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Air

Evaluation of Sampling and Analysis Procedures for the Plywood Industry

EVALUATION OF SAMPLING AND ANALYSIS PROCEDURES FOR THE PLYWOOD INDUSTRY

Environmental Consultants, Inc.

ESED Project 80/02
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PREFACE

The work described herein was conducted by personnel from TRC - Environmental Consultants, Inc., Research Triangle Institute (RTI), Georgia-Pacific Corporation (G-P) in Whiteville, North Carolina, and the United States Environmental Protection Agency (EPA).

The scope of work was issued under EPA Contract 68-02-3543, work assignment 1. The work was performed under the supervision of Eugene A. Brackbill, P.E., the TRC work assignment manager.

RTI personnel involved during the course of the testing program included J. Michael McCarthy, P.E., and Robert L. Chessin. Personnel at the G-P Whiteville plant whose assistance and guidance contributed greatly to the performance of the test program include Norman Bulson, plant manager, and Royce Nobles.

Gary McAlister, Office of Air Quality Planning and Standards, Emission Measurement Branch, EPA, served as task manager and was responsible for coordinating the test program.

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1.0 INTRODUCTION

1.1 Background

Section 111 of the Clean Air Act of 1970 charges the Administrator of the U.S. Environmental Protection Agency (EPA) with the responsibility of establishing Federal standards of performance for new stationary sources which may significantly contribute to air pollution. When promulgated, these New Source Performance Standards (NSPS) are to reflect the degree of emission limitation available through application of the best demonstrated emission control technology. EPA utilizes emission data obtained from controlled sources in the particular industry under consideration as a partial basis for NSPS.

TRC was engaged by the Emission Measurement Branch (EMB) of the Emission Standards and Engineering Division (ESED), Office of Air Quality Standards and Planning (OAQPS), to measure total organic compound and condensed particulate matter emissions from the plywood veneer dryers associated with the plywood/veneer source category.

Under the provisions of a previous work assignment (EPA Contract 68-02-2820, Work Assignment 21) TRC made an initial assessment of the test procedures which have been used to measure veneer dryer emissions and EPA Method 25 - Determination of Total Gaseous Nonmethane Organic Emissions as Carbon. The test procedures which have been used are the Washington State University (WSU) technique and the Oregon Department of Environmental Quality (ODEQ) Method 7, Condensible Particulate. The assessment was based primarily upon the sampling and analytical principles employed by the methods, their effectiveness when applied to the characteristic process emission stream, and limited prior test report data. TRC concurred with previous findings that ODEQ Method 7 was more acceptable than the WSU technique for the purpose of measuring condensible particulate emissions. However, its use for measuring

total organic compound emissions was deemed inadequate. TRC's findings were favorable toward the use of EPA Method 25 for measuring total organic compound emissions and, when particle sizes were limited to 5μ or less, condensed particulate matter emissions. A detrimental factor to its use which was discovered after the assessment was completed, was the potential for sampling train pluggage by ice formed when sampling high moisture content exhaust streams. Overall, TRC's assessment recommended that further study be undertaken which would focus on evaluations of ODEQ Method 7 and EPA Method 25 both individually and comparatively.

OAQPS selected the Georgia-Pacific Corporation (G-P) plywood manufacturing plant in Whiteville, North Carolina, as the site for the method development test program. The plant is considered to employ veneer drying processes which are representative of the state of the art in the plywood industry. Although emission controls are not employed on the veneer dryer operations, the plant has a wood-fired boiler which incorporates a venturi-type wet scrubber for particulate emission control. This was considered to represent a satisfactory situation for evaluating the impact of boiler and wet scrubber exhaust streams on the two sampling methods. Current plywood industry practice includes the use of boilers as afterburners and wet scrubbers for veneer dryer emission control. The method development program was conducted during January and March 1981.

1.2 Brief Process Description

1.2.1 Veneer Dryer

The No. 1 veneer dryer was selected for emission measurements. It is a steam-heated Coe Manufacturing Company unit with 22 heated zones, 1 seal zone,

and 3 cooling zones. Veneer is continuously hand-fed onto the dryer feed conveyor which distributes the veneer to one of four drying decks. The veneer is handled in a similar manner upon exiting the dryer.

There are three exhausts from the heated zones. One exhaust is located near the dryer entrance, one about midway along the length of the dryer, and one preceding the cooling zone. Three cooling zone exhausts immediately follow the drying section.

Emissions from the dryer are exhausted directly to the atmosphere from the three heated zone exhausts. The emissions consist of naturally occurring organic compounds, such as terpenes and resin acids, thermally driven from the wood during drying. The cooling zone exhausts are not considered to be an emission source.

1.2.2 Boiler

The boiler is an overfeed spreader stoker design fired with hogged wastewood. Flue gas exits the boiler through dry multiclones and passes through an auxiliary air-to-liquid heat exchanger.

The heat exchanger is followed by a fan which imparts the required energy to overcome the pressure drop of the venturi scrubber/cyclonic separator system downstream in addition to providing boiler draft. The venturi scrubber is a conventional rectangular flooded throat design manufactured by Zurn Industries. The cyclonic entrainment separator is also of conventional design. The scrubber system was installed to comply with State particulate matter emission regulations.

1.3 Method Development Program Summary

The method development program was conducted at the G-P Whiteville plant in two test phases. Phase I was performed during the period from January 12

to January 15, 1981. Phase III occurred during the period from March 2 to March 6, 1981. The tests were designed to evaluate candidate total organic compound and condensible particulate matter emission sampling and analytical procedures for application to plywood veneer dryer exhaust streams and associated emission control devices. The purpose was to develop procedures that may be employed to provide EPA with a documented database which may be used to develop and support an NSPS for the plywood veneer industry.

1.3.1 Phase I

The first phase of the program was performed between January 12 and 15, 1981. At this time, the emission definition for the standard had not been resolved and testing proceeded with the objective of developing methods and collecting data for two regulatory alternatives:

- Treating condensible organics as particulate matter
- Treating all emissions as total organic compounds

The two candidate methods were used independently with no intention of directly comparing their results. Specific considerations for the two methods were as follows:

- ODEQ Method 7 - precision
- EPA Method 25 - precision and effect of high moisture content sample streams.

The precision of each method was evaluated by obtaining concurrent, paired samples during each test. The effect of high moisture content sample streams related to the sample volume that could be obtained with Method 25 before freezeup occurred in the method's cryogenic trap. During sampling, heat was applied to the top of the trap where the sample enters when the vacuum gauge

indicated that sample flow had stopped. When this procedure failed to eliminate freezeup, tests were performed with the trap immersed in a water ice bath instead of dry (CO_2) ice and with two traps in series. The first trap was immersed in a water ice bath and the second was immersed in dry ice.

All testing during the first phase was performed at the No. 1 veneer dryer.

1.3.2 Phase II

The phase II program further evaluated EPA Method 25 applicability to veneer dryers using the experience gained during phase I. Testing was performed during the period from March 2 to 6, 1981. Precision was the primary concern, and the "two traps in series" scheme was used. Simultaneous testing was performed at all three veneer dryer exhausts using paired Method 25 sampling trains.

The applicability of the series trap Method 25 scheme was also evaluated for boiler and wet scrubber exhaust streams. The scrubber exhaust was sampled simultaneously using both ODEQ Method 7 and EPA Method 25. In this case, the Method 25 sample was extracted from the ODEQ Method 7 sampling train at a point after the hot-box filter. The front half of the ODEQ Method 7 sampling train served as a sample conditioner for EPA Method 25. Probe and hot-box filter temperatures were maintained at 350 $\pm 25^{\circ}$ F. This temperature was chosen because it is representative of typical veneer dryer operating temperatures. The purpose is to include in the sample only those materials produced by the drying process and not include any materials which may be incidental to the process.

