I.D.: 32" x 120"
Pbar: 29.5
Sample Tube #: NDA-8-1A NDA-8-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: VOST #3
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 0755 Finish: 0855 Total: 60
W/B: - D/B: - O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0755	1515.89	1	21	72
0805	1518.77	1	21	74
0815	1521.32	1	21	76
0825	1523.82	1	21	79
0835	1526.48	1	21	81
0845	1529.05	1	21	83
	Vm = 13.16		$\bar{X}$	787

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$

$$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$$

$$Md =$$

$$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$$

$$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$$

$$Ms =$$

$$Ts = \quad °F = \quad °R \ (°F + 460)$$

$$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$$

$$Ps = \quad \text{in. Hg}$$

$$\overline{\sqrt{\Delta P}} =$$

$$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$$

$$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$$

$$Vs = \quad \text{ft/s}$$

$$As = \quad ft^2$$

$$Qs = Vs \times As \times 60 \text{ s/m}$$

$$Qs = \quad \times \quad \times 60$$

$$Qs = \quad \text{acfm}$$

$$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$$

$$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$$

$$Qs_{std} = \quad \text{dscfm}$$

METHOD 18 FIELD DATA SHEET

Plant: Lasco Products
Date: 5/22/97
Location: NDB
Run #: NDB-8-2 A,B
Stack I.D.: 0.5" x 72"
Pbar: 29.5
Sample Tube #: NDB 8-2A, NDB 8-2B
Operators: SS / TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost #3
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 0921 Finish: 1021 Total: 60
W/B: – D/B: – O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Temp
0921	0 1529.14	1	21	81
0931	10 1531.72	1	21	81
0941	20 1534.15	1	21	82
0951	30 1536.38	1	21	84
1001	40 1538.70	1	21	85
1011	50 1541.75	1	21	86
1021	60 1543.75	1	21	88

Vm = 14.61 l/m

$\bar{X}$ 84

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps = \quad$ in. Hg

$\sqrt{\overline{\Delta P}} =$

$Vs = 85.49 \times Cp \times \sqrt{\overline{\Delta P}} \times \sqrt{\frac{(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{}{}}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} = \quad$ dscfm

APPENDIX A.1.10

Condition 9
(includes flows, moistures, and Method 18)

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-22-97
Location: Main Exhaust
Run #: ME-9-1
Stack I.D.: 17.5
Pbar: 29.28
Sample Tube #: ME-9-1A, ME-9-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: VOST #2
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1803 Finish: 1818 Total: 15
W/B: 66 D/B: 84 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Im
1803 0	2318.52	1	150cc	68
1808 5	2319.65	1	150cc	69
1813 10	2320.43	1	150cc	72
1818 15	2321.43	1	150cc	73

Static 0.2

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.25	84
2	.29	84
3	.31	84
4	.33	84
5	.34	84
6	.37	85
7	.39	84
8	.42	84
1	.27	84
2	.30	84
3	.31	84
4	.32	84
5	.32	84
6	.32	84
7	.31	84
8	.33	84
	0.5679	~~84°F~~ 544°R

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = \cancel{28.55}$ 28.67

$Bws = \frac{55}{\cancel{4.82}} = 1.6\%$

$Ts = 84$ °F $= 544$ °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.28) + \frac{.02}{13.6}$

$Ps = 29.28$ in. Hg

$\sqrt{\overline{\Delta P}} = 0.5679$

$Vs = 85.49 \times Cp \times \sqrt{\overline{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\frac{\quad}{29.28 \times}}$

$Vs = \cancel{38.91}$ 38.64 ft/s

$As = 1.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \cancel{3900}$ 3877 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.28}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \cancel{3537}$ 3624 dscfm

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WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: MAIN EXHAUST

Site: Main Exhaust Operators: JA Run #: ME-9-1 Date: 5-22-97

Barometric Pressure, in. Hg = Pbar = 29.28 in. Hg

Static Pressure, in. H_2O = Pg = 0.02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.28 in. Hg

Wet-Bulb Temperature, °F = Tw = 66 °F

Dry-Bulb Temperature, °F = Td = 84 °F

Temperature Difference, Td - Tw = ΔT = 18 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6442 in. Hg

Vapor Pressure of H_2O = Pva = $(Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

Pva = ( ) - $\frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)}$ = ~~0.1899~~ BE 0.4543 in. Hg

Proportion of Water Vapor by Volume = Bws

Bws = $\frac{(Pva)}{(Ps)}$ = $\frac{(\cancel{0.1899}\ BE\ 0.4543)}{(29.28)}$ = ~~0.0065~~ 0.0155 ~~≈ 0.79%~~ BE 1.6%

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-22-97
Location: Room Exhaust
Run #: RE-9-1
Stack I.D.: 28" x 24"
Pbar: 29.28
Sample Tube #: RE-9-1A, RE-9-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost II
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1803 Finish: 1833 Total: 15
W/B: 57 D/B: 78 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1803	7746.60	1	150 cc	66
1813	7747.95	1	150 cc	68
1823	7749.21	1	150 cc	71
1833	7750.54	1	150 cc	72
			AVG=	69

Static = -.63

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.07	78
2	.07	78
3	.06	78
4	.06	78
5	.06	78
6	.06	78
1	.07	78
2	.07	78
3	.06	78
4	.05	78
5	.06	78
6	.08	78
1	.12	78
2	.08	78
3	.05	78
4	.05	78
5	.06	78
6	.11	78
1	.11	78
2	.07	78
3	.05	78
4	.05	78
5	.06	78
6	.10	78
	0.262	78 °F = 538 °R

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms = 28.75$ BE

$Ts = 78$ °F = 538 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.28) + \frac{-.63}{13.6}$

$Ps = 29.23$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.262$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\frac{}{}}$

$Vs =$ ~~17.87~~ BE ft/s 17.74

$As = 4.67$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs =$ ~~78~~ BE $\times \quad \times 60$

$Qs =$ ~~5006~~ BE 4971 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} =$ ~~4584~~ BE 4728 dscfm

$B_{ws} =$ ~~4.5%~~ BE $= 0.8\%$

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✓ RD

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: TA Run #: RE-9-1 Date: 5-22-97

Barometric Pressure, in. Hg = Pbar = 29.22 in. Hg

Static Pressure, in. H_2O = Pg = -0.63 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.23 in. Hg

Wet-Bulb Temperature, °F = Tw = 57 °F

Dry-Bulb Temperature, °F = Td = 78 °F

Temperature Difference, Td - Tw = ΔT = 21 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.4686 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.4686) - \frac{(29.23 - .4686) \times (21)}{2800 - (1.3 \times 57)} = .2470 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.2470)}{(29.23)} = 0.0084 \simeq 0.8\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-22-97
Location: Oven #9
Run #: 9-9-1
Stack I.D.: 15"
Pbar: 29.50
Sample Tube #: 9-9-1A 9-9-1B
Operators: DB / GG
Leak Check: Pre: ✓ Post: .000 @ 2

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1804 Finish: 1850 Total: 46
W/B: — D/B: — O_2: — CO_2: —

	Time	Gauge Vacuum (Hg)	Flow Setting
71.73	1804	0	250 cc/min
74.15	1814	0	
76.75	1824	0	
79.15	1834	0	
81.75	1844	0	
83.34	1850	0	
1.61			

STATIC -.68 AVG 86.5

46 minute

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.09	158
2	.12	161
3	.16	162
4	.22	162
5	.23	160
6	.22	159
B-1	.17	156
2	.20	155
3	.21	161
4	.21	161
5	.21	159
6	.20	158
	$\overline{\sqrt{\Delta P}}$ = .434	Avg 160

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

84/84 85/85 86/86 88/87 89/88 89/88

$Md = 29.0$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{4.5}{100}) + 18(\frac{4.5}{100})$

$Ms = 28.51$

$Ts = 160\ °F = 620\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (29.5) + \frac{-.68}{13.6}$

$Ps = 29.45$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4290$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 31.20$ ft/s

$As = 1.227\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \frac{\quad}{2} \times \quad \times 60$

$Qs = 2297$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1839$ dscfm

FIELD DATA SHEET

Plant: LASCO
Sampling Location: Oven #9
Run Number: 9-9-1 Date: 5.22.97
Pretest Leak Rate: .001 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DM/GG
Pbar: 29.50 Ps: -.68
CO2: — O2: —
Probe Length/Type: 1' 95 Pitot #: ST.3
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 74 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: .000 cfm @ 15 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	00	1804	615.600										
	10	1814	623.30		1.86					60	88	89	3
	20	1824	630.70		1.86					55	88	88	3
	30	1834	638.85		1.86					50	87	89	3
	40	1844	646.603		1.86					51	88	91	3

ΔVm= 31.903 √Δp= ΔH= 1.86 Ts= 160 Tm= 89 °F or 549 °R

Vmstd = 28.521 Vwstd = .1346 [redacted] = .015 [redacted] 96

SAMPLE RECOVERY DATA

Plant: LASCO Run No.: 99-1

Date: 5-22-97 Sample Box No.: N-6 Job No.: 5905.003

Sample Location: # OVCU OUTLET

Sample Type: M-4 Filter No.: —

Sample Recovery Person: GGH

Comments: M4- MOISTURE CAN

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H_2O	100	611.7	611.9	.2
2	H_2O	100	639.2	639.5	.3
3	EMPTY	—	456.0	456.0	—
4	S/G	250	721.9	750.0	28.1
5					
6					
TOTAL			2428.8	2457.4	28.6

Description of Impinger Catch: —

JRD

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 9-9-1 DATE: 5-22-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\qquad) - (\qquad - 0.02) \times (\qquad)$$

$$V_{mc} = \underline{31.003}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (31.003) \times (0.966) \times \left(\frac{(29.50) + (1.86 / 13.6)}{(89+460)}\right)$$

$$V_{m_{std}} = \underline{28.519}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (28.6)$$

$$V_{w_{std}} = \underline{\cancel{28.6}\ 1.346}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(1.346)}{(1.346) + (28.519)}$$

$$B_{ws} = \underline{0.045} \simeq 4.5\%$$

✓ A

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: CASCO
Date: 5-22-97
Sampling Location: Oven # 10
Clock Time: 1830
Run #: 10-9-1
Operators: DAS/GG
Barometric Pressure, in. Hg: 29.50
Static Pressure, in. H_2O: -.80
Moisture, %: —
Molecular wt., Dry: —
Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15"
Side 2: —
Wet Bulb, °F: —
Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.11	228
2	.15	231
3	.15	231
4	.18	231
5	.24	229
6	.27	228
B-1	.14	229
2	.22	229
3	.21	232
4	.18	233
5	.21	232
6	.24	229
	$\overline{\sqrt{\Delta P}}$ = .434	$\overline{Ts}$ = 230

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{4.5}{100}) + 18(\frac{4.5}{100})$ B_{WS}=4.5% (Run 9-9-1)

$Ms = 28.51$

$\overline{Ts} = 230$ °F = 690 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.44$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4340$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 33.30$ ft/s

$As = 1.227$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2452$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

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METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-22-98
Location: NDA
Run #: NDA-9-1
Stack I.D.: ~~29.50BE~~ 32" x 120"
Pbar: 29.50
Sample Tube #: NDA-9-1
Operators: TA/SS
Leak Check: Pre: ✓ Post: ✓ .005 at 8"

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: [illegible] #7
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1802 Finish: 1832 Total: 30
W/B: - D/B: - O_2: 21 CO_2: 0

		Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1802	0	1543.88	1	21	85
1812	10	1546.26	1	21	86
1822	20	1548 [illegible]	1	21	90
1832	30	1550.65	1	21	90

$\Delta V = 6.77$

$\overline{T_m} = 88$

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms =$

$Ts =$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps =$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{}{}}$

$Vs =$ ft/s

$As =$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} =$ dscfm

APPENDIX A.1.11

Condition 10
(includes flows, moistures, and Method 18)

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-22-97
Location: Main Exhaust
Run #: ME-10-1
Stack I.D.: 17.5
Pbar: 29.28
Sample Tube #: ME-10-1A, ME-10-1B
Operators: TR
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost #1
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1936 Finish: 1951 Total: 15
W/B: 64 D/B: 82 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	lm
1936/0	2321.57	1	150cc	67
1941/5	2322.31	1	150cc	69
1946/10	2322.97	1	150cc	71
1951/15	2323.45	1	150cc	73
			AVG=70	

+.03

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.25	87
2	.28	82
3	.32	82
4	.33	82
5	.35	82
6	.37	82
7	.39	82
8	.42	82
1	.27	82
2	.29	82
3	.30	82
4	.32	82
5	.31	82
6	.30	82
7	.32	82
8	.32	82
	0.5656	82°F ✓
		542°R

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{1.4}{100}) + 18 (\frac{1.4}{100})$

$Ms = 28.69$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.28$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.5656$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 38.45$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3854$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3623$ dscfm

✓RD.

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: MAIN EXHAUST

Site: MAIN Exhaust Operators: TA Run #: ME-10-1 Date: 5-22-97

Barometric Pressure, in. Hg = Pbar = 29.28 in. Hg

Static Pressure, in. H_2O = Pg = +0.03 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.28 in. Hg

Wet-Bulb Temperature, °F = Tw = 64 °F

Dry-Bulb Temperature, °F = Td = 82 °F

Temperature Difference, Td - Tw = ΔT = 18 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6009 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.6009) - \frac{(29.28 - .6009) \times (18)}{2800 - (1.3 \times 64)} = 0.4109 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.4109)}{(29.28)} = 0.014 \simeq 1.4\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-22-97
Location: Room Exhaust
Run #: AE-10-1
Stack I.D.: 28" x 24"
Pbar: 29.28
Sample Tube #: RE-10-1A, RE-10-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost #1
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1930 Finish: 2000 Total: 30
W/B: 54 D/B: 76 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1930	7750.86	1	150cc	69
1940 10	7752.32	1	150cc	71
1950 20	7753.85	1	150cc	71
2000 30	7755.23	1	150cc	72
			AVG =	71

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.06	76
2	.06	76
3	.05	76
4	.05	76
5	.06	76
6	.07	76
1	.08	76
2	.07	76
3	.05	76
4	.05	76
5	.05	76
6	.07	76
1	.11	76
2	.07	76
3	.05	76
4	.05	76
5	.06	76
6	.09	76
1	.10	76
2	.05	77
3	.05	77
4	.05	76
5	.07	76
6	.10	76
	0.254	76°F = 536°R

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{.6}{100}) + 18 (\frac{.6}{100})$

$Ms = 28.77$

$Ts = \quad °F = 536\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P}{13.6} = (29.28) + \frac{-.03}{13.6}$

$Ps = 29.25$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.254$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 17.16$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 4806$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4597$ dscfm

✓ G

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Rm Exhaust Operators: TA Run #: RE-10-1 Date: 5-22-97

Barometric Pressure, in. Hg = Pbar = 29.28 in. Hg

Static Pressure, in. H_2O = Pg = -0.63 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.23 in. Hg

Wet-Bulb Temperature, °F = Tw = 54 °F

Dry-Bulb Temperature, °F = Td = 76 °F

Temperature Difference, Td - Tw = ΔT = 22 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.4203 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.4203) - \frac{(29.23 - .4203) \times (22)}{2800 - (1.3 \times 54)} = 0.1881 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.1881)}{(29.23)} = 0.006 \simeq 0.6\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1718	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO — Date: 5-22-97

Sampling Location: OVEN #9 — Clock Time: 0022

Run #: 9-10-1 — Operators: DBS/CC

Barometric Pressure, in. Hg: 29.50 — Static Pressure, in. H_2O: -.68

Moisture, %: — Molecular wt., Dry: — Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 15" — Side 2: —

Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.09	165
2	.17	165
3	.17	166
4	.23	165
5	.23	163
6	.23	164
B 1	.14	162
2	.20	164
3	.22	165
4	.20	165
5	.22	163
6	.21	162
	$\overline{\sqrt{\Delta P}}$ = .430	$\overline{T_s}$ = 164

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.0$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = \cancel{28.64}$ 28.97

$\overline{T_s} = 164$ °F = 624 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.45$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.430$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \cancel{31.305}$ BE N/s $\cancel{30.408}$ BE 31.124

$As = 1.23$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \cancel{2310}$ BE scfm $\cancel{1949}$ BE 2297

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

OE BE

BE

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METHOD 18 FIELD DATA SHEET

Plant: CASCO
Date: 5-22-97
Location: OVEN #10
Run #: 10-10-1
Stack I.D.: 15
Pbar: 29.5
Sample Tube #: 10-10-1A 10-10-1B
Operators: DBS / CG
Leak Check: Pre: .000 @ 1" Post: .000 @ 1"

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 2000 Finish: 2056 Total: 56
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
2000	0	250 cc/min
2010	0	
2020	0	
2030	0	
2040	0	
2050	0	
2056	0	

83.47
86.10
88.70
91.36
93.93
96.56
98.21

STATIC -.81

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
A-1	.13	228
2	.16	230
3	.16	231
4	.19	232
5	.24	230
6	.24	231
B-1	.14	227
2	.21	229
3	.22	232
4	.19	234
5	.21	235
6	.23	230
	$\sqrt{\Delta P}$	
	.436	avg 230

3 56 MIN RUN

14.74

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

84/84 Md = 29.0

85/84 $Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

85/84 85 $Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

85/85 Ms = 28.64

85/85 Ts = 230 °F = 690 °R (°F + 460)

85/85 85 $Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

Ps = 29.44 In. Hg

$\overline{\sqrt{\Delta P}}$ = 0.436

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

Vs = 33.382 ft/s

As = 1.23 ft^2

Qs = Vs x As x 60 s/m

Qs = x x 60

Qs = ~~2458~~ BE acfm 2464

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

Qs_{std} = ~~1790~~ BE dscfm

1851

Moisture = ~~3.36~~ BE 0.290

BE

FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN # 1C
Run Number: 10-10-1 Date: 5-23-96
Pretest Leak Rate: .002 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DBB/BG
Pbar: 29.50 Ps: -.31
CO2: — O2: —
Probe Length/Type: 1'55 Pitot #: ST-3
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: .000 cfm @ 5 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	00	2000	646.922										
	10		654.75		1.86					60	86	85	4
	20		662.80		1.86					51	84	84	4
	30		670.90		1.86					53	83	86	4
	40		678.356		1.86					53	83	85	4
										54	83	85	4

ΔVm= 31.434 $\sqrt{\Delta p}$= ____ $\overline{\Delta H}$= 1.86 $\overline{Ts}$= 230 $\overline{Tm}$= 84°F or 544 °R

Vmstd= 29.193 Vwstd= 0.0862 Bws= 0.037 or 3.3%

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SAMPLE RECOVERY DATA

10-10-1

Plant: LASCO

Run No.: [illegible]

Date: 5-27-97

Sample Box No.: W-1

Job No.: 5405002

Sample Location: #10 OVEN

Sample Type: M-4

Filter No.: —

Sample Recovery Person: G. GAN

Comments: M4- MOISTURE TRAIN

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H2O	100	621.1	622.2	1.1
2	H2O	100	616.9	616.6	-.3
3	EMPTY	—	506.1	506.2	.1
4	S/G	250	756.3	756.7	.4
5					
6					
TOTAL			2500.4	2501.7	1.3

Description of Impinger Catch: —

BL

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 10-10-1 DATE: 5-22-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{31.434}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m} \right)$$

$$V_{m_{std}} = 17.64 \times (31.434) \times (.966) \times \left(\frac{(29.5) + (1.86 / 13.6)}{(84 + 460)} \right)$$

$$V_{m_{std}} = \underline{29.181}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (1.3)$$

$$V_{w_{std}} = \underline{0.0612}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(\quad)}{(\quad) + (\quad)}$$

$$B_{ws} = \underline{0.002} = 0.2\%$$

METHOD 18 FIELD DATA SHEET

Plant: Lasco
Date: 5/22/17
Location: NDO-A
Run #: NDA-10-1
Stack I.D.: 32" x 120"
Pbar: 28.28
Sample Tube #:
Operators: SLTA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: VOST #3
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1937 Finish: ~~1952~~ 2005 Total: 30
W/B: – D/B: – O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1937 0	1550.75	1	21	88
1947 10	1553.39	1	21	88
1957 20	1555.77	1	21	89
30	1558.39	1	21	91
~~40~~			AVG =	89
50				
60				

ΔV: 7.64
$\bar{T}_m$ = 89

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\sqrt{\overline{\Delta P}} =$

$Vs = 85.49 \times Cp \times \sqrt{\overline{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

APPENDIX A.1.12

Condition 11
(includes flows, moistures, and Method 18)

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-23-97
Location: Main Exhaust
Run #: ME-11-1A, ME-11-1B
Stack I.D.: 17.5"
Pbar: 29.48
Sample Tube #: ME-11-1A, ME-11-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: Vost # 2
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 0913 Finish: 0928 Total: 15
W/B: 62 D/B: 77 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0913 0	2323.57	1	150cc	53
0918 5	2324.35	1	150cc	56
0923 10	2324.92	1	150cc	57
0928 15	2325.43	1	150cc	57

ΔV = 1.86
Tm = 56

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.25	77
2	.31	77
3	.31	77
4	.33	77
5	.36	77
6	.38	77
7	.40	77
8	.42	77
1	.28	77
2	.30	77
3	.31	77
4	.31	77
5	.31	77
6	.32	77
7	.32	77
8	.30	77
	0.5704	77

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

Moisture = 1.4%

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.85$

$Ts = 77\ °F = 537\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (29.48) + \frac{.02}{13.6}$

$Ps = 29.48$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.5704$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\frac{\quad}{29.48 \times \quad}}$

$Vs = 38.360$ ft/s

$As = 1.67\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times 1.67 \times 60$

$Qs = 3844$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.48}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3672$ dscfm

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WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Panel Products Location: Florence Ky

Site: Main Exhaust Operators: TH/SS Run #: ME-11-1 Date: 5/23/97

Barometric Pressure, in. Hg = Pbar = 29.48 in. Hg

Static Pressure, in. H_2O = Pg = +.02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.48 in. Hg

Wet-Bulb Temperature, °F = Tw = 62 °F

Dry-Bulb Temperature, °F = Td = 77 °F

Temperature Difference, Td - Tw = ΔT = 15 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.5601 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.5601) - \frac{(29.48 - .5601) \times (15)}{2800 - (1.3 \times 62)} = 0.4001 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.4001)}{(29.48)} = 0.014 \sim 1.4\%$$

$$\frac{433.8}{2719.4} = 0.160$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Panel Products Location: Florence Ky

Site: Main Exhaust Operators: TA/SS Run #: ME-11-2 Date: 5/23/97

Barometric Pressure, in. Hg = Pbar = 29.48 in. Hg

Static Pressure, in. H_2O = Pg = +0.03 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.48 in. Hg

Wet-Bulb Temperature, °F = Tw = 66 °F

Dry-Bulb Temperature, °F = Td = 79 °F

Temperature Difference, Td - Tw = ΔT = 13 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6442 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.6442) - \frac{(29.48 - 0.6442) \times (13)}{2800 - (1.3 \times 66)} = 0.5062 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.5062)}{(29.48)} = 0.017 \text{ or } 1.7\%$$

$$\frac{374.9}{2714} = 0.138$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-23-97

Sampling Location: Main Exhaust Clock Time: 1205

Run #: ME-11-3 Operators: TA/SS

Barometric Pressure, in. Hg: 29.25 Static Pressure, in. H_2O: .02

Moisture, %: 1.6 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 17.5 Side 2: —

Wet Bulb, °F: 65 Dry Bulb, °F: 81

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.25	81
2	.29	81
3	.31	81
4	.31	81
5	.35	81
6	.37	81
7	.39	81
8	.43	81
1	.27	81
2	.28	81
3	.28	81
4	.30	81
5	.29	80
6	.30	81
7	.31	81
8	.31	81
	$\overline{\sqrt{\Delta P}}$ = 0.5599	$\overline{Ts}$ = 81

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{1.6}{100}) + 18 (\frac{1.6}{100})$

$Ms = 28.67$

$\overline{Ts} =$ °F = 541 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.25) + \frac{.02}{13.6}$

$Ps = 29.25$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.5599$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\frac{\quad}{29.25}}$

$Vs = 38.06$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times 1.67 \times 60$

$Qs = 3813$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.25}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3581$ dscfm

./10 ⊠

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: MAIN EXHAUST

Site: Main Exhaust Operators: TA/SS Run #: ME-11-3 Date: 5-23-97

Barometric Pressure, in. Hg = Pbar = 29.25 in. Hg

Static Pressure, in. H_2O = Pg = .02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.25 in. Hg

Wet-Bulb Temperature, °F = Tw = 65 °F

Dry-Bulb Temperature, °F = Td = 81 °F

Temperature Difference, Td - Tw = ΔT = 16 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6222 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.6222) - \frac{(29.25 - .6222) \times (16)}{2800 - (1.3 \times 65)} = 0.4535 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(0.4535)}{(29.25)} = 0.0155 = 1.6\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-23-97
Location: Room Exhaust
Run #: RE-11-1
Stack I.D.: 28" x 24"
Pbar: 29.48
Sample Tube #: RE-11-1A, RE-11-1B
Operators: TR
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: Vost #21
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 0913 Finish: 0943 Total: 30
W/B: 55 D/B: 72 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0913 0	7756.17	1	150cc	52
0923 10	7757.62	1	150cc	55
0933 20	7758.84	1	150cc	61
0943 30	7760.17	1	150cc	62

$\Delta V = 4.0$

$T_m = 58$

Static = -.62

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.06	72
2	.06	72
3	.05	72
4	.05	72
5	.06	72
6	.07	72
1	.08	72
2	.07	72
3	.06	72
4	.05	72
5	.06	72
6	.07	72
1	.11	72
2	.09	72
3	.05	72
4	.05	72
5	.06	72
6	.11	72
1	.09	72
2	.06	72
3	.05	72
4	.05	72
5	.06	72
6	.11	72
Ave	0.2581	72

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 77)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{.87}{100}) + 18 (\frac{.87}{100})$

$Ms = 28.75$

$Ts = 72\ °F = 532\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (29.48) + \frac{-.62}{13.6}$

$Ps = 29.43$ in. Hg

$\overline{\sqrt{\Delta P}} = .2581$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2581) \times \sqrt{\frac{532}{29.43 \cdot 28.75}}$

$Vs = 17.32$ ft/s

$As = 4.67\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = 17.32 \times 4.67 \times 60$

$Qs = 4850$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = 4850 \times 17.647 \times \frac{29.43}{532} \times (1 - \frac{.87}{100})$

$Qs_{std} = 4694$ dscfm

VLD

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: Lasco Location: Room Exhaust

Site: Room Exhaust Operators: TA/SS Run #: RE-11-1 Date: 5/23/97

Barometric Pressure, in. Hg = Pbar = 29.48 in. Hg

Static Pressure, in. H_2O = Pg = -.62 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.43 in. Hg

Wet-Bulb Temperature, °F = Tw = 55 °F

Dry-Bulb Temperature, °F = Td = 72 °F

Temperature Difference, Td - Tw = ΔT = 17 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .4359 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.4359) - \frac{(29.43 - .4359) \times (17)}{2800 - (1.3 \times 55)} = .2552 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.2552)}{(29.43)} = .87\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-23-97
Sampling Location: Room Exhaust Clock Time: 1044
Run #: BE-11-2 Operators: JH/SS
Barometric Pressure, in. Hg: 29.48 Static Pressure, in. H_2O: -.61
Moisture, %: 0.9% Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 38" Side 2: 24"
Wet Bulb, °F: 56 Dry Bulb, °F: 74

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.06	74
2	.07	74
3	.06	74
4	.06	74
5	.07	74
6	.07	74
1	.06	74
2	.07	74
3	.06	74
4	.06	74
5	.06	74
6	.07	74
1	.08	74
2	.07	74
3	.06	74
4	.06	74
5	.05	74
6	.08	74
1	.08	74
2	.06	74
3	.05	74
4	.05	74
5	.05	74
6	.09	74
	$\overline{\sqrt{\Delta P}}$ = 0.2516	$\overline{Ts}$ = 74

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.54$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.54) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.90$

$\overline{Ts} = 74$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.48) + \frac{-.61}{13.6}$

$Ps = 29.44$ in. Hg

$\overline{\sqrt{\Delta P}} = .2516$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2516) \times \sqrt{\quad}$

$Vs = 16.87$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ a/m

$Qs = \quad \times 4.67 \times 60$

$Qs = 4727$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4552$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: Lasco Location: Room Exhaust

Site: Room Exhaust Operators: TW/SS Run #: RE-11-2 Date: 5/23/97

Barometric Pressure, in. Hg = Pbar = 29.45 in. Hg

Static Pressure, in. H_2O = Pg = -.61 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.44 in. Hg

Wet-Bulb Temperature, °F = Tw = 56 °F

Dry-Bulb Temperature, °F = Td = 74 °F

Temperature Difference, Td - Tw = ΔT = 18 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.4520 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (0.4520) - \frac{(29.44 - .4520) \times (18)}{2800 - (1.3 \times 56)} = -.261 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.261)}{(29.44)} = 0.009 \approx 0.9\%$$

VPD

$$\frac{521.7}{2727.} = .191$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-23-96
Location: Room Exhaust
Run #: RES-11-3 SPIKE
Stack I.D.: 28"x24"
Pbar: 29.25
Sample Tube #: RES-11-3A, RES-11-3B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: VOST # 2
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1201 Finish: 1231 Total: 30
W/B: — D/B: — O_2: 21 CO_2: 0

		Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1201	0	2328.02	1	150cc	80
1211	10	2329.13	1	150cc	93
1221	20	2330.08	1	150cc	84
1231	30	2331.22	1	160cc	85

$\Delta V = 32$
$\overline{T_m} = 83$

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts =$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.25) + \frac{\quad}{13.6}$

$Ps =$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ ft/s

$As =$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs =$ x x 60

$Qs =$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-23-97
Location: Room Exhaust
Run #: RE-11-3
Stack I.D.: 28" x 28"
Pbar: 29.25
Sample Tube #: RE-11-3A, RE-11-3B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: vost # 1
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1201 Finish: 1231 Total: 30
W/B: 56 D/B: 77 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	T_m
1201 0	7762.90	1	150cc	74
1211 10	7764.18	1	150cc	76
1221 20	7765.47	1	150cc	79
1231 30	7766.65	1	150cc	81

ΔH = 3.75
T_m = 78

STATIC = -.63

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.06	77
2	.07	77
3	.06	77
4	.06	77
5	.07	77
6	.08	77
1	.09	76
2	.08	77
3	.07	77
4	.06	77
5	.06	77
6	.08	77
1	.10	77
2	.09	77
3	.06	77
4	.05	77
5	.06	77
6	.10	77
1	.09	74
2	.07	75
3	.07	77
4	.06	77
5	.07	77
6	.10	77
	$\sqrt{\Delta P}$ = ~~0.2712~~ RG .2695	T_s = 77

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (28.84) \times (1 - \frac{0.8}{100}) + 18 (\frac{0.8}{100})$

$Ms = 28.75$

$Ts = \quad °F = 537 \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (29.25) + \frac{-.63}{13.6}$

$Ps = 29.20$ in. Hg

$\overline{\sqrt{\Delta P}} =$ ~~0.2712~~ RG .2695

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\quad}$

$Vs =$ ~~18.30~~ RG 18.24 ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ ~~5144~~ RG 5107 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ ~~4896~~ RG 4863 dscfm

.11 n.