1.4 Description of Report Sections

The remaining sections of this report present a summary and discussion of the test results (Section 2), a description of the veneer dryer and boiler/wet

scrubber system processes (Section 3), a description of the sampling locations (Section 4), and a discussion of the sampling and analysis methods (Section 5.) Field data sheets, laboratory data, and other pertinent information are presented in the various appendices as noted in the Table of Contents.

2.0 SUMMARY AND DISCUSSION OF RESULTS

This section summarizes the sampling and analytical results for the method development program conducted at the G-P plywood plant in Whiteville, North Carolina. Phase I focused solely on the emissions from the No. 1 veneer dryer and was performed during the week of January 12, 1981. Phase II included additional sampling at the No. 1 veneer dryer and sampling across the venturi system installed to control particulate matter emissions from the plant's wood-fired boiler. Phase II was performed during the week of March 2, 1981.

2.1 Phase I

The phase I sampling program was designed to evaluate the applicability of EPA Method 25, Determination of Total Gaseous Nonmethane Organic Emissions as Carbon and the precision of ODEQ Method 7, Condensible Emissions from Stationary Sources as applied to plywood veneer dryer emissions.

2.1.1 EPA Method 25

Table 2-1 presents a summary of the Method 25 results and source operational parameters. Several problems were encountered with this method which resulted in poor paired sample correlation and poor data comparability between results for a given exhaust duct.

The most significant sampling problem was trap freezeup attributable to the high exhaust stream moisture contents. These ranged from 33.2 percent by volume for exhaust No. 1 to 55.8 percent for exhaust No. 2. After it became apparent that trap freezeup was unavoidable despite heating of the probe and trap inlet, variations were tried using a water ice bath and two traps in series with the first trap in water ice and the second trap in dry ice.

TABLE 2-1

NO. 1 VENEER DRYER
PHASE I
EPA METHOD 25 EMISSION MEASUREMENTS SUMMARY
Georgia-Pacific, Whiteville, North Carolina

Run Number	Date	Location	Time	Stack Temperature (^{o}F)	Stack Moisture (% by volume)	Stack Flow Rate (DSCFM)[1, 2]	Volume of Gas Sampled (liters)	Condensible[3] Concentration (ppm C_1)	Noncondensible[3] Concentration (ppm C_1)	Total Sampled Concentration (ppm C_1)	Emission Rate (lb/hr C_1)[1]
1A	1-13-81	Exhaust No. 3	1038-1125	229	54.8	1233	1.04	8294	631	8924	20.57
1B	1-13-81	Exhaust No. 3	1038-1125	229	54.8	1233	1.11	7297	18	7315	16.86
2A	1-13-81	Exhaust No. 1	1258-1328	293	33.2	-[4]	0.88	4325	528	4853	-
2B	1-13-81	Exhaust No. 1	1258-1328	293	33.2	-[4]	1.15	2816	512	3328	-
3	1-13-81	Exhaust No. 3	1511-1545	321	54.8	1233	2.18	1981	257	2238	5.16
4	1-14-81	Exhaust No. 2	0951-1022	314	55.8	2032	0.82	1490	1053	2543	9.66
5	1-14-81	Exhaust No. 2	1058-1128	323	55.8	2032	1.75	1937	2271	4208	15.99
6A	1-14-81	Exhaust No. 2	1409-1454	318	55.8	2032	2.50	666	2441	3107	11.80
6B	1-14-81	Exhaust No. 2	1409-1454	318	55.8	2032	2.57	1743	2926	4669	17.74

[1] Standard conditions: 29.92 inches mercury, 68° F
[2] Average of ODEQ Method 7 measurements
[3] "Condensible" and "noncondensible" as defined by EPA Method 25
[4] No measureable flow.

Both of these configurations functioned without freezeup. The sampling schemes used were as follows:

1-A and 1-B - exhaust No. 3, simultaneous pair, traps in dry ice

2-A and 2-B - exhaust No. 1, simultaneous pair, traps in dry ice

3 - exhaust No. 3, single train, trap in water ice

4 - exhaust No. 2, single train, trap in dry ice

5 - exhaust No. 2, single train, two traps in series

6-A and 6-B - exhaust No. 2, single train with two traps in series and single train with one trap in water ice, run simultaneously

In-stack filters were used on all runs except Nos. 3, 4 and 5. Filter deterioration due to moisture was significant and resulted in filter tearing and loss during recovery. Additional details of the sampling problems are discussed in Section 5.4.4.

Analyses of the collected samples were performed without difficulty. The poor precision and comparability may have been a result of the small sample volumes obtained.

2.1.2 ODEQ Method 7

These tests were performed without any problems. As expected, a large volume of water was collected in the impingers. However, there was no evidence of in-stack filter deterioration as had occurred with the Method 25 sampling trains. The tests planned for the No. 1 exhaust could not be performed because of a low/no flow condition. The dampers on the No. 1 exhaust had been welded closed.

Table 2-2 presents a summary of the Method 7 results. The paired samples showed excellent reproducibility and all four tests showed reasonable agreement. A breakdown of the total collected sample by collection element;

TABLE 2-2

NO. 1 VENEER DRYER
PHASE 1
ODEQ METHOD 7 EMISSION MEASUREMENTS SUMMARY
Georgia-Pacific, Whiteville, North Carolina

Run Number	Date	Location	Time	Stack Temperature (°F)	Stack Moisture (% by volume)	Stack Gas Flow Rate (DSCFM)[1]	Meter Volume (DSCF)[1]	Sample Weight (g)	Emission Concentration (gr/DSCF)	Emission Rate (lb/hr)	Isokinetic Variation (%)
1-1	1-13-81	Exhaust No. 2	1300-1407	304	44.8	2101	35.19	0.3175	0.14	2.51	103
1-2	1-13-81	Exhaust No. 2	1300-1407	327	47.4	1962	35.27	0.3431	0.15	2.52	111
2-1	1-14-81	Exhaust No. 3	1009-1117	294	48.9	1344	41.29	0.5143	0.19	2.21	115
2-2	1-14-81	Exhaust No. 3	1009-1117	327	49.5	1122	37.27	0.4906	0.20	1.95	124

[1]Standard conditions: 29.92 inches mercury, 68° F

i.e., in-stack filter, probe wash, hot-box filter, impingers, and back-up filter, for each test is given in Table 2-3. Although some consistency appears in the percentage collected by the in-stack and back-up filters, the remaining sample distributions are random with no clear pattern among tests.

Two discrepancies appear in the measurement data. For both tests the average measured temperature varies for the paired trains. This was attributed to the probe-thermocouple configuration. One probe was modified on site to accommodate the in-stack filter holder. As a result, the thermocouple was located a few inches behind the sampling nozzle. Although not believed to be a concern while sampling at points well within the exhaust, the thermocouple was evidently out of the flow stream while sampling at points adjacent to the port opening. This was confirmed by the field data sheets which showed much lower measured temperatures at these points when this probe was used. Excluding these, the average measured temperatures for both sampling trains were essentially identical.

The other discrepancy was the isokinetic variation. Three of the four tests were performed outside the accepted limits. This is believed to be related to the high exhaust stream moisture contents and the nonapplicability of the standard sampling nomograph in these ranges.

2.2 Phase II

Phase II continued the work of phase I with respect to the veneer dryer emissions. Testing was also performed across the venturi scrubber system installed on the plant's wood-fired boiler exhaust. The objective of tests at this location was the investigation of Method 25 applicability to wood-fired combustion and scrubber exhaust streams.