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: TA Run #: RE-11-3 Date: 5-23-97

Barometric Pressure, in. Hg = Pbar = 29.25 in. Hg

Static Pressure, in. H_2O = Pg = -.63 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.20 in. Hg

Wet-Bulb Temperature, °F = Tw = 56 °F

Dry-Bulb Temperature, °F = Td = 77 °F

Temperature Difference, Td - Tw = ΔT = 21 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.4520 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\ .4520\ ) - \frac{(\ 29.20 - .4520\ ) \times (\ 21\ )}{2800 - (1.3 \times\ 56\ )} = 0.2306 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\ .2306\ )}{(\ 29.20\ )} = 0.008 \simeq 0.8\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: Lasco Pedrinos — Date: 5-23-97
Sampling Location: Oven # 9 — Clock Time: 1010
Run #: 9-11-1 — Operators: DGB/CG
Barometric Pressure, in. Hg: 29.43 — Static Pressure, in. H_2O: -.69
Moisture, %: — — Molecular wt., Dry: — — Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15" — Side 2: —
Wet Bulb, °F: — — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.18	154
2	.15	155
3	.16	157
4	.24	157
5	.24	157
6	.23	154
B 1	.15	154
2	.22	156
3	.24	157
4	.23	157
5	.23	157
6	.21	154
	$\overline{\sqrt{\Delta P}}$ = .444	$\overline{T_s}$ = 156

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

B_{ws} = .8% (from Run 2)

$Ms = 28.79$

$\overline{T_s}$ = °F = 616 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.43$ in. Hg

$\overline{\sqrt{\Delta P}} = .4440$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 32.04$ ft/s

$As = 1.227$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2359$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$ → 137

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-23-97
Location: OVEN #9
Run #: 9-11-2
Stack I.D.: 15"
Pbar: 29.48
Sample Tube #: 9-11-2A - 9-11-2B
Operators: DBS / BC
Leak Check: Pre: .000 @1 Post: .000 @1

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1038 Finish: 1120 Total: 42
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
1038	0	250 cc/min
1048	0	↓
1058	0	
1108	0	
1118	0	
1120	0	✓

113.83
116.65
119.27
122.98
124.40
125.18
ΔV = 11.35

11.35
12 minutes

STATIC -.69 $\bar{T}_m$ = 86

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A - 1	.11	156
2	.14	157
3	.17	157
4	.22	157
5	.24	154
6	.24	154
B - 1	.14	154
2	.23	155
3	.24	156
4	.23	157
5	.22	156
6	.22	155
	$\overline{\sqrt{\Delta P}}$ = .449	156

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

86/86 Md = 28.84

86/85 $Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

86/85 $Ms = (\quad) \times (1 - \frac{.5}{100}) + 18 (\frac{.5}{100})$

87/86 Ms = 28.79

$Ts = 156$ °F = 616 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.48) + \frac{-.69}{13.6}$

Ps = 29.43 in. Hg

$\overline{\sqrt{\Delta P}}$ = 0.4490

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

Vs = 32.40 ft/s

As = 1.227 ft^2

Qs = Vs x As x 60 s/m

Qs = x x 60

Qs = 2385 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

Qs_{std} = 2001 dscfm

VRM

FIELD DATA SHEET

$\gamma = 0.966$

Plant: LASCO – Florence, KY
Sampling Location: OUB # 9
Run Number: 9-11-2 Date: 5-23-97
Pretest Leak Rate: .000 cfm @ 16 in. Hg
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DGS/GG
Pbar: 29.48 Ps: -.69
CO2: — O2: —
Probe Length/Type: 1'SS Pitot #: ST-3
Stack Diameter: 15" As: —

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: ~~.996~~ ΔH@: 1.860
Post-Test Leak Rate: .000 cfm @ 14 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp (Ts)	Temperature °F Probe	Filter	Impinger Temp °F	Dry Gas Meter Temp Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	00		710.042										
	10		718.10		1.86					60	86	86	3
	20		726.00		1.86					46	84	85	3
	30		733.80		1.86					48	82	85	3
	40		742.320		1.86					50	83	87	3

ΔVm = 31.978 $\sqrt{\Delta p}$ = ___ $\overline{\Delta H}$ = 1.86 $\overline{Ts}$ = 156 $\overline{Tm}$ = 85

VRD

SAMPLE RECOVERY DATA

PLANT LASCO Products Run No. 9-11-2

DATE 5-23-91 Sample Box No. N-5 Job No. 5405.003

SAMPLE LOCATION #9 Oven Outlet Filter No.

TRAIN PREPARER GGAK

SAMPLE RECOVERY PERSON GGAK

COMMENTS Moisture train

FRONT HALF

Acetone Container No. Liquid Level Marked Sealed

Filter Container No. Sealed

Description of Filter

Samples Stored and Locked

BACK HALF/MOISTURE

Container No.

Liquid Level Marked Sealed

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	DI H_2O	100	598.1	601.4	3.3
2	DI H_2O	100	589.5	584.7	-4.8
3	Empty	—	495.1	495.1	—
4	Silica Gel	250	790.6	795.1	4.5
5					
6					
TOTAL			2473.3	2476.3	3.0

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 9-11-2 DATE: 5·23·97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{31.978}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (31.978) \times (0.966) \times \left(\frac{(\cancel{1.86}\ 29.48) + (1.86 / 13.6)}{(545)}\right)$$

$$V_{m_{std}} = \underline{29.612}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (3.0)$$

$$V_{w_{std}} = \underline{0.141}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(0.141)}{(0.141) + (29.612)}$$

$B_{ws} =$ 0.005 or ~~error~~ 0.5 % Moisture

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO
Date: 5-23-97
Sampling Location: OVEN #9
Clock Time: 1805
Run #: 9-11-3
Operators: DBB/GG
Barometric Pressure, in. Hg: 29.48
Static Pressure, in. H_2O: -.68
Moisture, %: —
Molecular wt., Dry: —
Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15"
Side 2: —
Wet Bulb, °F: —
Dry Bulb, °F: —

Traverse Point Number	Velocity Head in H_2O	Stack Temp. °F
A-1	.11	155
2	.14	156
3	.17	157
4	.23	157
5	.24	157
6	.23	154
B-1	.17	154
2	.23	156
3	.24	157
4	.23	157
5	.22	157
6	.21	154
	$\overline{\sqrt{\Delta P}}$ = .446	$\overline{T_s}$ = 156

$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$M_d = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$M_d = 28.84$

$M_s = M_d \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$M_s = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$B_{ws} = 0.57$, (from Ru[redacted]

$M_s = 28.79$

$\overline{T_s} = 156$ °F = 616 °R (°F + 460)

$P_s = P_b + \frac{S.P.}{13.6} = (29.48) + \frac{-.68}{13.6}$

$P_s = 29.43$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4460$

$V_s = 85.49 \times C_p \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{P_s \times M_s}}$

$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$V_s = 32.19$ ft/s

$A_s = 1.227$ ft^2

$Q_s = V_s \times A_s \times 60$ s/m

$Q_s = \quad \times \quad \times 60$

$Q_s = 2369$ acfm

$Q_{std} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{\%H_2O}{100})$

$Q_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-23-97
Location: #10 OVEN OUTLET
Run #: 10-11-1
Stack I.D.: 15"
Pbar: 29.48
Sample Tube #: 10-11-1 A & B
Operators: DBS / GG
Leak Check: Pre: .001 @ 1 Post: 000 @ 1

Tested Analyte: STYRENE
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 0912 Finish: 1012 Total: 60
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting
0912	0	250 cc/min
0922	0	
0932	0	
0942	0	
0952	0	
1002	0	
1012	0	

STATIC -.51 Avg = 83

98.30
100.90
103.03
106.14
108.82
111.10
113.78
115.48

77/80
82/81
83/82
84/83
85/84
85/85
86/85

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.13	230
2	.14	230
3	.15	231
4	.14	233
5	.24	231
6	.25	230
B 1	.18	231
2	.24	232
3	.22	233
4	.14	234
5	.21	233
6	.26	231
	$\overline{\sqrt{\Delta P}}$ .443	Avg 231

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{.03}{100}) + 18 (\frac{.03}{100})$

$Ms = 28.84$

$Ts = 231\ °F = 691\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (29.48) + \frac{-.81}{13.6}$

$Ps = 29.42$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4430$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 33.84$ ft/s

$As = 1.227\ ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2492$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 1872$ dscfm

N/A Mike

FIELD DATA SHEET

Plant: CASCO
Sampling Location: # 10 OVEN OUTLET
Run Number: 10-11-1 Date: 5-23-97
Pretest Leak Rate: .001 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: NA

Sample Type: M4 Operator: DB/GG
Pbar: 29.98 Ps: -.81
CO2: — O2: —
Probe Length/Type: 1'SS Pitot #: ST-3
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.86
Post-Test Leak Rate: .000 cfm @ 16 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	00	0912	678.815										
	10	0922	686.70		1.86					60	90	89	4
	20	0932	694.40		1.86					51	83	84	4
	30	0942	702.20		1.86					53	83	85	4
	40	0952	710.048		1.86					54	84	88	4
										~~57~~	~~88~~	~~87~~	~~4~~

ΔVm= 31.233 $\overline{\sqrt{\Delta p}}$= — $\overline{\Delta H}$= 1.86 $\overline{Ts}$= 231 $\overline{Tm}$= 86

✓RD

SAMPLE RECOVERY DATA

Plant: LASCO Run No.: 10-11-1

Date: 5-23-97 Sample Box No.: N-6 Job No.: 5905.003

Sample Location: #10 OVEN OUTLET

Sample Type: M-4 Filter No.: —

Sample Recovery Person: GGA

Comments: MOISTURE TRAIN

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H_2O	100	611.9	611.6	-.3
2	H_2O	100	639.5	639.8	0.3
3	Empty	—	456.0	456.6	.6
4	S/G	250	750.0	751.6	1.6
5					
6					
TOTAL			2457.4	2459.6	2.2

Description of Impinger Catch: —

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EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 10-11-1 DATE: 5-23-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = 31.233 \ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m} \right)$$

$$V_{m_{std}} = 17.64 \times (31.233) \times (0.966) \times \left(\frac{(29.48) + (1.86 / 13.6)}{(546)} \right)$$

$$V_{m_{std}} = 28.869 \ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (2.2)$$

$$V_{w_{std}} = 0.104 \ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(0.104)}{(0.104) + (28.869)}$$

$B_{ws} =$ 0.004 m 0.4 % Moisture ✓PTS

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO
Date: 5-23-97
Sampling Location: ~~Compost~~ OVEN # 10
Clock Time: 1100
Run #: 10-11-2
Operators: DBL/CG
Barometric Pressure, in. Hg: 29.48
Static Pressure, in. H_2O: -.81
Moisture, %: —
Molecular wt., Dry: —
Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15"
Side 2: —
Wet Bulb, °F: —
Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A-1	.11	220
2	.14	226
3	.16	231
4	.16	233
5	.19	232
6	.26	231
B-1	.16	230
2	.22	232
3	.22	234
4	.19	234
5	.23	230
6	.24	230
	$\overline{\sqrt{\Delta P}}$ = .433	$\overline{T_s}$ = 230

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{.5}{100}) + 18(\frac{.5}{100})$

$Ms = \cancel{28.79}$ lb 28.75

$\overline{T_s} = 230$ °F = 690 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.48) + \frac{-.81}{13.6}$

$Ps = 29.42$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4330$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 33.08$ ft/s

$As =$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 2485$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100}) \rightarrow 142$

B_{ws} = ~~0.5%~~ .8% (Avg of Run 1)

FIELD DATA SHEET

Plant: LASCO
Sampling Location: OVEN # 10
Run Number: 10-11-3 Date: 5-23-97
Pretest Leak Rate: .000 cfm @ 12 in. Hg
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: M-4 Operator: DDB/GG
Pbar: 29.48 Ps: -.81
CO2: — O2: —
Probe Length/Type: 1'SS Pitot #: ST-3
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: — Thermocouple #: 4B
Assumed Bws: — Filter #: —
Meter Box #: 14 Y: .966 ΔH@: 1.869
Post-Test Leak Rate: .000 cfm @ 15 in. Hg
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp °F	Dry Gas Meter Temp Inlet (Tm in °F)	Dry Gas Meter Temp Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	00	1201	742.430										
	10	1211	750.25		1.86					60	85	85	4
	20	1221	758.30		1.86					49	90	90	4
	30	1231	766.30		1.86					51	84	88	4
	40	1241	773.970		1.86					52	90	85	4
				VELOCITY		STACK	Temp						
			A-1	.11		221							
			2	.14		225		V_s =	~~33.51~~ 33.70 fps				
			3	.15		230							
			4	.19		231		Q_s =	~~2467~~ 2481 acfm				
			5	.25		234							
			6	.24		233		Q_{std} =	~~1835~~ 1843 dscfm				
			B-1	.17		230							
			2	.23		232							
			3	.22		234							
			4	.14		234							
			5	.23		232							
			6	.25		231							

ΔVm = ~~35.540~~ [redacted] $\overline{\sqrt{\Delta p}}$ = .440 $\overline{\Delta H}$ = 1.86 [redacted] $\overline{Ts}$ = 231 = 691 R [redacted] $\overline{Tm}$ = 87

[redacted] M1

SAMPLE RECOVERY DATA

Plant: LASCO Run No.: 10-11-3

Date: 5-23-97 Sample Box No.: W-6 Job No.: S405.003

Sample Location: #10 OUCO OUTLET

Sample Type: M-4 Filter No.: —

Sample Recovery Person: GGMK

Comments: MOISTURE TRAIN

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H2O	100	611.6	613.0	1.4
2	H2O	100	639.8	639.8	0.0
3	EMPTY	—	456.6	457.1	0.5
4	S/G	250	738.3	743.7	5.4
5					
6					
TOTAL			2446.3	2453.6	7.3

Description of Impinger Catch: —

VLD

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 10-11-3 DATE: 5-23-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \text{RD } \cancel{35.540}\ 31.540 \text{ ft}^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (\text{RD } \cancel{35.540}\ 31.540) \times (0.966) \times \left(\frac{(29.48) + (1.86 / 13.6)}{(87+460)}\right)$$

$$V_{m_{std}} = \cancel{32.79}\ 29.100 \text{ RD dscf}$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (7.3)$$

$$V_{w_{std}} = 0.3436 \text{ scf}$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.3436)}{(.3436) + (32.29)}$$

$$B_{ws} = 0.010 \simeq \cancel{1.0\%}\ \text{RD } 1.2\%$$

VRD

METHOD 18 FIELD DATA SHEET

Plant: Lasco
Date: 5/23/97
Location: NOO-A
Run #: NOA-11
Stack I.D.: 32" x 120"
Pbar: 29.48
Sample Tube #:
Operators: SS/TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: VOST #3
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 0914 Finish: 1014 Total: 60
W/B: – D/B: – O_2: 21 CO_2: –

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0914 0	1558.44	1	21	75
0924 10	1561.00	1	21	77
0934 20	1563.42	1	21	79
0944 30	1565.12	1	21	81
0954 40	1568.12	1	21	85
1004 50	1570.45	1	21	87
1014 60	1572.838	1	21	89

ΔV = 14.40
T_m = 82

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

VB

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APPENDIX A.1.13

Condition 12
(includes flows, moistures, and Method 18)

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: Main Exhaust
Run #: ME-12-1
Stack I.D.: ~~29.3~~ 17.5
Pbar: 29.3
Sample Tube #: ME-12-1A, ME-12-1B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: VOST #7
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 0837 Finish: 0852 Total: 15
W/B: 66 D/B: 79 O_2: 21 CO_2: 0

		Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0837	0	2331.30	1	150cc	56
0842	5	2331.83	1	150cc	58
0847	10	2332.55	1	150cc	60
0852	15	2333.12	1	150cc	62

ΔV = 1.82

Tm = 59

Start = .07

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	79
2	.27	79
3	.30	79
4	.31	79
5	.37	79
6	.33	79
7	.35	79
8	.38	79
1	.26	79
2	.27	79
3	.27	79
4	.28	79
5	.29	79
6	.27	79
7	.27	79
8	.29	79
$\overline{\sqrt{\Delta P}}$	0.5398	T_s = 79

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.7}{100}) + 18 (\frac{1.7}{100})$

$Ms = 28.64$

$Ts = 79$ °F = 539 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.3) + \frac{.07}{13.6}$

$Ps = 29.31$ in. Hg

$\overline{\sqrt{\Delta P}} = .5398$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\quad}$