TABLE 2-3

NO. 1 VENEER DRYER

PHASE I

ODEQ METHOD 7 DISTRIBUTION OF COLLECTED SAMPLE

Georgia-Pacific, Whiteville, North Carolina

Run Number	Date	Location	Total Sample Weight (mg)	Sample Weight Distribution (%) In-Stack Filter	Probe Wash	Hot-Box Filter	Impingers	Back-up Filter
1-1	1-13-81	Exhaust No. 2	317.53	10.77	32.22	30.43	26.39	0.19
1-2	1-13-81	Exhaust No. 2	343.08	6.97	25.13	15.10	52.03	0.78
2-1	1-14-81	Exhaust No. 3	514.32	7.00	33.48	44.38	14.37	0.77
2-2	1-14-81	Exhaust No. 3	490.62	8.17	54.87	22.78	12.76	1.42

2.2.1 Veneer Dryer

Using the experience gained during phase I, the three veneer dryer exhausts were each sampled twice using paired modified Method 25 trains. The modification consisted of using two traps in series with the first trap in water ice and the second in dry ice. This approach effectively eliminated the freeze-up problem encountered during phase I.

Whereas the first phase suffered from sampling problems, this phase experienced analytical problems which had a significant effect on the resulting data, Table 2-4. Only two of the six paired samples provided data for comparison. Two cases provided data for one of the two paired samples and one case yielded no data. Those cases yielding only partial or no analytical data were the direct result of sample recovery or analyzer problems related to the high sample moisture content. Some of the problems encountered were:

- rapid degradation of oxidation catalyst efficiency
- water condensation in analyzer tubing
- water carryover into the NDIR
- water vapor carryover into the sample tank during trap purge

A detailed discussion of these problems and actions taken to eliminate them is presented in Section 5.4.5. The reason these problems did not become apparent during the first phase is that sample volumes obtained during this phase were from one and one-half to two and one-half times greater.

2.2.2 Boiler/Wet Scrubber System

The Method 25 and ODEQ Method 7 data are presented in Tables 2-5 and 2-6, respectively.

Method 7 tests were performed only at the scrubber outlet. One modification was incorporated into the procedure. The probe and hot-box filter were

TABLE 2-4

NO. 1 VENEER DRYER
PHASE II
EPA METHOD 25 EMISSION MEASUREMENTS SUMMARY
Georgia-Pacific, Whiteville, North Carolina

Run Number	Date	Location	Time	Stack Temperature (^{O}F)	Stack Moisture (% by volume)	Stack Flow Rate (DSCFM)[1]	Volume of Gas Sampled (liters)	Condensible[2] Concentration (ppm C_1) Trap 1	Trap 2	Noncondensible[2] Concentration (ppm C_1)	Total Sampled Concentration (ppm C_1)	Emission Rate (lb/hr C_1)
1-1-A	3-3-81	Exhaust No. 1	1515-1613	282	45	780	3.64	697	1240	867	2804	4.09
1-1-B	3-3-81	Exhaust No. 1	1515-1613	282	45	780	3.57	828	1621	5536	7985	11.64
2-1-A	3-3-81	Exhaust No. 2	1515-1613	320	60	616	3.47	4600	2901	5305	12806	14.75
2-1-B	3-3-81	Exhaust No. 2	1515-1613	320	60	616	3.40	2855	4634	435	7924	9.13
3-1-A	3-3-81	Exhaust No. 3	1514-161230	320	58	1168	3.39	NA[3]	1239	1504	-	-
3-1-B	3-3-81	Exhaust No. 3	1514-161230	320	58	1168	3.54	NA[3]	2292	4408	-	-
1-2-A	3-3-81	Exhaust No. 1	1745-1845	279	45	780	3.15	1603	783	3236	5622	8.20
1-2-B	3-3-81	Exhaust No. 1	1745-1845	279	45	780	NA[3]	-	-	-	-	-
2-2-A	3-3-81	Exhaust No. 2	1745-1845	309	60	616	NA[3]	-	-	-	-	-
2-2-B	3-3-81	Exhaust No. 2	1745-1845	309	60	616	3.32	1185	921	1821	3927	4.52
3-2-A	3-3-81	Exhaust No. 3	1743-1842	308	58	1168	NA[3]	-	-	-	-	-
3-2-B	3-3-81	Exhaust No. 3	1743-1842	308	58	1168	NA[3]	-	-	-	-	-

[1]Standard conditions: 29.92 inches mercury, 68^{O} F
[2]"Condensible" and "noncondensible" as defined by EPA Method 25
[3]Not analyzed.

TABLE 2-5

BOILER/WET SCRUBBER SYSTEM
EPA METHOD 25 EMISSION MEASUREMENTS SUMMARY
Georgia-Pacific, Whiteville, North Carolina

Run Number	Date	Location	Time	Stack Temperature (^{o}F)	Stack Moisture (% by volume)	Stack Dry Gas Molecular Weight (lb/ft^3)	Stack Gas Flow Rate (DSCFM)[1, 2]	Volume of Gas Sampled (liters)	Condensible[4] Concentration (ppm C_1) Trap 1	Trap 2	Noncondensible[4] Concentration (ppm C_1)	Total Sampled Concentration (ppm C_1)	Emission Rate ($lb/hr\ C_1$)
SI-25-1A	3-5-81	Scrubber	1110-	334	8.9	30.1	NM[3]	3.42	452	1323	92	1867	-
SI-25-1B	3-5-81	Inlet	1220	334	8.9	30.1	NM[3]	3.28	984	1209	94	2287	-
SO-25-1A	3-5-81	Scrubber	1109-	145	14.0	28.0	44,000	3.21	1278	573	88	1939	159.5
SO-25-1B	3-5-81	Outlet	1218	145	14.0	28.0	44,000	3.69	731	4517	118	5366	441.4
SI-25-2A	3-5-81	Scrubber	1615-	380	8.9	30.1	NM[3]	2.92	10375	935	160	11470	-
SI-25-2B	3-5-81	Inlet	1822	380	8.9	30.1	NM[3]	3.46	1564	3517	107	5188	-
SO-25-2A	3-5-81	Scrubber	1613-	149	18.4	27.8	44,700	2.99	1857	2048	454	4359	364.3
SO-25-2B	3-5-81	Outlet	1822	149	18.4	27.8	44,700	3.09	1138	426	669	2233	186.6
SI-25-3A	3-6-81	Scrubber	1000-	367	8.9	30.1	NM[3]	3.28	2453	3352	80	5885	-
SI-25-3B	3-6-81	Inlet	1110	367	8.9	30.1	NM[3]	3.93	670	1715	63	2448	-
SO-25-3A	3-6-81	Scrubber	0955-	144	14.2	28.2	44,100	3.54	1152	783	1377	3,312	273.1
SO-25-3B	3-6-81	Outlet	1105	144	14.2	28.2	44,100	3.48	806	15036	2405	18,247	1504

[illegible]

[1] Standard conditions: 29.92 inches mercury, 68° F
[2] Average of ODEQ Method 7 measurements
[3] Not measured.
[4] "Condensible" and "noncondensible" as defined by EPA Method 25

[illegible]

TABLE 2-6

BOILER/WET SCRUBBER SYSTEM
ODEQ METHOD 7 EMISSION MEASUREMENTS SUMMARY
Georgia-Pacific, Whiteville, North Carolina

Run Number	Date	Location	Time	Stack Temperature (^{o}F)	Stack Moisture (% by volume)	Stack Gas Flow Rate (DSCFM)[1]	Meter Volume (DSCF)[1]	Sample Weight (g)	Emission Concentration (gr/DSCF)	Emission Rate (lb/hr)	Isokinetic Variation (%)
SO7-1	3-5-81	Scrubber Outlet	1111-1222	145	14.0	44,000	32.1	0.1279	0.06	23.2	97
SO7-2	3-5-81	Scrubber Outlet	1615-1826	149	18.4	44,700	35.3	0.2136	0.09	35.7	105
SO7-3	3-6-81	Scrubber Outlet	1000-1111	144	14.2	44,100	32.5	0.1798	0.09	32.2	98

[1]Standard conditions: 29.92 inches mercury, 68^{o} F

maintained at 350 $\pm 25^{\circ}$ F. This temperature was selected to correspond with typical veneer dryer operation conditions as described previously. Both the sampling and analysis went smoothly.

Method 25 samples were extracted from the Method 7 sample stream immediately following the hot-box filter. The inlet samples could not be obtained at the desired location and were instead extracted through a thermometer port in the ductwork following the air-to-liquid heat exchanger. This precluded flow measurements being taken.