$Vs = 36.60$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3667$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3459$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main Exhaust

Site: Main Exhaust Operators: TA Run #: ME-12-1 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.30 in. Hg

Static Pressure, in. H_2O = Pg = .07 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.31 in. Hg

Wet-Bulb Temperature, °F = Tw = 66 °F

Dry-Bulb Temperature, °F = Td = 79 °F

Temperature Difference, Td - Tw = ΔT = 13 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6442 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.6442) - \frac{(29.31 - .6442) \times (13)}{2800 - (1.3 \times 66)} = 0.5069 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.5069)}{(29.31)} = 0.017 \cong 1.7\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: Main Exhaust
Run #: MES-12-2 SPIKE
Stack I.D.: 17.5
Pbar: 29.3
Sample Tube #: MES-12-2A, MES-12-2B
Operators:
Leak Check: Pre: ✓ Post: VOID

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: UGS1 #1
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1008 Finish: 1108 Total: 60
W/B: 64 D/B: 76 O_2: 21 CO_2: 0

		Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1008	0	7770.94	1	150cc	59
1018	10	7772.37	1	.50cc	61
	20			.50cc	
	30			150cc	
	40			.50cc	
	50			150cc	
	60			150cc	

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

VOID

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

Md =

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

Ms =

Ts = °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

Ps = in. Hg

$\sqrt{\overline{\Delta P}} =$

$Vs = 85.49 \times Cp \times \sqrt{\overline{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{}{}}$

Vs = ft/s

As = ft^2

Qs = Vs x As x 60 s/m

Qs = x x 60

Qs = acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} =$ dscfm

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: Main Exhaust
Run #: ME-12-2
Stack I.D.: 17.5
Pbar: 29.3
Sample Tube #: ME-12-2 A,B
Operators: TH
Leak Check: Pre: ✓ Post: VOID

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: USGF # 2
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1008 Finish: 1108 Total: 60
W/B: 64 D/B: 76 O_2: 21 CO_2: 0

		Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1008	0	2333.17	1	150 cc	57
1018	10	2334.46	1	150 cc	63
	20			150 cc	
	30			150 cc	
	40			150 cc	
	50			150 cc	
	60			150 cc	

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	78
2	.27	75
3	.28	75
4	.28	75
5	.30	75
6	.33	76
7	.35	76
8	.38	76
1	.25	77
2	.26	77
3	.26	77
4	.27	77
5	.25	77
6	.26	77
7	.27	77
8	.28	77

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (29) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts =$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.3) + \frac{.03}{13.6}$

$Ps = 29.3$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{29.3}}$

$Vs =$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.3}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ dscfm

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METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: Main Exhaust
Run #: MES-12-3
Stack I.D.: 17.5
Pbar: 29.3
Sample Tube #: MES-12-3 A, B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: VOST #1
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1105 Finish: 1205 Total: 60
W/B: — D/B: — O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1105 0	7773.84	1	150 cc	60
1115 10	7776.72	1	150 cc	61
1125 20	7778.25	1	150 cc	63
1135 30	7779.32	1	150 cc	65
1145 40	7780.54	1	150 cc	66
1155 50	7781.73	1	150 cc	68
1205 60	7782.78	1	150 cc	69

Vm 8.94 Tm = 65

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$

$$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$$

$$Md = 29$$

$$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$$

$$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$$

$$Ms =$$

$$Ts = \quad °F = \quad °R \ (°F + 460)$$

$$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$$

$$Ps = \quad \text{in. Hg}$$

$$\overline{\sqrt{\Delta P}} =$$

$$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$$

$$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$$

$$Vs = \quad \text{ft/s}$$

$$As = \quad ft^2$$

$$Qs = Vs \times As \times 60 \text{ s/m}$$

$$Qs = \quad \times \quad \times 60$$

$$Qs = \quad \text{acfm}$$

$$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$$

$$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$$

$$Qs_{std} = \quad \text{dscfm}$$

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: Main Exhaust
Run #: ME-12-3
Stack I.D.: 17.5
Pbar: 29.3
Sample Tube #: ME-12-3 A, B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: VOST #2
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1105 Finish: 1205 Total: 60
W/B: 65 D/B: 80 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1105 0	2335.59	1	150cc	62
1115 10	2337.73	1	150cc	65
1125 20	2339.30	1	150cc	66
1135 30	2339.84	1	150cc	69
1145 40	2340.55	1	150cc	71
1155 50	2342.75	1	150cc	73
1205 60	2344.22	1	150cc	74

Vm 8.63

Temp = 69

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	80
2	.25	80
3	.27	81
4	.27	81
5	.31	81
6	.33	81
7	.35	81
8	.37	80
1	.25	80
2	.26	80
3	.25	80
4	.27	80
5	.25	80
6	.25	80
7	.26	80
8	.26	80
		T_s = 80

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.6}{100}) + 18 (\frac{1.6}{100})$

$Ms = 28.67$

$Ts = 80\ °F = 540\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (29.3) + \frac{.02}{13.6}$

$Ps = 29.3$ in. Hg

$\overline{\sqrt{\Delta P}} = .5250$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5250) \times \sqrt{\frac{540}{29.3 \times}}$

$Vs = 35.03$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 3571$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.3}{540} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3364$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: MAIN EXHAUST

Site: MAIN Exhaust Operators: TJ Run #: ME-12-3 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.3 in. Hg

Static Pressure, in. H_2O = Pg = 02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.3 in. Hg

Wet-Bulb Temperature, °F = Tw = 65 °F

Dry-Bulb Temperature, °F = Td = 80 °F

Temperature Difference, Td - Tw = ΔT = 15 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6222 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\ 6222\ ) - \frac{(\ 29.3 - .6222\ ) \times (\ 15\ )}{2800 - (1.3 \times 65\ )} = .4638 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\ 4638\ )}{(\ 29.3\ )} = 0.158 \approx 1.6\%$$

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VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97
Sampling Location: Main Exhaust Clock Time: 1317
Run #: [redacted] ME-12-4 Operators: TA/SS
Barometric Pressure, in. Hg: 29.3 Static Pressure, in. H_2O: .02
Moisture, %: 1.9% Molecular wt., Dry: 29 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 17.5 Side 2: —
Wet Bulb, °F: 68 Dry Bulb, °F: 82

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	82
2	.26	82
3	.27	82
4	.27	82
5	.29	82
6	.31	82
7	.33	82
8	.36	82
1	.24	82
2	.25	81
3	.26	81
4	.27	81
5	.25	82
6	.24	82
7	.25	82
8	.23	82
	$\overline{\sqrt{\Delta P}}$ = .5180	$\overline{Ts}$ = 82

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.9}{100}) + 18 (\frac{1.9}{100})$

$Ms = 28.63$

$\overline{Ts} = 82$ °F = 542 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.3) + \frac{.02}{13.6}$

$Ps = 29.3$ in. Hg

$\overline{\sqrt{\Delta P}} = .5180$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5180) \times \sqrt{\frac{542}{29.3 \times}}$

$Vs = 35.24$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = 35.24 \times 1.67 \times 60$

$Qs = 3531$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.3}{542} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3305$ dscfm

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WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main Exhaust

Site: Main Exhaust Operators: TAKS Run #: ME-12-4 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.3 in. Hg

Static Pressure, in. H_2O = Pg = 02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.3 in. Hg

Wet-Bulb Temperature, °F = Tw = 68 °F

Dry-Bulb Temperature, °F = Td = 82 °F

Temperature Difference, Td - Tw = ΔT = 14 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6903 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\ .6903\ ) - \frac{(\ 29.3\ -\ .6903\ ) \times (\ 14\ )}{2800 - (1.3 \times\ 68\ )} = .5426 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\ .5426\ )}{(\ 29.3\ )} = 0.0185 \simeq 1.9\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1876	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97
Sampling Location: Room Exhaust Clock Time: 0930
Run #: RE-12-1 Operators: TA / SS
Barometric Pressure, in. Hg: 29.3 Static Pressure, in. H_2O: -.65
Moisture, %: 1.6 Molecular wt., Dry: 29 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 28" Side 2: 24"
Wet Bulb, °F: 63 Dry Bulb, °F: 74

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.07	74
2	.07	74
3	.05	74
4	.05	74
5	.06	74
6	.06	74
1	.08	74
2	.08	74
3	.05	74
4	.05	74
5	.04	74
6	.08	74
1	.08	74
2	.07	74
3	.06	74
4	.05	74
5	.05	74
6	.09	74
1	.09	74
2	.07	74
3	.05	73
4	.05	73
5	.06	74
6	.09	73
	$\overline{\sqrt{\Delta P}}$ = .2524	$\overline{Ts}$ = 74

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.6}{100}) + 18 (\frac{1.6}{100})$

$Ms = 28.67$

$\overline{Ts} =$ °F = 534 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.3) + \frac{-.65}{13.6}$

$Ps = 29.25$ in. Hg

$\overline{\sqrt{\Delta P}} = .2524$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\quad}$

$Vs = 17.05$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 4774$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4541$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: TH/SS Run #: RE-12-1 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.30 in. Hg

Static Pressure, in. H_2O = Pg = -0.65 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.25 in. Hg

Wet-Bulb Temperature, °F = Tw = 63 °F

Dry-Bulb Temperature, °F = Td = 74 °F

Temperature Difference, Td - Tw = ΔT = 11 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.5802 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\ .5802\ ) - \frac{(\ 29.25\ -\ .5802\ ) \times (\ 11\ )}{2800 - (1.3 \times\ 63\ )} = 0.4642 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\ 0.4642\ )}{(\ 29.25\ )} = 0.0158 \simeq 1.6\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: Room Exhaust
Run #: RE-12-2
Stack I.D.: 28" x 24"
Pbar:
Sample Tube #: RE-12-2A, RE-12-2B
Operators: TA
Leak Check: Pre:_____ Post:_____

Tested Analyte: Styrene
Orifice Tank #:
Pump/Rotometer #: Vost #2
Pt: Pretest (mm Hg):
Post-Test (mm Hg):
Tt: Pretest (°F):
Post-Test (°F):
Time: Start:_____ Finish:_____ Total:_____
W/B:_____ D/B:_____ O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting
0			150cc
10			150cc
20			150cc
30			150cc

Static

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1		
2		
3		
4		
5		
6		
1		
2		
3		
4		
5		
6		
1		
2		
3		
4		
5		
6		
1		
2		
3		
4		
5		
6		

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{}{}}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} = \quad$ dscfm

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97
Sampling Location: Room Exhaust Clock Time: 1128
Run #: RE - 12-3 Operators: TA/SS
Barometric Pressure, in. Hg: 29.3 Static Pressure, in. H_2O: -.64
Moisture, %: 1.62 Molecular wt., Dry: 29 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 28" Side 2: 24"
Wet Bulb, °F: 63 Dry Bulb, °F: 74

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.07	75
2	.06	75
3	.06	74
4	.06	74
5	.06	74
6	.07	74
1	.08	74
2	.07	74
3	.05	74
4	.05	74
5	.05	74
6	.08	75
1	.09	74
2	.07	74
3	.05	74
4	.05	74
5	.05	74
6	.10	73
1	.11	74
2	.06	74
3	.05	74
4	.05	74
5	.06	74
6	.10	74
	$\overline{\sqrt{\Delta P}}$ = .2514	$\overline{Ts}$ = 74

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29 \quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.67$

$\overline{Ts} = \quad °F = 534 \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.25$ in. Hg

$\overline{\sqrt{\Delta P}} = .2561$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$Vs = 17.30$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 4846$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4610$ dscfm

/14

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: TAJ Run #: RE-12-3 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.3 in. Hg

Static Pressure, in. H_2O = Pg = -.64 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.25 in. Hg

Wet-Bulb Temperature, °F = Tw = 63 °F

Dry-Bulb Temperature, °F = Td = 74 °F

Temperature Difference, Td - Tw = ΔT = 11 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.5802 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$$Pva = (.5802) - \frac{(29.25 - .5802) \times (11)}{2800 - (1.3 \times 63)} = .4642 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.4642)}{(29.25)} = .0158 \simeq 1.6\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97
Sampling Location: Room Exhaust Clock Time: 1242
Run #: RE-12-4 Operators: TA/SS
Barometric Pressure, in. Hg: 29.3 Static Pressure, in. H_2O: -.62
Moisture, %: 1.7 Molecular wt., Dry: 29 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 28" Side 2: 24"
Wet Bulb, °F: 64 Dry Bulb, °F: 75

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.05	75
2	.06	75
3	.05	75
4	.06	75
5	.06	75
6	.07	75
1	.06	75
2	.05	75
3	.05	75
4	.05	75
5	.05	75
6	.06	75
1	.08	75
2	.07	75
3	.05	75
4	.04	75
5	.05	75
6	.09	75
1	.07	75
2	.06	75
3	.05	75
4	.05	75
5	.06	75
6	.08	75
	$\overline{\sqrt{\Delta P}}$ = .2421	$\overline{T_s}$ = 75

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.7}{100}) + 18 (\frac{1.7}{100})$

$Ms = 28.66$

$\overline{T_s} = 75$ °F = 535 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.3) + \frac{-.62}{13.6}$

$Ps = 29.25$ in. Hg

$\overline{\sqrt{\Delta P}} = .2421$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2421) \times \sqrt{\frac{535}{29.25 \times}}$

$Vs = 16.37$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times 4.67 \quad \times 60$

$Qs = 4587$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.25}{535} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4350$ dscfm

JLD

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: ~~SPS~~ Room Exhaust

Site: Room Exhaust Operators: TA/SS Run #: RE-12-4 Date: 5-29-87

Barometric Pressure, in. Hg = Pbar = 29.3 in. Hg

Static Pressure, in. H_2O = Pg = -0.62 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.25 in. Hg

Wet-Bulb Temperature, °F = Tw = 64 °F

Dry-Bulb Temperature, °F = Td = 75 °F

Temperature Difference, Td - Tw = ΔT = 11 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6009 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\ .6009\ ) - \frac{(\ 29.25 - .6009\ ) \times (\ 11\ )}{2800 - (1.3 \times\ 64\ )} = 0.4849 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\ .4849\ )}{(\ 29.25\ )} = 0.0166 \simeq 1.7\%$$

✓BZ

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-99
Location: Auxillary Exhaust
Run #: AF-12-1
Stack I.D.: 19.75
Pbar: 29.3
Sample Tube #: AF-12-1A, AF-12-1B
Operators: TH
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: Vost #1
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 0837 Finish: 0907 Total: 30
W/B: 03 D/B: 72 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
0837 0	7767.00	1	150cc	55
0847 10	7768.19	1	150cc	58
0857 20	7769.50	1	150cc	60
0907 30	7770.90	1	150cc	62

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.7}{100}) + 18 (\frac{1.7}{100})$

$Ms = 28.66$

$Ts = 72$ °F $= 532$ °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.3) + \frac{-.86}{13.6}$

$Ps = 29.24$ in. Hg

$\overline{\sqrt{\Delta P}} = .5713$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\quad}$

$Vs = 38.53$ ft/s

$As = 2.13$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 4924$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4694$ dscfm

ΔV: 39

Tm = 59

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	~~.23~~ .28	72
2	~~.27~~ .33	72
3	~~.30~~ .37	72
4	~~.31~~ .38	72
5	~~.32~~ .41	72
6	~~.33~~ .39	72
7	~~.35~~ .32	72
8	~~.38~~ .30	72
1	.20	72
2	.30	73
3	.33	72
4	.38	74
5	.38	72
6	.34	72
7	.29	72
8	.26	72
$\overline{\sqrt{\Delta P}}$	0.5713	$\overline{T_s}$ = 72

11.1

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Auxillary Exhaust

Site: Auxiliary Fan Operators: TA Run #: AF-12-1 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.3 in. Hg

Static Pressure, in. H_2O = Pg = -30 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.24 in. Hg

Wet-Bulb Temperature, °F = Tw = 63 °F

Dry-Bulb Temperature, °F = Td = 72 °F

Temperature Difference, Td - Tw = ΔT = 9 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.5802 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.5802) - \frac{(29.24 - .5802) \times (9)}{2800 - (1.3 \times 63)} = 0.4853 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.4853)}{(29.24)} = 0.166 \cong 1.7\%$$

JCB

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-25-97
Sampling Location: Auxillary Fan Clock Time: 1120
Run #: AF-12-3 Operators: TH / SS
Barometric Pressure, in. Hg: 29.3 Static Pressure, in. H_2O: -.85
Moisture, %: 1.6 Molecular wt., Dry: 29 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 19.75 Side 2:
Wet Bulb, °F: 63 Dry Bulb, °F: 73

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.29	70
2	.34	70
3	.36	70
4	.39	73
5	.42	73
6	.36	75
7	.34	75
8	.28	74
1	.26	73
2	.31	73
3	.31	73
4	.35	73
5	.39	73
6	.33	73
7	.32	73
8	.29	73
	$\overline{\sqrt{\Delta P}}$ = 0.5765	$\overline{T_s}$ = 73

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$

$$M_d = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$$

$$M_d = 29$$

$$M_s = M_d \times \left(1 - \frac{\%H_2O}{100}\right) + 18\left(\frac{\%H_2O}{100}\right)$$

$$M_s = (29) \times \left(1 - \frac{1.6}{100}\right) + 18\left(\frac{1.6}{100}\right)$$

$$M_s = 28.67$$

$$\overline{T_s} = 73\ °F = 533\ °R\ (°F + 460)$$

$$P_s = P_b + \frac{S.P.}{13.6} = (29.3) + \frac{-.85}{13.6}$$

$$P_s = 29.24 \text{ in. Hg}$$

$$\overline{\sqrt{\Delta P}} = .5765$$

$$V_s = 85.49 \times C_p \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s\,(°R)}{P_s \times M_s}}$$

$$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$$

$$V_s = 38.91 \text{ ft/s}$$

$$A_s = 2.13 \text{ ft}^2$$

$$Q_s = V_s \times A_s \times 60 \text{ s/m}$$

$$Q_s = \quad \times \quad \times 60$$

$$Q_s = 4967 \text{ acfm}$$

$$Q_{s_{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times \left(1 - \frac{\%H_2O}{100}\right)$$

$$Q_{s_{std}} = \quad \times 17.647 \times \frac{\quad}{\quad} \times \left(1 - \frac{\quad}{100}\right)$$

$$Q_{s_{std}} = 4731 \text{ dscfm}$$

RD

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Auxillary Fan

Site: Auxiliary Operators: TA/S Run #: AF-12-3 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.3 in. Hg

Static Pressure, in. H_2O = Pg = -.85 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.24 in. Hg

Wet-Bulb Temperature, °F = Tw = 63 °F

Dry-Bulb Temperature, °F = Td = 73 °F

Temperature Difference, Td - Tw = ΔT = 10 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = .5502 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (.5502) - \frac{(29.24 - .5502) \times (10)}{2800 - (1.3 \times 63)} = .4748 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.4748)}{(29.24)} = .016 \simeq 1.6\%$$

VBZ

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: Auxillary Fan
Run #: AFS - 12 - 4 SPIKE
Stack I.D.: 19.75
Pbar: 29.3
Sample Tube #: AFS - 12-4 A, B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: vac + #1
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1231 Finish: 1331 Total: 60
W/B: – D/B: – O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	TA
1231 0	7783.41	1	150cc	66
1241 10	7784.94	1	150cc	67
1251 20	7786.41	1	150cc	67
1301 30	7787.83	1	150cc	68
1311 40	7789.23	1	150cc	69
1321 50	7790.72	1	150cc	70
1331 60	7792.13	1	150cc	70

V_m = 8.72 $\bar{T}$ = 68

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

BE

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: Auxillary Fan
Run #: AF-12-4
Stack I.D.: 19.75
Pbar: 29.3
Sample Tube #: AF-12-4A, B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: vost # 2
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1231 Finish: 1331 Total: 60
W/B: 64 D/B: 76 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1231 0	2344.42	1	150 cc	71
1241 10	2346.06	1	150cc	72
1251 20	2347.65	1	150cc	73
1301 30	2349.29	1	150cc	74
1311 40	2350.89	1	150cc	75
1321 50	2352.47	1	150cc	76
1331 60	2354.13	1	150cc	77

V_m = 9.71

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.22	72
2	.31	73
3	.34	73
4	.36	74
5	.39	76
6	.37	76
7	.31	76
8	.28	76
1	.23	76
2	.26	76
3	.29	76
4	.34	76
5	.36	76
6	.33	76
7	.30	76
8	.27	76
.88	.5550	Ts = 76

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.6}{100}) + 18 (\frac{1.6}{100})$

$Ms = 28.67$

$Ts = 76$ °F = 536 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.3) + \frac{-.80}{13.6}$

$Ps = 29.24$ in. Hg

$\overline{\sqrt{\Delta P}} = .5550$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5550) \times \sqrt{\frac{536}{29.24 \times 46.972}}$

$Vs = 37.56$ ft/s

$As = 2.13$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times 2.13 \times 60$

$Qs = 4800$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.24}{536} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4547$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Auxillary FAN

Site: Auxiliary FAN Operators: TAI Run #: AF-12-4 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.3 in. Hg

Static Pressure, in. H_2O = Pg = -.80 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.24 in. Hg

Wet-Bulb Temperature, °F = Tw = 64 °F

Dry-Bulb Temperature, °F = Td = 76 °F

Temperature Difference, Td - Tw = ΔT = 12 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6009 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\ 6009\ ) - \frac{(\ 29.24 - .6009\ ) \times (\ 12\ )}{2800 - (1.3 \times 64\ )} = 0.4744 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\ .4744\ )}{(\ 29.24\ )} = 0.016 \simeq 1.6\%$$

VBE

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: Lasco — Date: 5.29.97

Sampling Location: # 9 oven outlet — Clock Time: 855

Run #: 9 12-1 — Operators: GGAT

Barometric Pressure, in. Hg: 29.30 — Static Pressure, in. H_2O: -.66

Moisture, %: 3.0 — Molecular wt., Dry: 28.84 — Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 15 — Side 2: —

Wet Bulb, °F: — — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in H_2O	Stack Temp. °F
1	.66	176
2	.66	176
3	.66	176
4	.66	176
5	.65	177
6	.65	173
1	.67	177
2	.66	177
3	.67	180
4	.67	177
5	.67	187
6	.66	176
	$\sqrt{\Delta P}$ = .9134	$\overline{Ts}$ = 177

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$B_{ws} = 3.0\%$

$Ms = \cancel{28.73}$ 28.51

$\overline{Ts} = 177$ °F = 637 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.25$ in. Hg

$\overline{\sqrt{\Delta P}} = .8134$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 60.17$ ft/s

$As = 1.22$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \cancel{4414}$ 4430 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

3482

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: #9 OVEN OUTLET
Run #: 9-12-3
Stack I.D.: 15
Pbar: 29.30
Sample Tube #: 9-12-3 A & B
Operators: GG / RM
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: STYRENE
Orifice Tank #: NA
Pump/Rotometer #: -
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1105 Finish: 1204 Total: 58
W/B: — D/B: — O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting
114.781	0 1105	0	250
114.4	10 1115	0	250
114.6	20 1125	0	250
114.9	30 1135	0	250
115.3	40 1145	0	250
	50 1155	0	250
115.551	60 1204	0	250

Temp IN/OUT

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.66	173
2	.66	173
3	.68	174
4	.67	174
5	.67	174
6	.66	170
B 1	.66	167
2	.66	167
3	.67	167
4	.66	168
5	.67	170
6	.67	170
	.8159	170

1,350

= .84

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

8483 $Md =$

8483 $Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

8483 $Ms = (\quad) \times (1 - \frac{3.0}{100}) + 18 (\frac{3.0}{100})$

8584

8581 $Ms =$ ~~28.73~~ 28.51

$Ts = 170$ °F $= 630$ °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 29.22 in. Hg

$\sqrt{\Delta P} = .8159$

$Vs = 85.49 \times Co \times \sqrt{\Delta P} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ ~~59.85~~ ft/s 60.03

$As =$ 1.72 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ ~~4405~~ acfm 4419

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ ~~2542~~ 3511 dscfm

RD.

FIELD DATA SHEET

Plant: LAS CO
Sampling Location #9 OVEN OUTLET
Run Number: 9-12-3 Date: 5-29-97
Pretest Leak Rate: .001 cfm @ 15 in. Hg
Pretest Leak Check: Pitot: ✓ Orsat: NN

Sample Type: M-4 Operator: G G
Pbar: 29.30 Ps: -0.80
CO2: 0 O2: 21
Probe Length/Type: 3'SS Pitot #: 553B
Stack Diameter: 15" As: 1.23 ft²

Nozzle ID: D1 Thermocouple #: 4B
Assumed Bws: 1 Filter #: NA
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: 0 cfm @ 3 in. Hg
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp °F	Dry Gas Meter Temp Inlet (Tm in °F)	Dry Gas Meter Temp Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	11:05	817.314										
	10	1115	824.9		1.8	1.8		—	—	62	91	90	3
	20	1125	833.0		1.8	1.8				51	87	91	3
	30	1135	840.9		1.8	1.8				52	87	91	3
	40	1145	848.975		1.8	1.8				52	87	91	3

ΔVm = 31.661 $\overline{\sqrt{\Delta p}}$ = — $\overline{\Delta H}$ = 1.8 $\overline{T_s}$ = — $\overline{T_m}$ = 89

[redacted]

SAMPLE RECOVERY DATA

Plant: LASCO Run No.: 9-12-3

Date: 5-29-97 Sample Box No.: W-2 Job No.: S905.003

Sample Location: # 9 OVEN OUTLET

Sample Type: MOISTURE Filter No.: —

Sample Recovery Person: GG

Comments: MOISTURE TRAIN

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

613.0

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H2O	100	~~630~~ 613.0	622.2	9.2
2	H2O	100	638.9	641.5	2.6
3	EMPTY	—	457.1	457.3	.2
4	S/G	250	743.7	750.5	6.8
5					
6					
TOTAL			2452.7	2471.5	18.8

Description of Impinger Catch: —

✓ RD

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 9-12-3 DATE: 5-29-92

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{31.661}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (31.661) \times (0.966) \times \left(\frac{(29.30) + (1.862 / 13.6)}{(89+460)}\right)$$

$$V_{m_{std}} = \underline{28.93}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (18.8)$$

$$V_{w_{std}} = \underline{0.8849}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.8849)}{(.8849) + (28.93)}$$

$$B_{ws} = \underline{0.0291 \simeq 3.0\%}$$

/0 M

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO — Date: 5.29.97

Sampling Location: #9 Oven — Clock Time: 1247

Run #: 9-12-4 — Operators: Gen

Barometric Pressure, in. Hg: 29.30 — Static Pressure, in. H_2O: -.79

Moisture, %: 3.0 — Molecular wt., Dry: 28.84 — Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 15 — Side 2: —

Wet Bulb, °F: — — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.66	171
2	.66	173
3	.65	175
4	.65	176
5	.65	175
6	.65	166
B 1	.66	169
2	.66	171
3	.66	175
4	.66	175
5	.66	176
6	.66	175
	$\overline{\sqrt{\Delta P}}$ = .8091	$\overline{T_s}$ = 173

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.53$ 28.51

$\overline{T_s} = 173$ °F = 633 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.24$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{P_s \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ ~~59.49~~ 59.67 ft/s

$As = 1.22$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ ~~4348~~ 4393 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

3474

B_{ws} = 3.0%

159/11

FIELD DATA SHEET

Plant: Lasco Products
Sampling Location #10 Duct outlet
Run Number: 10-12-1 Date: 5-29-97
Pretest Leak Rate: .001 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: NA

Sample Type: M-4 Operator: GGM
Pbar: 29.30 Ps: -.80
CO2: 0 O2: 21
Probe Length/Type: SS Pitot #: 55749
Stack Diameter: 15 As: 1.23 ft²

Nozzle ID: NA Thermocouple #: 4B
Assumed Bws: 1 Filter #: NA
Meter Box #: 14 Y: 966 ΔH@: 1.862
Post-Test Leak Rate: — cfm @ 3 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp (Ts)	Temperature °F Probe	Filter	Impinger Temp °F	Dry Gas Meter Temp Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
0	836		774.305										
10	846		783.1		1.8	1.8				50	90	90	3
20	856		790.5		1.8	1.8				48	90	90	3
30	906		798.2		1.8	1.8				52	91	90	3
40	916		806.009		1.8	1.8				53	91	90	3
					See	Line	14						
1				.18			229						
2				.18			231						
3				.18			232						
4				.20			235						
5				.25			228						
6				.24			230						
1				.21			232						
2				.22			234						
3				.22			236						
4				.18			237						
5				.21			237						
6				.22			233						

ΔVm= 31.704 $\overline{\sqrt{\Delta p}}$= .5580 $\overline{\Delta H}$= 1.81 $\overline{Ts}$= 233 $\overline{Tm}$= 90

SAMPLE RECOVERY DATA

10-12-1

Plant: LASCO

Run No.: ~~12-10-1~~ 5E

Date: 5-29-97

Sample Box No.: N-5

Job No.: 5405.003

Sample Location: #10 OVEN OUTLET

Sample Type: MOISTURE — M4

Filter No.: NA

Sample Recovery Person: G Gon

Comments: MOISTURE TRAIN

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H_2O	100	601.4	606.2	4.8
2	H_2O	100	584.7	586.8	2.1
3	Empty	—	495.1	495.9	.8
4	S/G	250	747.7	743.0	-4.7
5					
6					
TOTAL			2428.9	2431.9	3.0

Description of Impinger Catch: _____

✓ RD

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASD SOURCE/RUN #: 10-12-1 DATE: 5-29-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = 31.704 \ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m} \right)$$

$$V_{m_{std}} = 17.64 \times (31.704) \times (0.96) \times \left(\frac{(29.30) + (1.862 / 13.6)}{(90+460)} \right)$$

$$V_{m_{std}} = 28.91 \ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (3.0)$$

$$V_{w_{std}} = 0.1412 \ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.1412)}{(.1412) + (28.91)}$$

$$B_{ws} = .005 \approx 0.5\%$$

METHOD 18 FIELD DATA SHEET

Plant: LASCO PRODUCTS
Date: 5-29-97
Location: #10 ACCU OUTLET
Run #: ~~1-2-10-3~~ 10-12-1
Stack I.D.: 15
Pbar: 29.30
Sample Tube #: 10-12 1 A & B
Operators: GGT
Leak Check: Pre: 1001 Post: ✓

Tested Analyte: STYRENE
Orifice Tank #: NA
Pump/Rotometer #: NA
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 846 Finish: 936 Total: 60
W/B: — D/B: — O_2: 21 CO_2: 0

START 2,518
112.7
112.9
113.1
113.3
113.6
113.834
ΔV: 1.316
T_n: 83

0 936 Time		Gauge Vacuum (Hg)	Flow Setting
846	10	0	.250 ✓
856	20	0	.250
906	30	0	.250
916	40	0	.250
926	50	0	.250
936	60	0	.250

÷ .80

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.18	229
2	.18	231
3	.19	232
4	.20	235
5	.25	228
6	.29	230
B 1	.21	232
2	.22	234
3	.22	236
4	.19	237
5	.21	237
6	.22	233
	.4580	232

TEMP FOUT

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

8502 $Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 28.84

8587

538 $Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

8507 $Ms = (28.84) \times (1 - \frac{5}{100}) + 18(\frac{5}{100})$ $B_{ws} = 0.5\%$

8527 $Ms =$ 28.79

8587

$Ts =$ 232 °F = 692 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 29.24 in. Hg

$\overline{\sqrt{\Delta P}} =$ .4580

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 35.14 ft/s

$As =$ 1.22 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ ~~2592.4~~ 2587 BE acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ ~~1911.58~~ 1920 dscfm