The analyzer modifications required to eliminate moisture problems were made prior to analysis of these samples. Analytical data were obtained for all samples. The sample tank analyses showed good precision for paired samples but the trap samples did not correlate well. This is somewhat in contrast to the veneer dryer sample analyses which indicated reasonable precision for the traps and poor precision for the tanks. The poor trap precision may indicate the impact of trap contamination and/or the effect of CO_2 which is absorbed in the water collected in the trap or encapsulated within the ice formed inside the trap.

2.3 Conclusions

The method development test program demonstrated the following:

- o High moisture content exhaust streams can present problems for EPA Method 25 sampling and analysis procedures.
- o Method 25 sample trap freezeup can be eliminated by using two traps in series with the first trap in water ice and the second in dry ice.
- o Heat tracing of all valves and tubing associated with the trap sample recovery module are required to prevent degradation of analyzer performance due to water condensation.
- o ODEQ Method 7 will yield reproducible results for condensible organic emissions within the emission character definition provided by the method.

d) The program was not conclusive with regard to the Method 25 analysis procedures as was indicated by the poor paired sample precison. This area requires further attention. A particular item of interest is the CO_2 interference effect. This occurs when CO_2 is absorbed by the water or encapsulated within the ice formed in the trap. This CO_2 is not liberated during the trap purge procedure and becomes part of the oxidized organic sample recovery, contributing a high degree of bias. The National Council of the Paper Industry for Air and Stream Improvement (NCASI) has conducted studies which indicate that this interference can exceed 100 ppm as carbon.

3.0 PROCESS DESCRIPTION

Emission tests were conducted at the G-P plywood manufacturing plant located in Whiteville, North Carolina, during January and March 1981. The tests were designed to evaluate candidiate total organic compound and condensible particulate matter emission sampling and analytical procedures for application to plywood veneer dryer exhaust streams and associated emission control devices. This section describes the processes that were sampled.

3.1 Veneer Drying

After the veneer has been peeled from the pine log at the lathe operation, the veneer is palletized and transferred to the drying operation. Here, the veneer is continuously hand-fed onto the dryer feed conveyor and into the dryer. The purpose of this operation is to thermally drive the moisture out of the veneer in preparation for the lay-up and laminating operations which follow. During the drying operation, natural organic compounds, primarily terpenes and resin acids, are also volatilized and driven from the veneer. The volatilized organic compounds are the emissions of interest.

The No. 1 veneer dryer was selected for the purposes of the method development program. It is a 22-zone, four-deck, steam-heated, jet design unit designed by the Coe Manufacturing Company. It has three exhausts from the heated zones. One exhaust is located near the dryer entrance, one about midway along the length of the dryer, and one preceding the cooling zone. A three-zone cooling section with three exhausts immediately follows the drying section. A rebuild of the dryer was completed on October 5, 1980.

Dryer emissions are exhausted directly to the atmosphere through the three heated zone exhausts. Based upon visual observations, the character of the three exhaust streams is notable in that they represent the range of conditions expected throughout the industry. The plume from the first exhaust

had a high moisture content and only a trace of visible condensed organic aerosols evidenced by a bluish haze. The second exhaust plume appeared to have approximately equal portions of water vapor and organic aerosols. The third exhaust plume showed no water vapor but, relative to the other two, a significant amount of condensed organics.

The cooling zone exhausts are not considered to be an emission source.

3.2 Boiler/Venturi Scrubber System

The boiler is a Keeler overfeed spreader stoker design fired with hogged wastewood. It has a nominal rating of 110,000 lbs/hr steam at 290 psig. An air sweep blower feeds the hogged wood onto the firing grate. Ash is removed manually through clean-out doors.

The exhaust gases exit the boiler and pass through dry multiclones for removal of coarse particulate matter. The multiclones are followed by a Tranter Kentube Retromizer Fuel Economizer which is an air-to-liquid heat exchanger used for boiler feedwater preheating. This is followed by a fan which imparts the required energy to overcome the pressure drop of the venturi scrubber and its cyclonic separator as well as providing boiler draft.

The venturi scrubber is a conventional flooded rectangular throat design manufactured by Zurn Industries. A standard cyclonic entrainment separator follows the venturi scrubber. The scrubber system was installed to comply with State particulate emission regulations.

3.3 Production and Control Equipment Monitoring

Limited production monitoring was performed by RTI during the first phase. Their purpose was to develop a methodology for monitoring production during the future standard development test programs rather than correlating test results with production rates during this program.

Other than the RTI monitoring, only routine confirmation that the process was operating normally was made by TRC personnel during phase I and phase II testing. The typical observed dryer operation was 12 minutes drying time at 320° F.

During the second phase testing at the boiler, periodic checks were made of the boiler operating conditions to aid correlation of the test results with changes of boiler operation. It was observed that the steam load varied considerably during all tests with fluctuations from 45,000 lbs/hr to 75,000 lbs/hr. This was mainly attributable to changing process demands. A constant steam load could not be maintained.

Other than the KI, monitoring only routine confirmation that the process

4.0 DESCRIPTION OF SAMPLING LOCATIONS

This section presents descriptions of the sampling locations used during the method development program.

4.1 Veneer Dryer

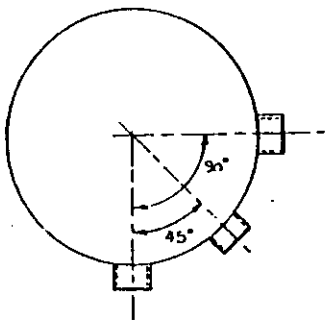
All three exhausts from the No. 1 dryer were sampled. Since no sampling had previously been performed, ports and platforms were installed by G-P to accommodate this program. Three 3-inch ports were provided in each 24-inch diameter exhaust stack as shown in Figure 4-1. Two ports were positioned 90 degrees apart in a horizontal plane for the purposes of preliminary velocity traverses and ODEQ Method 7 sampling. The third port was located 12 inches above the plane of the other two ports on a vertical centerline midway (45 degrees) between them. This port was used for EPA Method 25 sampling.

The ODEQ Method 7 sampling ports for exhausts No. 1 and 2 were located at points greater than eight duct diameters downstream and two duct diameters upstream from flow disturbances. Therefore, in accordance with EPA Method 1, four sampling points were used on each traverse axis for a total of eight sampling points. Sampling ports for exhaust No. 3 were located 5.5 duct diameters downstream and greater than two diameters upstream of flow disturbances necessitating 10 sample points on each traverse axis for a total of 20 sampling points. Locations of the sampling points in each exhaust are shown in Figure 4-2.

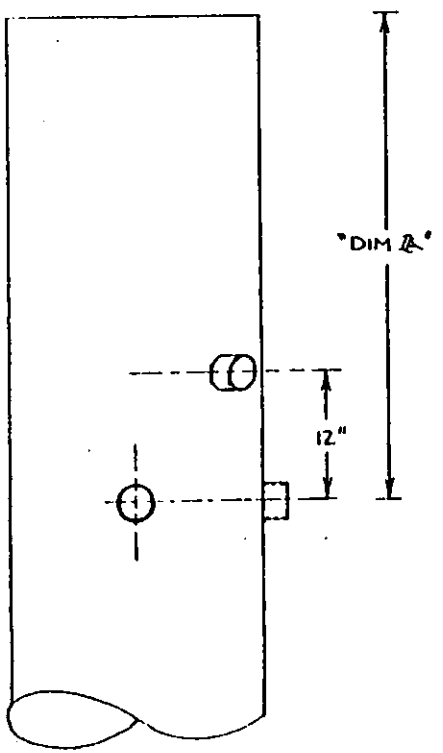
4.2 Boiler/Venturi Scrubber System

4.2.1 Scrubber System Inlet

It had originally been intended to use a single existing sampling port for the inlet sampling location since only EPA Method 25 tests were planned at