1/A.M

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO PRODUCTS — Date: 5-29-97
Sampling Location: #10 OVEN OUTLET — Clock Time: 11:20
Run #: 10 12-3 — Operators: GG
Barometric Pressure, in. Hg: 29.30 — Static Pressure, in. H_2O: -.83
Moisture, %: ~~1%~~ ~~[illegible]~~ 1.6 — Molecular wt., Dry: 28.84 — Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15 — Side 2: —
Wet Bulb, °F: — — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.15	230
2	.16	231
3	.17	233
4	.19	233
5	.26	233
6	.27	225
B 1	.15	228
2	.17	229
3	.22	234
4	.21	236
5	.20	237
6	.24	229
	$\overline{\sqrt{\Delta P}}$ = ~~.2351~~	$\overline{T_s}$ = 231

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad + (0.32 \times \quad + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$B_{ws} = 1.6\%$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$ Avg

$Ms =$ ~~28.72~~ 28.67

$\overline{T_s} = 231$ °F = 691 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.23$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ ~~33.41~~ 33.06 ft/s

$As = 1.22$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ ~~2465~~ acfm ~~2446~~ 2508

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

METHOD 18 FIELD DATA SHEET

Plant: Lasco
Date: 5-29-97
Location: 10' Oven Outlet
Run #: 10-12-4
Stack I.D.: 15
Pbar: 29.30
Sample Tube #: 10-12-4- A&B
Operators: GCn.
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: —
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1231 Finish: 131 Total: 60
W/B: — D/B: — O_2: 21 CO_2: 0

Time		Gauge Vacuum (Hg)	Flow Setting
1231	0	0	250cc
1241	10	0	250
1251	20	0	250
101	30	0	250
111	40	0	250
121	50	0	250
131	60	0	250

15.552
115.8
116.0
116.2
116.5
116.7
6.989
1.437
Temp=84

.99 — .84

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.14	231
2	.15	233
3	.16	234
4	.18	235
5	.25	236
6	.26	235
1	.24	233
2	.22	235
3	.18	236
4	.18	237
5	.19	237
6	.22	237
	.4423	229

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

8483 $Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

8583 $Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

8483 $Ms = (28.84) \times (1 - \frac{2.7}{100}) + 18 (\frac{2.7}{100})$ BWS = 2.7%

8584 8585 $Ms = 28.55$

86/85 $Ts = 234$ °F = 694 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.25$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 34.13$ ft/s

$As = 1.22$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ ~~2605.82~~ 2512 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ ~~1840~~ 1845 dscfm

RD

FIELD DATA SHEET

Plant: LASCO
Sampling Location #10 GOEN OUTLET
Run Number: 10-12-4 Date: 5-29-97
Pretest Leak Rate: .001 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: NA

Sample Type: M-4 Operator: CGM
Pbar: 27.30 Ps: -0.84
CO2: 0 O2: 21
Probe Length/Type: Pitot #: 5538
Stack Diameter: 15 As:

Nozzle ID: NA Thermocouple #: 48
Assumed Bws: 1 Filter #: NA
Meter Box #: 14 Y: .966 ΔH@: 1.86
Post-Test Leak Rate: 0 cfm @ 3 in. Hg.
Post-Test Leak Check: Pitot: Orsat:

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	1233	849.016										
	10	1243	856.9		1.8	1.8	—	—	-	60	86	86	3
	20	1253	865.7		1.8	1.8				49	86	85	3
	30	103	872.3		1.8	1.8				52	85	86	3
	40	113	880.436		1.8	1.8				53	85	87	3

ΔVm = 31.420 $\overline{\sqrt{\Delta p}}$ = ___ $\overline{\Delta H}$ = 1.8 $\overline{Ts}$ = ___ $\overline{Tm}$ = 86

SAMPLE RECOVERY DATA

Plant: LASCO Run No.: 10-12-4

Date: 5-29-97 Sample Box No.: N-5 Job No.: 5405.003

Sample Location: #10 OVEN OUTLET

Sample Type: M-4 Filter No.: —

Sample Recovery Person: GGT

Comments: MOISTURE TRAIN

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H_2O	100	606.2	616.0	9.8
2	H_2O	100	586.8	587.7	.9
3	EMPTY	—	495.9	496.4	.5
4	S/G	250	743.0	748.6	5.6
5					
6					
TOTAL			2431.9	2448.7	16.8

Description of Impinger Catch: —

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EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 10-12-4 DATE: 5-29-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{31.420}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (31.420) \times (.966) \times \left(\frac{(29.30) + (1.86 / 13.6)}{(86+460)}\right)$$

$$V_{m_{std}} = \underline{28.87}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (16.8)$$

$$V_{w_{std}} = \underline{0.7908}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.7908)}{(.7908) + (28.87)}$$

$$B_{ws} = \underline{0.0266 \simeq 2.7\%}$$

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METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: NDA
Run #: NDA-12-1
Stack I.D.: 32" x 120"
Pbar: 29.3
Sample Tube #: NDA-12-1A, NDA-12-1B
Operators: SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: vost #3
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 0836 Finish: 0936 Total: 60
W/B: - D/B: - O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	T_m
0836	0	1573.00	1	80
0846	10	1575.63	1	82
0856	20	1577.95	1	84
0906	30	1580.62	1	86
0916	40	1582.84	1	89
0926	50	1585.31	1	91
0936	60	1587.74	1	92

V_m = 14.74 $\bar{T}$ = 86

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\sqrt{\overline{\Delta P}} =$

$Vs = 85.49 \times Cp \times \sqrt{\overline{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

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METHOD 18 FIELD DATA SHEET

Plant: Lasco
Date: 5/29/97
Location: NDO-R
Run #: NDB-12-4
Stack I.D.: 0.5" x 72"
Pbar: 29.3
Sample Tube #: NDB-12-4 A, B
Operators: SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: Vost #3
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1231 Finish: 1331 Total: 60
W/B: - D/B: - O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1231 0	1587.83	1	21	84
1241 10	1590.46	1	21	86
1251 20	1592.85	1	21	88
1301 30	1595.18	1	21	90
1311 40	1597.69	1	21	92
1321 50	1600.00	1	21	94
1331 60	1602.30	1	21	95

V_m = 14.47 $\bar{T}$ = 90

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

APPENDIX A.1.14

Condition 13
(includes flows, moistures, and Method 18)

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97
Sampling Location: Main Exhaust Clock Time: 1535
Run #: ME-13-1 Operators: TA/SS
Barometric Pressure, in. Hg: 29.20 Static Pressure, in. H_2O: .02
Moisture, %: 1.4 Molecular wt., Dry: 29 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 17.5 Side 2: —
Wet Bulb, °F: 62 Dry Bulb, °F: 77

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	77
2	.25	77
3	.27	77
4	.27	77
5	.29	77
6.	.33	77
7	.34	77
8	.37	77
1	.25	77
2	.26	77
3	.27	77
4	.27	77
5	.25	77
6	.24	77
7	.25	77
8	.26	77
	$\overline{\sqrt{\Delta P}}$ = .5233	$\overline{Ts}$ = 77

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 29

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$ 28.69

$\overline{Ts} = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ 29.20 in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$Vs =$ 35.46 ft/s

$As =$ 1.07 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 3553 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 3362 dscfm

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WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: MAIN EXHAUST

Site: Main Exhaust Operators: TAKS Run #: ME-13-1 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.20 in. Hg

Static Pressure, in. H_2O = Pg = 0.02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.20 in. Hg

Wet-Bulb Temperature, °F = Tw = 62 °F

Dry-Bulb Temperature, °F = Td = 77 °F

Temperature Difference, Td - Tw = ΔT = 15 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.5601 in. Hg

Vapor Pressure of H_2O = Pva = $(Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

Pva = ( ) - $\frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)}$ = 0.4021 in. Hg

Proportion of Water Vapor by Volume = Bws

Bws = $\frac{(Pva)}{(Ps)}$ = $\frac{(\quad)}{(\quad)}$ = 0.0137 ≃ 1.4%

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: Main Exhaust
Run #: ME-13-2
Stack I.D.: 17.5
Pbar: 29.2
Sample Tube #: ME-13-2 A, B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: Vinyl #1
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1637 Finish: 1737 Total: 60
W/B: 66 D/B: 81 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1637 0	7800.15	1	150cc	69
1647 10	7801.47	1	150cc	70
1657 20	7802.89	1	150cc	70
1707 30	7804.27	1	150cc	72
1717 40	7805.77	1	150cc	73
1727 50	7807.67	1	150cc	73
1737 60	7809.24	1	150cc	74
			AVG	72

STATIC = +.02

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	81
2	.26	81
3	.28	81
4	.27	81
5	.31	81
6	.31	81
7	.34	81
8	.37	80
1	.25	80
2	.25	81
3	.26	81
4	.26	81
5	.27	81
6	.26	80
7	.27	81
8	.25	81

$\overline{\sqrt{\Delta P}}$ = .5258 T_s = 81

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.7}{100}) + 18 (\frac{1.7}{100})$

$Ms = 28.66$

$Ts = 81$ °F = 541 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.2) + \frac{.02}{13.6}$

$Ps = 29.2$ in. Hg

$\overline{\sqrt{\Delta P}} = .5258$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5258) \times \sqrt{\frac{541}{29.2 \times}}$

$Vs = 35.77$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \times 1.67 \times 60$

$Qs = 3585$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \times 17.647 \times \frac{29.2}{541} \times (1 - \frac{}{100})$

$Qs_{std} = 3358$ dscfm

√R 1.6

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: MAIN EXHAUST

Site: Main Exhaust Operators: TA Run #: ME-13-2 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.20 in. Hg

Static Pressure, in. H_2O = Pg = 0.02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.20 in. Hg

Wet-Bulb Temperature, °F = Tw = 66 °F

Dry-Bulb Temperature, °F = Td = 81 °F

Temperature Difference, Td - Tw = ΔT = 15 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6442 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\quad) - \frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)} = 0.4864 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\quad)}{(\quad)} = 0.0167 \simeq 1.7\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97
Sampling Location: Main Exhaust Clock Time: 1805
Run #: ME-13-3 Operators: TH/SS
Barometric Pressure, in. Hg: 29.2 Static Pressure, in. H_2O: .02
Moisture, %: 1.9 Molecular wt., Dry: 29 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 17.5 Side 2:
Wet Bulb, °F: 68 Dry Bulb, °F: 82

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.22	82
2	.26	82
3	.27	82
4	.27	82
5	.30	82
6	.32	82
7	.34	82
8	.37	82
1	.24	82
2	.25	82
3	.25	82
4	.26	82
5	.25	82
6	.25	82
7	.27	82
8	.26	82
	$\overline{\sqrt{\Delta P}}$ = .5220	$\overline{Ts}$ = 82

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.63$

$\overline{Ts} = 82$ °F = 542 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.2) + \frac{.02}{13.6}$

$Ps = 29.2$ in. Hg

$\overline{\sqrt{\Delta P}} = .5220$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5220) \times \sqrt{\frac{542}{29.2 \times}}$

$Vs = 35.56$ ft/s

$As = 1.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times 1.67 \times 60$

$Qs = 3565$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.2}{542} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 3325$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Main Exhaust

Site: Main Exhaust Operators: TA/SS Run #: ME-13-3 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.20 in. Hg

Static Pressure, in. H_2O = Pg = 0.02 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.20 in. Hg

Wet-Bulb Temperature, °F = Tw = 68 °F

Dry-Bulb Temperature, °F = Td = 82 °F

Temperature Difference, Td - Tw = ΔT = 14 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6903 in. Hg

Vapor Pressure of H_2O = Pva = $(Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

Pva = ( ) - $\frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)}$ = 0.5431 in. Hg

Proportion of Water Vapor by Volume = Bws

Bws = $\frac{(Pva)}{(Ps)}$ = $\frac{(\quad)}{(\quad)}$ = 0.0186 ≃ 1.9%

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: Room Exhaust
Run #: RE-13-1
Stack I.D.: 28"x24"
Pbar: 29.20
Sample Tube #: RE-13-1 A, B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: —
Pump/Rotometer #: VOST #1
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: 1520 Finish: 1620 Total: 56
W/B: 65 D/B: 75 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	T_m
1520 0	7792.50	1	150cc	62
1530 10	7793.73	1	150cc	69
1540 20	7795.00	1	150cc	66
1550 30	7796.25	1	150cc	68
1600 40	7797.50	1	150cc	69
1610 50	7798.63	1	150cc	70
1620 60	7799.80	1	150cc	70

ΔH 7.3
T_m = 67

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.05	75
2	.06	75
3	.06	75
4	.06	75
5	.07	75
6	.07	75
1	.07	75
2	.06	75
3	.05	75
4	.05	75
5	.05	75
6	.07	75
1	.10	75
2	.08	74
3	.08	75
4	.05	75
5	.05	75
6	.10	75
1	.06	75
2	.06	75
3	.05	75
4	.05	75
5	.06	75
6	.08	75
	$\overline{\sqrt{\Delta P}}$ = .2493	$\overline{T_s}$ = 75

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$ 6.13

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{1.8}{100}) + 18 (\frac{1.8}{100})$ B_{ws} = 1.8%

$Ms =$ 28.64

$Ts =$ 75 °F = 535 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{-.02}{13.6}$

$Ps =$ 29.15 in. Hg

$\overline{\sqrt{\Delta P}} =$ .2493

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 16.89 ft/s

$As =$ 4.67 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 4729 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 4465 dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: TA Run #: RE-13-1 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.20 in. Hg

Static Pressure, in. H_2O = Pg = -.62 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.15 in. Hg

Wet-Bulb Temperature, °F = Tw = 65 °F

Dry-Bulb Temperature, °F = Td = 75 °F

Temperature Difference, Td - Tw = ΔT = 10 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6222 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\ .6222\ ) - \frac{(29.15 - .6222) \times (10)}{2800 - (1.3 \times 65)} = 0.5171 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(.5171)}{(29.15)} = 0.0177 \simeq 1.8\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97

Sampling Location: Room Exhaust Clock Time: 1048

Run #: RB-13-2 Operators: TH/SS

Barometric Pressure, in. Hg: 29.2 Static Pressure, in. H_2O: -.61

Moisture, %: 1.8 Molecular wt., Dry: 29 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 28" Side 2: 24"

Wet Bulb, °F: 65 Dry Bulb, °F: 75

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.05	75
2	.05	75
3	.05	75
4	.05	75
5	.06	75
6	.06	74
1	.07	75
2	.07	75
3	.05	75
4	.05	75
5	.05	75
6	.08	75
1	.08	75
2	.07	75
3	.06	75
4	.05	75
5	.05	75
6	.08	75
1	.08	75
2	.07	75
3	.05	75
4	.05	75
5	.06	75
6	.08	75
	$\overline{\sqrt{\Delta P}}$ = .2463	$\overline{Ts}$ = 75

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$\overline{Ts} = 75$ °F = 535 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.2) + \frac{-.61}{13.6}$

$Ps = 29.16$ in. Hg

$\overline{\sqrt{\Delta P}} = .2463$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.2463) \times \sqrt{\frac{535}{29.16 \times}}$

$Vs = 16.68$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times 4.67 \times 60$

$Qs = 4671$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.16}{535} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4412$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: TA/SS Run #: RE-13-2 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.2 in. Hg

Static Pressure, in. H_2O = Pg = -0.41 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.14 in. Hg

Wet-Bulb Temperature, °F = Tw = 65 °F

Dry-Bulb Temperature, °F = Td = 75 °F

Temperature Difference, Td - Tw = ΔT = 10 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6222 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\quad) - \frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)} = \cancel{0.1051}\ .5171 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws 0.0177 ≃ 1.8%

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\quad)}{(\quad)} = \cancel{0.0036} \simeq \cancel{0.4\%}$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97
Sampling Location: Room Exhaust Clock Time: 1528
Run #: RE-13-3 Operators: TH/SS
Barometric Pressure, in. Hg: 29.2 Static Pressure, in. H_2O: -.63
Moisture, %: 1.6 Molecular wt., Dry: 29 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 28" Side 2: 24"
Wet Bulb, °F: 64 Dry Bulb, °F: 76