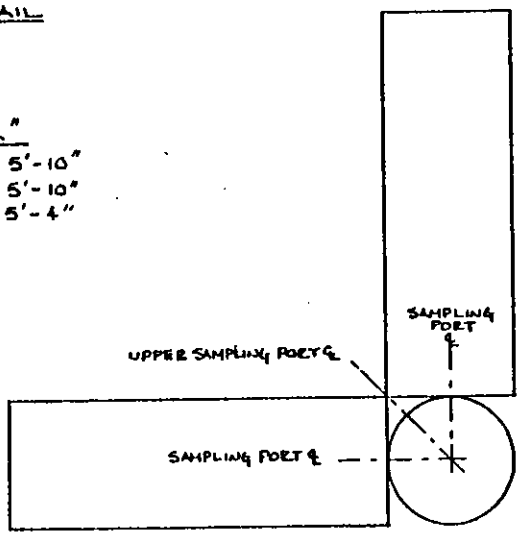


SAMPLING PORT LOCATION DETAIL

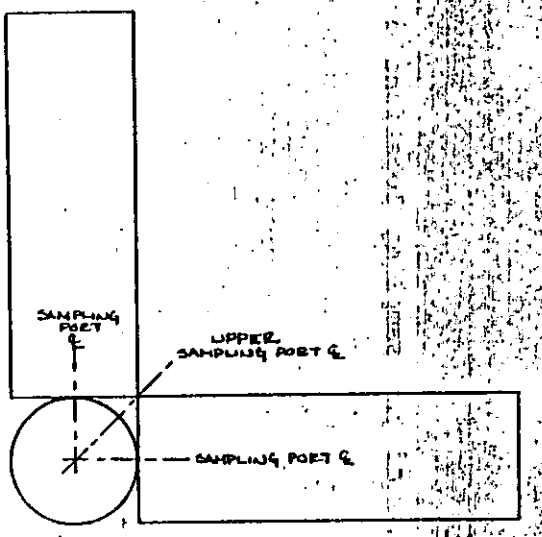


"DIM A"

DRYER EXHAUST NO.1 = 5'-10"
DRYER EXHAUST NO.2 = 5'-10"
DRYER EXHAUST NO.3 = 5'-4"



DRYER EXHAUSTS NOS. 1 & 2



DRYER EXHAUST NO.3

SAMPLING PLATFORM ARRANGEMENT

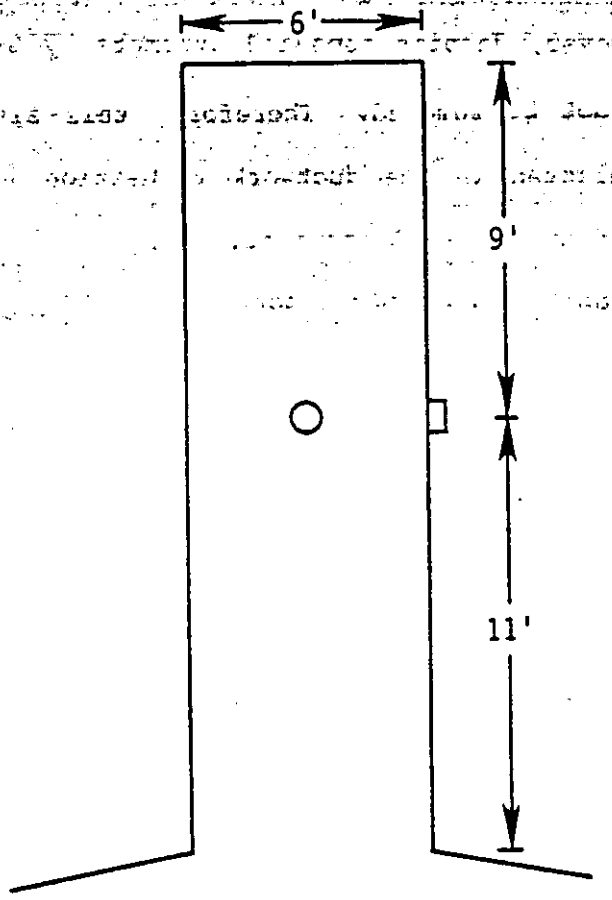
NOTE: AS VIEWED FROM ROOF ACCESS SIDE OF EXHAUST STACKS

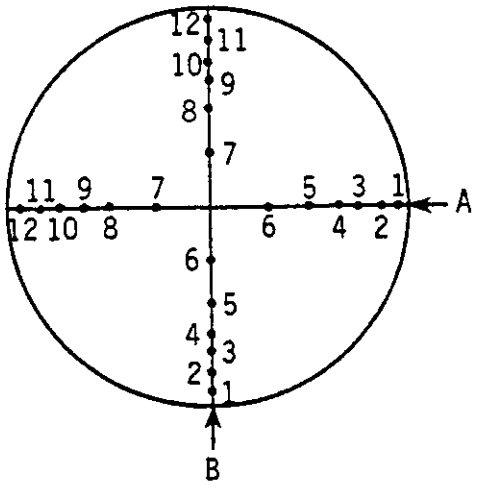
TRC Environmental Consultants, Inc.		125 Silas Deane Highway Wethersfield CT 06109
DWN: EAB	CLIENT: EPA-EMB	
CKD:	TITLE: GEORGIA-PACIFIC WHITEVILLE, NC	
APP.		
68-02-3543	SAMPLING PORT AND PLATFORM	
ESED 80/02	LOCATIONS	
1460-E80	DWG. NO. FIGURE 4-1	REV.

this location. The port is located immediately downstream of the system fan ahead of the venturi scrubber. However, despite repeated attempts by G-P and TRC personnel, the port cap could not be removed. Therefore, this site was abandoned and an alternate site selected in the ductwork transition immediately downstream from the Tranter Kentube Fuel Economizer. Sampling was performed through an existing 1-inch diameter thermometer port.

4.2.2 Scrubber System Outlet

Sampling ports and a platform had previously been installed by G-P at the scrubber system outlet for compliance test purposes. These existing facilities were used for this program. Figure 4-3 shows the sampling point locations. The sampling ports were located 1.8 diameters downstream and 1.5 diameters upstream from flow disturbances. Accordingly, EPA Method 1 required 48 sampling points. However, an exception was taken in this case and only 24 points were sampled for 2-1/2 minutes each with the approval of EPA/EMB. This was done so that the ODEQ Method 7 test would coincide with the 1-hour EPA Method 25 tests.





TOTAL NUMBER OF SAMPLING POINTS=24

SAMPLING POINT LOCATIONS

1A&B	1.5"
2A&B	4.8"
3A&B	8.5"
4A&B	12.7"
5A&B	18.0"
6A&B	25.0"
7A&B	46.4"
8A&B	54.0"
9A&B	59.3"
10A&B	63.5"
11A&B	67.2"
12A&B	70.5"

FIGURE 4-3: GEORGIA-PACIFIC, WHITEVILLE, NORTH CAROLINA
SCRUBBER OUTLET SAMPLING POINT LOCATIONS

5.0 SAMPLING AND ANALYSIS METHODS

This section presents descriptions of the sampling and analysis procedures employed during the method development program.

5.1 EPA Reference Methods Used During this Program

The following EPA Reference Methods were used during the method development program. These methods were taken from CFR 40, July 1, 1980, Part 60, "Standards of Performance for New Stationary Sources," Appendix A, pp. 183 ff. (Methods 1, 2, 3, and 4); and, Federal Register, Volume 45, No. 194, Friday, October 3, 1980, pp. 65959 ff. (Method 25).

Method 1 - Sample and Velocity Traverses for Stationary Sources

This method specifies the number and location of sampling points within a duct, taking into account duct size and shape and local flow disturbances.

Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate

This method specifies the measurement of gas velocity and flow rate using a pitot tube, manometer, and temperature sensor. The physical dimensions of the pitot tube and its spatial relationship to the temperature sensor and any sample probe are also specified.