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.07	76
2	.07	76
3	.06	76
4	.07	76
5	.07	76
6	.07	76
1	.06	76
2	.05	76
3	.06	76
4	.05	76
5	.05	76
6	.07	76
1	.08	76
2	.07	76
3	.05	76
4	.05	76
5	.05	76
6	.08	76
1	.08	76
2	.05	76
3	.05	76
4	.05	76
5	.05	76
6	.08	76
	$\overline{\sqrt{\Delta P}}$ = .2481	$\overline{Ts}$ = 76

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.66$

$\overline{Ts} =$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.2) + \frac{\quad}{13.6}$

$Ps = 29.15$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\quad}$

$Vs = 16.82$ ft/s

$As = 4.67$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times 4.67 \times 60$

$Qs = 4708$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4447$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Room Exhaust

Site: Room Exhaust Operators: TA/SS Run #: RE-13-3 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.2 in. Hg

Static Pressure, in. H_2O = Pg = -.63 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.15 in. Hg

Wet-Bulb Temperature, °F = Tw = 64 °F

Dry-Bulb Temperature, °F = Td = 76 °F

Temperature Difference, Td - Tw = ΔT = 12 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6009 in. Hg

$$\text{Vapor Pressure of } H_2O = Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$$

$$Pva = (\quad) - \frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)} = 0.4748 \text{ in. Hg}$$

Proportion of Water Vapor by Volume = Bws

$$Bws = \frac{(Pva)}{(Ps)} = \frac{(\quad)}{(\quad)} = 0.016 \simeq 1.6\%$$

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: Auxiliary Fan
Run #: AF-13-1
Stack I.D.: 19.75
Pbar: 29.20
Sample Tube #: AF-13-1A, B
Operators: TA
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: –
Pump/Rotometer #: Vost #2
Pt: Pretest (mm Hg): –
Post-Test (mm Hg): –
Tt: Pretest (°F): –
Post-Test (°F): –
Time: Start: 1520 Finish: 1625 Total: 60 sc
W/B: 64 D/B: 76 O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1520 0	2354.21	1	.50 cc	63
1530 10	2355.84	1	.50 cc	66
1540 20	2357.26	1	.50 cc	69
1550 30	2358.59	1	.50 cc	71
1600 40	2360.03	1	.50 cc	72
1610 50	2361.45	1	.50 cc	73
1625 66 36	2362.18	1	.50 cc	74

Static = -.80

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.23	72
2	.31	72
3	.35	73
4	.36	73
5	.38	76
6	.37	76
7	.35	76
8	.29	76
1	.21	76
2	.23	76
3	.27	76
4	.31	76
5	.39	76
6	.38	76
7	.30	76
8	.24	76

$\overline{\sqrt{\Delta P}}$ = .5547 T_s = 75

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{1.6}{100}) + 18 (\frac{1.6}{100})$

$Ms = 28.66$

$Ts = 76$ °F = 536 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.2) + \frac{-.80}{13.6}$

$Ps = 29.14$ in. Hg

$\overline{\sqrt{\Delta P}} = .5547$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5547) \times \sqrt{\frac{536}{29.14 \times}}$

$Vs = 37.58$ ft/s

$As = 2.13$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs =$ x x 60

$Qs = 4797$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} =$ x 17.647 x $\frac{29.14}{536}$ x $(1 - \frac{}{100})$

$Qs_{std} = 4536$ dscfm

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Auxiliary Fan

Site: Auxiliary Fan Operators: TA Run #: AF-B-1 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.2 in. Hg

Static Pressure, in. H_2O = Pg = -0.80 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.14 in. Hg

Wet-Bulb Temperature, °F = Tw = 64 °F

Dry-Bulb Temperature, °F = Td = 76 °F

Temperature Difference, Td - Tw = ΔT = 12 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6009 in. Hg

Vapor Pressure of H_2O = Pva = $(Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

Pva = ( ) - $\frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)}$ = 0.4748 in. Hg

Proportion of Water Vapor by Volume = Bws

Bws = $\frac{(Pva)}{(Ps)}$ = $\frac{(\quad)}{(\quad)}$ = 0.0162 ≃ 1.6%

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97
Sampling Location: Auxillary Fan Clock Time: 1718
Run #: AF-13-2 Operators: TA/SS
Barometric Pressure, in. Hg: 29.20 Static Pressure, in. H_2O: -.81
Moisture, %: 1.7 Molecular wt., Dry: 29 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 19.75 Side 2: ____
Wet Bulb, °F: 65 Dry Bulb, °F: 77

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	~~.52~~ .24	76
2	~~.53~~ .29	76
3	~~.54~~ .37	76
4	~~.54~~ .37	76
5	~~.54~~ .37	76
6	~~.54~~ .35	76
7	.30	77
8	.28	76
1	.19	76
2	.24	76
3	.26	76
4	.29	76
5	.38	76
6	.33	76
7	.31	76
8	.27	76
	$\overline{\sqrt{\Delta P}}$ = .5477	$\overline{Ts}$ = 76

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29.0) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.66$

$\overline{Ts} = 76$ °F = 536 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.2) + \frac{-.81}{13.6}$

$Ps = 29.14$ in. Hg

$\overline{\sqrt{\Delta P}} = .5477$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (.5477) \times \sqrt{\frac{536}{29.14}}$

$Vs = 37.14$ ft/s

$As = 2.13$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times 2.13 \quad \times 60$

$Qs = 4741$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{29.14}{536} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4471$ dscfm

JAD

WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LASCO Location: Auxiliary Fan

Site: Auxiliary Fan Operators: TA/SS Run #: AF-13-2 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.2 in. Hg

Static Pressure, in. H_2O = Pg = -0.81 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.14 in. Hg

Wet-Bulb Temperature, °F = Tw = 65 °F

Dry-Bulb Temperature, °F = Td = 77 °F

Temperature Difference, Td - Tw = ΔT = 12 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6222 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (\quad) - \frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)} =$ 0.4962 in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(\quad)}{(\quad)} =$ 0.0170 ≃ 1.7%

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97
Sampling Location: Baghouse Fan Clock Time: 1820
Run #: AF - 13-3 Operators: JW/SS
Barometric Pressure, in. Hg: 29.2 Static Pressure, in. H_2O: -.78
Moisture, %: 1.7 Molecular wt., Dry: 29 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 19.75 Side 2: —
Wet Bulb, °F: 65 Dry Bulb, °F: 76

Traverse Point Number	Velocity Head In. H_2O	Stack Temp. °F
1	.24	74
2	.31	74
3	.35	75
4	.36	75
5	.39	76
6	.35	77
7	.33	77
8	.29	77
1	.22	76
2	.25	75
3	.28	76
4	.33	76
5	.35	76
6	.33	76
7	.30	76
8	.27	76
	$\overline{\sqrt{\Delta P}}$ = .5546	$\overline{Ts}$ = 76

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 21) + (0.28 \times 79)$

$Md = 29$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.66$

$\overline{Ts} =$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.2) + \frac{\quad}{13.6}$

$Ps = 29.14$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (.99) \times (\quad) \times \sqrt{\quad}$

$Vs = 37.59$ ft/s

$As = 2.13$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times 2.13 \times 60$

$Qs =$ ~~4799~~ 4799 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 4529$ dscfm

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WET-BULB/DRY-BULB MOISTURE CALCULATION

Plant: LAFCO Location: Auxiliary FAN

Site: Auxiliary FAN Operators: TAKS Run #: AF-13-3 Date: 5-29-97

Barometric Pressure, in. Hg = Pbar = 29.20 in. Hg

Static Pressure, in. H_2O = Pg = -0.78 in. H_2O

Absolute Pressure of Stack = $Pbar \pm \frac{Pg}{13.6}$ Ps = 29.14 in. Hg

Wet-Bulb Temperature, °F = Tw = 65 °F

Dry-Bulb Temperature, °F = Td = 76 °F

Temperature Difference, Td - Tw = ΔT = 11 °F

Saturation Vapor Pressure of H_2O at Tw (from Table) = Pvw = 0.6222 in. Hg

Vapor Pressure of H_2O = $Pva = (Pvw) - \frac{(Ps - Pvw) \times (\Delta T)}{2800 - (1.3 \times Tw)}$

$Pva = (\quad) - \frac{(\quad - \quad) \times (\quad)}{2800 - (1.3 \times \quad)} =$ 0.5067 in. Hg

Proportion of Water Vapor by Volume = Bws

$Bws = \frac{(Pva)}{(Ps)} = \frac{(\quad)}{(\quad)} =$ 0.0173 ≃ 1.7%

VAPOR PRESSURES OF WATER

In Inches of Mercury

Temp. °F	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-29-97

Sampling Location: #9 OVEN OUTLET Clock Time: 8:46

Run #: 9-13-1 Operators: G Gar

Barometric Pressure, in. Hg: 29.20 Static Pressure, in. H_2O: -.72

Moisture, %: 1 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 15 Side 2: —

Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.66	169
2	.67	170
3	.67	172
4	.68	172
5	.68	168
6	.68	168
1	.65	168
2	.66	172
3	.66	173
4	.66	175
5	.66	175
6	.66	176
	$\overline{\sqrt{\Delta P}}$ = .8159	$\overline{T_s}$ = 172

$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$M_d = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$M_d = 28.84$

$M_s = M_d \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$M_s = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$M_s = 28.73$

$\overline{T_s} = 172\ °F = 632\ °R\ (°F + 460)$

$P_s = P_b + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$P_s = 29.14$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$V_s = 85.49 \times C_p \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{P_s \times M_s}}$

$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$V_s = 59.97$ f/s

$A_s =$ ft^2

$Q_s = V_s \times A_s \times 60$ s/m

$Q_s = \quad \times \quad \times 60$

$Q_s = 4416$ acfm

$Q_{std} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{\%H_2O}{100})$

$Q_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: #9 CUSU OUTLET
Run #: 9-13-2
Stack I.D.: 15"
Pbar: 29.20
Sample Tube #: 9-13-3 A9B
Operators: GGo
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: STYRENE
Orifice Tank #: NA
Pump/Rotometer #: NA
Pt: Pretest (mm Hg): NA
Post-Test (mm Hg): NA
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1637 Finish: 1737 Total: 60
W/B: ~ D/B: ~ O_2: 21 CO_2: 0

Gas meter	Time	Gauge Vacuum (Hg)	Flow Setting	Temp In/Out
118.408	1637 0	0	250 CLAIM	84/85
118.6	1647 10	0	250	85/85
118.9	1657 20	0	250	85/85
119.1	1707 30	0	250	86/85
119.4	1717 40	0	250	86/85
119.6	1727 50	0	250	87/86
119.907	1737 60	0	250	87/86
1.499				$\bar{T}_m$ = 86

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.66	166
2	.66	169
3	.66	173
4	.65	174
5	.66	175
6	.65	174
B 1	.66	163
2	.67	169
3	.67	174
4	.67	175
5	.66	174
6	.66	170
	.9139	171

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

1.6% H_2O

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = \cancel{28.73}$ AD 28.67

$Ts = 171$ °F = 631 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.15$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \cancel{59.73}$ AD 59.81 ft/s

$As = 1.22$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \cancel{4398}$ AD 4404 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \cancel{3548}$ AD dscfm

11 J.

FIELD DATA SHEET

48

Plant: LASCO
Sampling Location #9 OVEN OUTLET
Run Number: 9-13-2 Date: 5-29-97
Pretest Leak Rate: .001 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: U Orsat: NA

Sample Type: M-4 Operator: G.G.
Pbar: 29.20 Ps: -0.74
CO2: 0 O2: 21
Probe Length/Type: Pitot #: STBP
Stack Diameter: 15" As: 1.23 ft2

Nozzle ID: N/A Thermocouple #: [redacted]
Assumed Bws: 1 Filter #: NA
Meter Box #: 14 Y: .965 ΔH@: 1.86
Post-Test Leak Rate: 0 cfm @ 4 in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0	1637	912.770										
	10	1647	920.1		1.8	1.8	—	—	-	52	85	86	4
	20	1657	928.0		1.8	1.8	-	—	—	53	84	85	4
	30	1707	935.8		1.8	1.8	—	-	—	53	84	85	4
	40	1717	943.564		1.8	1.8	—	—	—	53	84	86	4

ΔVm= 31.444 √Δp= — ΔH= 1.8 Ts= — Tm= 85

SAMPLE RECOVERY DATA

Plant: LASCO Run No.: 9-13-2

Date: 5-29-97 Sample Box No.: N-5 Job No.: S 405.003

Sample Location: #9 OVEN

Sample Type: M-4 Filter No.: —

Sample Recovery Person: GG

Comments: MOISTURE TEAM

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H2O	100	616.0	619.7 ~~622.6~~	3.7
2	H2O	100	587.7	587.8	.1
3	EMPTY	—	496.4	496.6	.2
4	S/G	250	748.6	754.5	5.9
5					
6					
TOTAL			2449.7	2458.6	9.9

Description of Impinger Catch: —

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 9-13-2 DATE: 5-29-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{31.444}\ ft^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m}\right)$$

$$V_{m_{std}} = 17.64 \times (31.444) \times (0.966) \times \left(\frac{(29.2) + (1.86 / 13.6)}{(85+460)}\right)$$

$$V_{m_{std}} = \underline{28.83}\ dscf$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (9.9)$$

$$V_{w_{std}} = \underline{0.4660}\ scf$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.4660)}{(.4660) + (28.83)}$$

$$B_{ws} = \underline{0.0159 \simeq 1.6\%}$$

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO Date: 5-22-97
Sampling Location: #9 OVEN OUTLET Clock Time: 1810
Run #: 9-13-3 Operators: GG
Barometric Pressure, in. Hg: 29.20 Static Pressure, in. H_2O: -.76
Moisture, %: 1 Molecular wt., Dry: 28.84 Pitot Tube, Cp: .99
Stack Dimension, in. Diameter or Side 1: 15 Side 2: —
Wet Bulb, °F: — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.66	172
2	.66	171
3	.66	174
4	.66	175
5	.65	175
6	.65	170
B 1	.67	169
2	.68	172
3	.66	175
4	.66	177
5	.67	177
6	.66	177
	$\overline{\sqrt{\Delta P}}$ = .8139	$\overline{Ts}$ = 173

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18(\frac{\quad}{100})$

$Ms = 28.72$

$\overline{Ts} = 173\ °F = 633\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.14$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 59.92$ ft/s

$As = 1.27$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 4412$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

/1

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: #10 OVEN OUTLET
Run #: 10-13-1
Stack I.D.: 15
Pbar: 27.30
Sample Tube #: 10-13 1 - A & B
Operators: GGM
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: STYRENE
Orifice Tank #: -
Pump/Rotometer #: -
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1520 Finish: 1615 Total: 55
W/B: - D/B: - O_2: 21 CO_2: 0

GAS MOTOR

Time		Gauge Vacuum (Hg)	Flow Setting
1520	0	0	250 CLEAN
1530	10	0	250
1540	20	0	250
1550	30	0	250
1600	40	0	250
1610	50	0	250
1615	60	0	250

117.011
117.2
117.5
117.8
118.0
118.2
118.495

TEMP FU OUT

30/80
82/81
82/81
82/81
85/84
86/85
86/85

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 29.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (29.8) \times (1 - \frac{2.2}{100}) + 18 (\frac{2.2}{100})$

$Ms = \cancel{28.75}$ BE 28.60

$Ts = 230\ °F = 690\ °R\ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.13$ in. Hg

$\sqrt{\Delta P} = 0.4366$

$Vs = 85.49 \times Cp \times \sqrt{\Delta P} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \cancel{33.52}$ BE ft/s 33.63

$As = 1.22\ ft^2$

$Qs = Vs \times As \times 60\ s/m$

$Qs = \quad \times \quad \times 60$

$Qs = \cancel{2470.2}$ BE acfm 2474

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \cancel{1877}$ BE dscfm

Temp = 83

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1	.15	228
2	.16	230
3	.18	231
4	.18	231
5	.22	235
6	.23	206
1	.15	232
2	.20	235
3	.22	236
4	.20	237
5	.19	237
6	.22	220
	.4366	230

-.85

FIELD DATA SHEET

Plant: LASCO
Sampling Location: # 10 OVEN OUTLET
Run Number: 10-13-1 Date: 5 29 97
Pretest Leak Rate: .001 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: N.A.