Method 3 - Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight

This method describes procedures for determining the carbon dioxide, oxygen and, if desired, carbon monoxide volumetric concentration in a gas stream. Measurement of these concentrations allows calculation of the excess air present and the dry molecular weight of the gas stream.

Method 4 - Determination of Moisture Content in Stack Gases

This method specifies the procedures by which the water vapor content of a gas stream can be determined.

Method 25 - Determination of Total Gaseous Nonmethane Organic Emissions as Carbon

This method describes how total gaseous nonmethane organic compounds (NMO) are sampled and analyzed. An emission sample is drawn through a condensate trap and into an evacuated tank. Trap and tank contents are oxidized to carbon dioxide, reduced to methane, and analyzed by a flame ionization detector (FID).

5.2 Non-EPA Reference Methods Used During this Program

Particulate matter and condensible organic compound emissions were sampled using the ODEQ, Air Quality Control Division, Method 7 - Condensible Emissions from Stationary Sources. Details of the method are presented in the ODEQ "Source Sampling Manual," as revised April 1979 and an excerpt is contained in Appendix D. A summary of the method and modifications incorporated in the method development program are presented in Section 5.5. The method was included in this program in recognition of the fact that the majority of the historical veneer dryer emission database has been developed using ODEQ Method 7.

5.3 Preliminary Measurements

5.3.1 Phase I

The first phase of the method development program focused exclusively on the No. 1 veneer dryer exhausts. Preliminary tests performed prior to sample collection included velocity traverses and gas stream moisture determinations. These were performed on January 12 and 13, 1981.

Velocity traverses were performed in accordance with EPA Methods 1 and 2 employing a 36-inch standard pitot tube, 0 to 10-inch inclined manometer, and a chromel-alumel thermocouple with a Thermo-Electric Digimite Model 31160 digital electronic thermometer. Despite the obvious presence of exhaust plumes, there was no discernible velocity pressure indication at any of the exhausts. A 0 to 1-inch range manometer was substituted which indicated velocity pressures of 0 to 0.005 inches water column (w.c.). Higher velocity pressures were periodically observed but these were due to wind effects.

It was learned through subsequent discussions with plant personnel that the dryer was normally operated with the dryer exhaust dampers in the fully

closed position. Therefore, the observed plumes were attributable to damper leakage. G-P agreed to partially open the No. 2 and 3 exhaust dampers to the limit that dried veneer quality was not affected. The No. 1 exhaust damper could not be opened because it had been welded shut. After the dampers had been adjusted, a velocity pressure scan indicated flow velocity pressures of 0.1 to 0.8 and 0.04 to 0.08 inches w.c. for exhausts No. 2 and 3, respectively. Complete EPA Method 2 flow rate determinations were not performed separately but, instead, flow rates were determined in conjunction with ODEQ Method 7 sampling.

Gas stream moisture content determinations were performed at all three exhausts using EPA Method 4 procedures.

5.3.2 Phase II

The second phase of the method development program focused on the No. 1 veneer dryer and the boiler/wet scrubber system. Preliminary tests performed included velocity traverses and moisture determinations. A preliminary determination of the dry gas molecular weight was also performed at the boiler/wet scrubber system sampling locations.

No. 1 Veneer Dryer

Velocity and gas stream moisture content tests were performed at all three dryer exhausts on March 3, 1981. Velocity and flow rate data were obtained in accordance with EPA Methods 1 and 2 using a 36-inch standard pitot tube, 0 to 1-inch manometer, and a chromel-alumel thermocouple with a Thermo-Electric Digimite Model 31160 digital electronic thermometer. The No. 2 and No. 3 exhaust dampers were opened to the extent possible which still provided acceptable dried veneer quality. It was also possible to obtain a velocity profile

for the No. 1 exhaust. Average velocity pressures were 0.018, 0.022, and 0.074 inches w.c. for exhaust No. 1, No. 2 and No. 3, respectively.

Gas stream moisture content was determined for all three exhausts using EPA Method 4. These tests were also performed on March 3.

Boiler/Wet Scrubber System

Preliminary moisture content, velocity, and dry gas molecular weight measurements were performed at the scrubber system outlet on March 4. Moisture content was determined using EPA Method 4. The preliminary velocity measurements consisted of a velocity pressure scan to determine the approximate average velocity pressure for the purpose of setting up the sampling nomograph. Actual flow rate measurements were included with the ODEQ Method 7 sampling. EPA Method 3 incorporating an Orsat analyzer was used for determination of dry gas molecular weight in conjunction with each ODEQ Method 7 test.

No preliminary measurements were performed at the scrubber inlet location. This was not a result of abandoning the planned test site for the alternate location. None had been planned since such data was not considered necessary to the method development program. Moisture content and dry gas molecular weight determinations were performed in conjunction with EPA Method 25 testing at the alternate location, as described on page 25.

5.4 Total Organic Compound Sampling with EPA Method 25

EPA Method 25 was used to determine the total organic compound emissions from the veneer dryer and across the boiler/wet scrubber system. During the method development program several modifications were necessitated by the source gas stream conditions. Sections 5.4.1 through 5.4.3 which

follow describe the general procedures associated with the method. Details of the method are presented in Appendix D. Sections 5.4.4 and 5.4.5 discuss the specific procedures and modifications incorporated during the course of the program.

5.4.1 Sampling Train Preparation

Condensate Trap

After checking for any signs of physical damage, each trap was interconnected to a hydrocarbon (HC) free air cylinder, flowmeters, and CO_2 monitor (nondispersive infrared (NDIR) detector) and inserted in the furnace as shown in Figure 5-1. The trap was then purged with the HC-free air at a 100 ml/min flow rate with the furnace operating at a temperature of 600° C. A propane torch was used to heat those portions of the trap and probe assembly which extend outside the furnace. The purge was performed until the CO_2 monitor indicated a concentration of 1 ppm or less.

Sample Tank

Each sample tank was connected to a cylinder of HC-free air, a vacuum pump, and a mercury manometer as shown in Figure 5-2. The tank was evacuated to 29 inches Hg vacuum after which the three-way valve was switched and the tank was pressurized to 10 inches Hg with HC-free air. This cycle was repeated three times. After the third pressurization, the tank was connected to the total organic compound analyzer and a sample analysis was performed. If a nonmethane organic concentration greater than 1 ppm was measured, the tank was again subjected to the evacuation/pressurization/analysis procedure until accepted. The tank was then evacuated and pressurized to atmospheric conditions with dry nitrogen for shipment to the field.

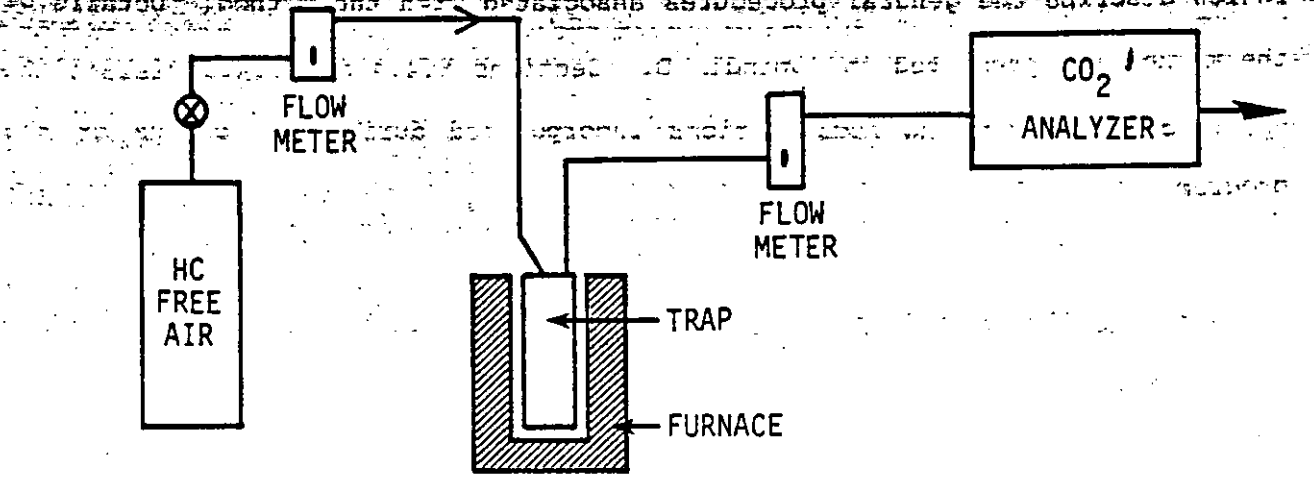


FIGURE 5-1: METHOD 25 TRAP PREPARATION

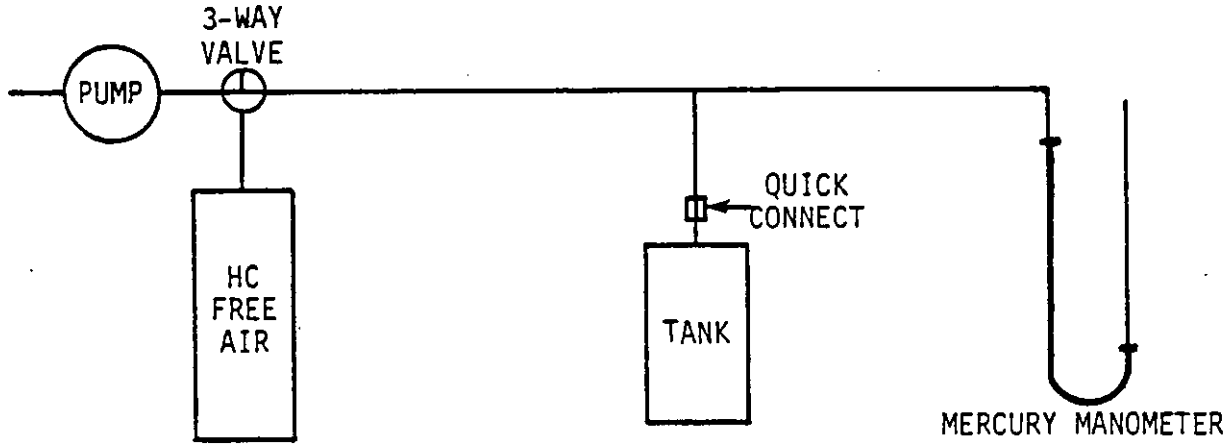


FIGURE 5-2: METHOD 25 TANK PURGING AND EVACUATION

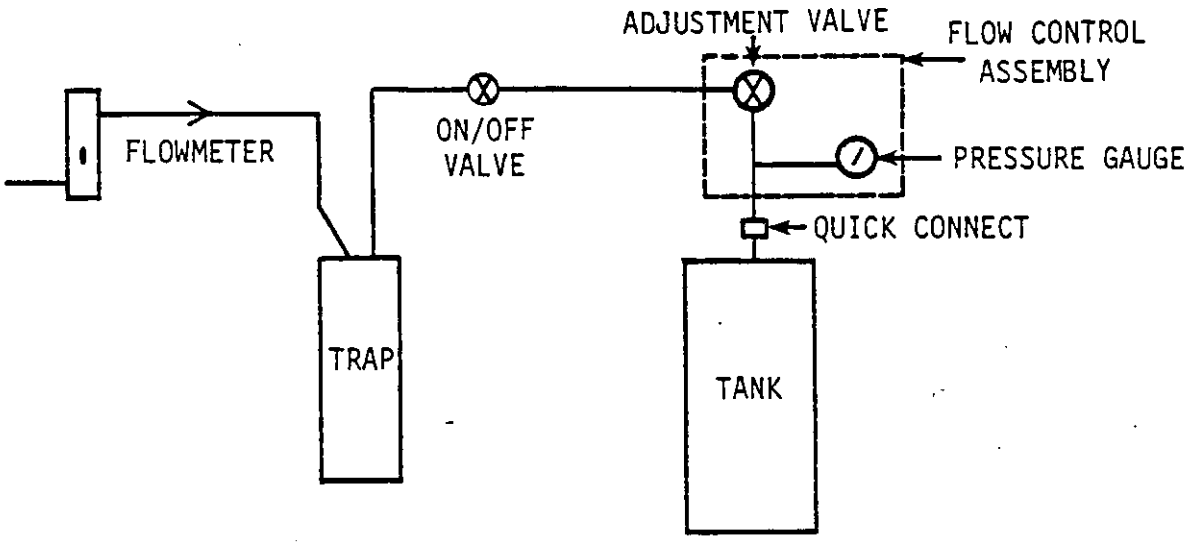


FIGURE 5-3: METHOD 25 FLOW CONTROL ASSEMBLY ADJUSTMENT

Flow Control Assembly

The sampling train was assembled as shown in Figure 5-3 and leak checked. The probe end cap was removed and the probe was connected to a flowmeter as shown. The sample flow shut-off valve was opened and the flow control valve adjusted to achieve a flow rate of 50 ±5 ml/min. The flow rate was then monitored either with the flowmeter or by timing the change in gauge vacuum.

The vacuum should change from 29 inches Hg to 27 inches Hg in about 7 minutes and to 26 inches Hg in about 10 minutes, for a tank volume of approximately 4.8 liters (0.169 ft^3). The general equation relating change in pressure with time is:

$$t \text{ (minutes)} = \frac{V}{Q} \frac{(P_o - P)}{P_B}$$

Where V = tank volume (liters)
Q = flow rate (liters/minute)
P_B = barometric pressure (inches Hg)
P_o = initial tank vacuum pressure (inches Hg)
P = tank vacuum pressure at time t (inches Hg)

The flow control adjustment screw was sealed after the desired flow rate was achieved. The flow control valve number and calibrated flow rate were recorded in the project notebook.

5.4.2 Sampling

The sample tanks were shipped to the site filled and slightly pressurized with dry nitrogen. Immediately prior to each test, the required number of tanks were evacuated. The tank vacuum, ambient temperature, and barometric pressure were recorded on the field sampling data sheet.

Assuring that the flow shut-off valve was in the closed position, the train was assembled as shown in Figure 5-4. The pretest leak check was then