Sample Type: M-4 Operator: G Gr
Pbar: 29.30 Ps: -.85
CO2: 0 O2: 21
Probe Length/Type: NA Pitot #: 513
Stack Diameter: 15 As: 1.2342

Nozzle ID: NA Thermocouple #: 4B
Assumed Bws: 1 Filter #: NA
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: 0 cfm @ 4 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp (Ts)	Temperature °F Probe	Filter	Impinger Temp °F	Dry Gas Meter Temp Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	0	1520	880.708										
	10	1530	888.542		1.8	1.8		—	—	55	84	85	4
	20	1540	896.4		1.8	1.8				50	84	84	4
	30	1550	904.6		1.8	1.8				52	84	87	4
	40	1600	912.075										

ΔVm = 31.367 $\overline{\sqrt{\Delta p}}$ = ___ $\overline{\Delta H}$ = 1.8 $\overline{Ts}$ = ___ $\overline{Tm}$ = 85

SAMPLE RECOVERY DATA

Plant: LASCO Run No.: 10-13-1

Date: 5-29-97 Sample Box No.: N-6 Job No.: S 405.00

Sample Location: H/O OVEN OUTLET

Sample Type: M-4 Filter No.: —

Sample Recovery Person: G GAY

Comments: MOISTURE TRAIN

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H_2O	100	622.2	628.7	6.5
2	H_2O	100	641.5	642.4	.9
3	EMPTY	—	457.3	457.6	.3
4	S/G	250	750.5	756.5	6.0
5					
6					
TOTAL			2471.5	2485.2	13.7

Description of Impinger Catch: _____

√ RD

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 10-13-1 DATE: 05-24-97

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = \underline{31.367} \text{ ft}^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m} \right)$$

$$V_{m_{std}} = 17.64 \times (31.367) \times (0.966) \times \left(\frac{(29.2) + (1.86 / 13.6)}{(85+460)} \right)$$

$$V_{m_{std}} = \underline{28.77} \text{ dscf}$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (13.7)$$

$$V_{w_{std}} = \underline{0.6449} \text{ scf}$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.6449)}{(.6449) + (28.77)}$$

$$B_{ws} = \underline{0.0219 \simeq 2.2\%}$$

10

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO — Date: 5-29-97

Sampling Location: # 10 OCCU OUTLET — Clock Time: 1706

Run #: 10-13-2 — Operators: GGT

Barometric Pressure, in. Hg: 29.20 — Static Pressure, in. H_2O: -.90

Moisture, %: 2.25 — Molecular wt., Dry: 28.84 — Pitot Tube, Cp: .99

Stack Dimension, in. Diameter or Side 1: 15 — Side 2: —

Wet Bulb, °F: — — Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.16	230
2	.15	232
3	.16	233
4	.17	235
5	.25	223
6	.21	179
B 1	.22	227
2	.23	231
3	.22	234
4	.19	236
5	.19	235
6	.21	227
	$\overline{\sqrt{\Delta P}}$ = .4437	$\overline{T_s}$ = 226

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$ $\quad \bar{B}_{ws} = 2.25$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18(\frac{\quad}{100})$

$Ms =$ ~~28.73~~ 28.60

$\bar{T}_s = 226$ °F = 687 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.2) + \frac{-.90}{13.6}$

$Ps = 29.13$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4437$

$Vs = 65.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s(°R)}{Ps \times Ms}}$

$Vs = 65.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ ~~34.07~~ ft/s ~~34.16~~ RD 33.83

$As = 1.22$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ ~~2505~~ acfm ~~2511~~ RD 2491

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: LASCO
Date: 5-22.97
Sampling Location: #10 OVEN OUTLET
Clock Time: 18:15
Run #: 10-13.3
Operators: GG DS
Barometric Pressure, in. Hg: 29.20
Static Pressure, in. H_2O: -.88
Moisture, %: ~~1.8~~ 2.2 BZ
Molecular wt., Dry: 28.84
Pitot Tube, Cp: .97
Stack Dimension, in. Diameter or Side 1: 15
Side 2: —
Wet Bulb, °F: —
Dry Bulb, °F: —

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	.15	232
2	.15	234
3	.16	235
4	.18	237
5	.22	237
6	.26	207
B 1	.16	234
2	.22	235
3	.22	237
4	.19	238
5	.21	237
6	.22	231
	$\overline{\sqrt{\Delta P}}$ = .4399	$\overline{T_s}$ = 233

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.84$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{2.2}{100}) + 18 (\frac{2.2}{100})$

$Ms = \cancel{28.75}$ BZ 28.60

$\overline{T_s} = 233$ °F = 693 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.15$ in. Hg

$\overline{\sqrt{\Delta P}} = 0.4399$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{T_s (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 33.97$ BZ ft/s

$As = 1.22$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ ~~2494~~ 2500 BZ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

TRIU

/n

FIELD DATA SHEET

Plant: Lasco
Sampling Location #10 oven
Run Number: 10-13-3 Date: 5-29-97
Pretest Leak Rate: .001 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: na

Sample Type: m4 Operator: GGn
Pbar: 29.20 Ps: -.88
CO2: 0 O2: 21
Probe Length/Type: Pitot #: ST3B
Stack Diameter: 15 As: 1.23 ft²

Nozzle ID: na Thermocouple #: 4B na
Assumed Bws: 1 Filter #: na
Meter Box #: 14 Y: .966 ΔH@: 1.862
Post-Test Leak Rate: 0 cfm @ 4 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: na

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0	1807	943.864										
	10	1812	951.6		1.8	1.8	—	na	na	62	93	93	4
	20	1822	959.5		1.8	1.8				54	89	90	4
	30	1832	967.3		1.8	1.8				54	90	91	4
	40	1842	975.135		1.8	1.8				54	90	91	

ΔVm= 31.271 $\overline{\sqrt{\Delta p}}$= ____ $\overline{\Delta H}$= 1.8 $\overline{Ts}$= ____ $\overline{Tm}$= 91

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AD

SAMPLE RECOVERY DATA

Plant: Lasco Run No.: 10-13-3

Date: 5-29-97 Sample Box No.: _____ Job No.: 5403.003

Sample Location: #10 DUCU OUTLET

Sample Type: M-4 Filter No.: —

Sample Recovery Person: GGN

Comments: MOISTURE TRAIN

FRONT HALF

Acetone Container No.: _____ Liquid Level Marked: _____ Sealed: _____

Filter Container No.: _____ Sealed: _____

Description of Filter: _____

Samples Stored and Locked: _____

BACK HALF/MOISTURE

Container No.: _____

Liquid Level Marked: _____ Sealed: _____

IMP. NO.	CONTENTS	INITIAL VOL (ml)	WEIGHT (grams)		
			INITIAL	FINAL	NET
1	H_2O	100	628.7	633.9	5.2
2	H_2O	100	642.4	643.1	.7
3	Empty	—	457.6	457.7	.1
4	S/G	250	756.5	763.9	7.4
5					
6					
TOTAL			2485.2	2498.6	13.4

Description of Impinger Catch: —

EPA METHOD 4 MOISTURE CALCULATIONS

PLANT: LASCO SOURCE/RUN #: 10-13-3 DATE: 5-29-92

1. Leakage Correction for Volume Metered

$$V_{mc} = V_m - (L_p - L_a) \times \theta$$

$$V_{mc} = V_m - (L_p - 0.02) \times \theta$$

$$V_{mc} = (\quad) - (\quad - 0.02) \times (\quad)$$

$$V_{mc} = 31.271 \text{ ft}^3$$

2. Volume Metered, Standard Conditions (68 F, 29.92 in. Hg)

$$V_{m_{std}} = 17.64 \times V_{mc} \times Y \times \left(\frac{P_{bar} + (\Delta H / 13.6)}{T_m} \right)$$

$$V_{m_{std}} = 17.64 \times (31.271) \times (0.966) \times \left(\frac{(29.2) + (1.86 / 13.6)}{(91+460)} \right)$$

$$V_{m_{std}} = 28.37 \text{ dscf}$$

3. Volume Water Vapor Collected, Standard Conditions

Impingers & Silica Gel = $V_{w_{std}} = 0.04707 \times (W_f - W_i)$

$$V_{w_{std}} = 0.04707 \times (13.4)$$

$$V_{w_{std}} = 0.6307 \text{ scf}$$

4. Percent Moisture, by Volume

$$B_{ws} = \frac{V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

$$B_{ws} = \frac{(.6307)}{(.6307) + (28.37)}$$

$$B_{ws} = .0217 \simeq 2.2\%$$

METHOD 18 FIELD DATA SHEET

Plant: LASCO
Date: 5-29-97
Location: NDA
Run #: NDA-13-1
Stack I.D.: 32" x 120"
Pbar: 29.20
Sample Tube #: NDA-13-1A, B
Operators: SS
Leak Check: Pre: ✓ Post: ✓

Tested Analyte: Styrene
Orifice Tank #: -
Pump/Rotometer #: VOST #3
Pt: Pretest (mm Hg): -
Post-Test (mm Hg): -
Tt: Pretest (°F): -
Post-Test (°F): -
Time: Start: 1520 Finish: 1916 Total: 56
W/B: ____ D/B: - O_2: 21 CO_2: 0

	Time	Gauge Vacuum (Hg)	Flow Setting	Tm
1520 0	1602.45	1	21	84
1530 10	1604.93	1	21	86
1540 20	1607.25	1	21	88
1550 30	1609.88	1	21	90
1700 40	1611.58	1	21	92
1910 50	1614.33	1	21	94
1916 56	1615.74	1	21	94

AVG = 90 ✓

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

$\Delta V = 13.24$ ✓

APPENDIX A.1.15

NDO Summary Data

PACIFIC ENVIRONMENTAL SERVICES, INC.

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Client EPA - LASLO	
Location FLORENCE, KY.	

Prepared By	Date	Checked By	Date	Sheet Title

ND.	Run No.	Time	NDO-A (Product Line) fpm	NDO-B (Doorway) fpm	NDO-C (Supply Air) fpm	NDO-D (Supply Air) fpm
			−	−	+	+
		5/14/97				
	1	1038-1138	250-300	500-600	250-275	200-220
	2	1230-1330	220-250	500-700	220-240	200
	3	1540-1640	220-240	500-700	230-250	200
	1	2018-21	200-250	400-500	250-280	200
	2	2158-2258	200-270	300-400 Storm Affecting Ambient Outside	240-280	200-220
	3	2330-0030	200-250	500-600	240-280	250-270
		5/15/97				
3	1	1425-1525	200-250	500-800	230-260	250-270
3	2	1600-1500	220-260	500-800	220-260	240-26
3	2	1735-1838	210-250	500-800	220-260	240-280
4	1	2005-2105	200-300	500-900	200-300	250-300
4	2	2130-2230	250-300	500-900	250-350	250-300

PACIFIC ENVIRONMENTAL SERVICES, INC.

Project No.	Page	of
5405.003	1	1

Client: U.S. EPA - LASCO

Location: Florence, Ky

Prepared By	Date	Checked By	Date	Sheet Title
R Kolb	5/19/97			Enclosure Flow Rates

Condition No. 5 5/19/97

Time	Run No.	NDO-A (fpm)	NDO-B	NDO-C	NDO-D
0904-1026	5-1	250-400	400-600	250-350	300-400
1108-1230	5-2	250-400	300-500	250-300	200-300
1353-1515	5-3	250-400	400-600	250-300	200-300

Condition No. 6 5/19/97

Time	Run No.	NDO-A	NDO-B	NDOC	NDO-D
1605-1707	6-1	250-350	200-300	200-300	200-300
1733-1856	6-2	200-300	200-300	200-300	200-300
1937-2019	6-3	200-350	150-250	200-300	300-400

PACIFIC ENVIRONMENTAL SERVICES, INC.

Project No.	Page of
5405.003	

Client: U.S. EPA - LASCO Panel Products

Location: Florence, Ky

Prepared By	Date	Checked By	Date	Sheet Title
R. Kolde	5/21			NDO Flow Rates

Condition 8 5/22/97

Time	Run No.	NDO-A	NDO-B	NDO-C	NDO-D
0754-0844	8-1	200-350	500-600	500-600	400-500
0921-1053	8-2	250-350	350-450	300-400	350-450
1140-1253	8-3	200-400	350-450	250-350	350-450

Condition 9 5/22/97

1804-1850	9-1	200-300	250-350	250-350	350-450

Condition 10 5/22/97

1037-0859	10-1	250-350	500-600	350-450	350-450

2001 for omn sites)

Condition 11 5/23/97

1002-1015	11-1	250-350	450-600	350-450	350-450
1038-1119	11-2	250-350	450-600	350-450	350-450
201-1247	11-3	150-250	450-600	350-450	350-450

PACIFIC ENVIRONMENTAL SERVICES, INC.

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S405.003	1 1

Client: USEPA

Location: LASCO Panel Products - Florence, Ky

Prepared By	Date	Checked By	Date	Sheet Title
R Kulde	5/20/97			NDO Flow Measurements

Condition 7 fpm

Time	Run No.	NDO-A	NDO-B	NDO-C	NDO-D
1449-1615	7-1	200-300	150-250	200-300	250-350
1703-1828	7-2	200-300	~~20~~ 150-250	200-300	250-350
1911-2035	7-3	250-350	200-400	250-350	250-350

TECHNICAL REPORT DATA

Please read instructions on the reverse before completing

1. REPORT NO. EPA-454/R-99-024a	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Air Emissions From Reinforced Plastics Composite Manufacturing Process, LASCO Panel Products: Volume I Volume I of III		5. REPORT DATE August 1999 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Franklin Meadows Daniel F. Scheffel		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Pacific Environmental Services, Inc. Post Office Box 12077 Research Triangle Park, North Carolina 27709-2077		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. 68-D-70069
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Emissions, Monitoring and Analysis Division Research Triangle Park, North Carolina 27711		13. TYPE OF REPORT AND PERIOD COVERED Final 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

The United States Environmental Protection Agency (EPA) Emission Standards Division (ESD) requested that the EPA's Emissions Monitoring and Analysis Division (EMAD), Emission Measurement Center (EMC) provide testing support in the investigation of the reinforced plastics composite manufacturing source category to properly set the Maximum Achievable Control Technology (MACT) standards as required by the Clean Air Act Amendments of 1990. The reinforced plastics composite manufacturing process located at LASCO Panel Products in Florence, Kentucky was selected by the ESD as the host facility for this emissions testing program.

The sampling program was designed to support the following ESD objectives: 1) Identify and quantify the hazardous air pollutants (HAPs) emitted by reinforced plastic manufacturing, 2) Identify the sources of HAPs and the total HAPs mass emission rates from the wet application area and the oven area, 3) Evaluate three ventilation scenarios, 4) Depending on the effectiveness of the industry proposed "closed" system, develope a performance-based emission limitation achieved by the use of a wet area enclosed table system, 5) Assess the existing emission factors for volatile organic compound emissions from a continuous lamination process for the purposes of updating the information in AP-42 and determining cost effectiveness for MACT options involving emissions abatement, and 6) Determine the effect of various process paramenters such as line speed, laminate thickness, HAP content of raw material and the addition of a gel coat layer on the emission factor.

Sampling was performed during 13 process operating conditions. Measurements were made of the total hydrocarbons (THC), styrene, cumene, and methyl methacrylate (MMA), and the air flow rate at all enclosure exhausts. A secondary objective of the sampling program was to obtain the emissions of HAPs from the oven stacks.

This volume (Volume I) is comprised of 464 pages and consists of the report text and Appendix A.1 (Manual Methods Raw Field Data).

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTIONS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COASTI Field/Group
Cumene Emission Measurements Hazardous Air Pollutants Lamination Process Methyl Methacrylate Reinforced Plastics Manufacturing Styrene Total Hydrocarbons Volatile Organic Compounds		

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