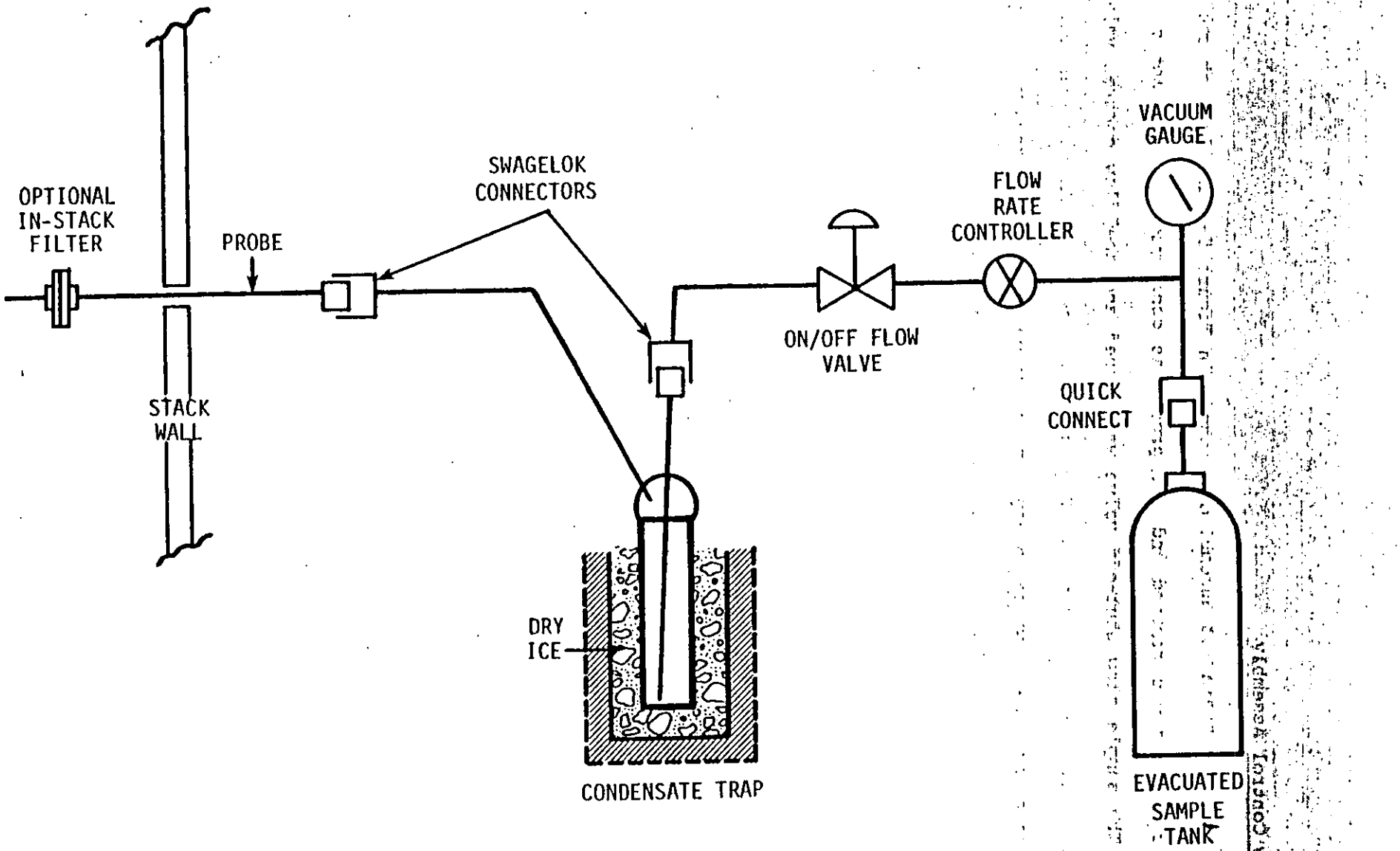


FIGURE 5-4: METHOD 25 SAMPLING TRAIN

performed. The tank vacuum as indicated by the vacuum gauge was recorded and checked again after a minimum period of 10 minutes. If the indicated vacuum had not changed, the portion of the sampling train behind the shut-off valve did not leak and was considered acceptable. Assuring that the probe tip was tightly capped, the front part of the sampling train was checked by opening the flow shut-off valve. After a short period to allow pressure stablization, not more than 2 minutes, the indicated gauge vacuum was noted. After a minimum period of 10 minutes, the indicated vacuum was again noted. The leak check was considered acceptable if no visible change in vacuum occurs. The pretest leak rate (mm Hg/10 minutes) was recorded if observed. At the completion of the leak checks, the sample flow shut-off valve was closed.

After the leak check has been performed, the sample tank number and each trap number comprising a sampling train were recorded on the field data sheet along with the respective test run number and sampling site. Immediately prior to sampling, the gauge vacuum and clock time was noted. The flow shut-off valve was opened and sampling begun. Gauge vacuum readings were recorded every 5 minutes during the sampling period. At the end of the sampling period, the flow shut-off valve was closed; the time and final gauge vacuum was recorded. The probe was removed from the stack and the tip tightly capped.

A post test leak check was performed prior to disassembly of the sampling train. After assuring that the probe has been tightly capped, the flow shut-off valve was opened and the gauge vacuum monitored for a minimum of 10 minutes. The leak check was acceptable if no visible change in tank vacuum occurs. The post test leak rate (mm Hg/10 minutes) was recorded if observed. At the completion of the leak check, the flow shut-off valve was closed.

After the post test leak check was completed, the sampling train components were disconnected. Both ends of each condensibles trap were tightly

sealed. The traps were then packed in dry ice for sample preservation and shipment to the laboratory.

5.4.3 Analysis

Nonmethane organics were determined by combining the analytical results obtained from independent analyses of the condensate trap and sample tank fractions. After sampling was completed, the organic contents of the condensate trap were oxidized to carbon dioxide (CO_2) which was quantitatively collected in an evacuated vessel; then a portion of the CO_2 was reduced to methane (CH_4) and measured by an FID. The organic content of the sample fraction collected in the sampling tank was measured by injecting a portion into a gas chromatographic (GC) column to achieve separation of the nonmethane organics from carbon monoxide (CO), CO_2 and CH_4; the NMO were oxidized to CO_2, reduced to CH_4, and measured by an FID. In this manner, the variable response of the FID associated with different types of organics was eliminated.

TRC Analysis Equipment

The analyzer was fabricated by TRC using the following base components:

Varian Model 2800 gas chromatograph with flame ionization detector
Varian Model A25 chart recorder
Varian Model 485 electronic integrator

These components were interconnected to provide an analyzer scheme very similar to that described in the method. However, TRC made some changes which, in our opinion, improved the ease of operation without affecting analyzer performance. Figure 5-5 depicts the analyzer schematic as assembled. A high grade, HC-free carrier gas was used which eliminated the necessity of the purification furnace.

A six-port valve (Carle Model 5521) was substituted for the two four-port valves. One four-port valve was used instead of two four-port valves in the reduction catalyst flow scheme. In effect, the latter valving modification precluded venting hydrogen within the laboratory.

The exit line from the oxidation furnace to the six-port valve was heat traced to avoid condensation. Additionally, all four switching valves incorporated in the analyzer were enclosed in a heated insulated compartment thermostatically controlled to maintain a constant 100° C temperature.

The separation column used was prepared by Supelco, Inc. It was a 4-1/2 foot long, 1/8-inch diameter stainless steel tube with two packed sections. The injection side section was 3 feet long and contained 10 percent OV-101 (liquid methyl silicone) on 80/100 mesh Supelcoport. The following section was 1-1/2 feet long packed with 60/80 mesh Poropak Q.

The oxidation catalyst assembly was prepared by TRC using a proprietary catalyst material manufactured by Davidson Specialty Chemical Company. The catalyst as received was crushed by TRC using mortar and pestle to provide a more homogeneous material with greater active surface area per unit volume. Approximately 6 to 8 inches of the crushed catalyst was packed into a 1/4-inch O.D. quartz tube. Glass wool plugs were inserted at both ends of the packing to retain the catalyst and maintain compaction.

The reduction catalyst was a Byron Instruments unit with integral heater. This was mounted within the Varian gas chromatograph oven to insure constant temperature operation.

Although not clearly shown on Figure 5-5, a single combustion air source serviced both the oxidation catalyst and the FID. Individual metering valves were used after the flow splitter to regulate the supply to each device.

The condensate recovery and conditioning apparatus equipment was assembled by TRC as shown in Figure 5-6 and was essentially the same as the configuration detailed by Method 25. The nondispersive infrared detector incorporated was an Anarad AR 400, 0-10,000 ppm CO_2.

The TRC arrangement did not incorporate the vacuum pump in a direct link with the other equipment. Instead, it was located remotely. This was done to avoid contamination by the oil mist vented from the vacuum pump.

A tube furnace was used for volatilization of the condensate trap sample. This provided more even, high temperature heating of the trap. A propane torch was used to heat those parts of the trap, including the probe, which remained outside the furnace during the sample recovery procedure. Valves A, B, C and D in Figure 5-6 and their connecting tubing were enclosed in a thermostatically controlled oven maintained at 125° C in order to prevent condensation.

Analyzer Operating Conditions:

Gas	Regulator Pressure (psig)	Flow Rate (cc/min)
Helium	42	25
Air	45	30 FID 50 Oxidation Catalyst
Hydrogen	20	30

Separation column normal temperature: 0° C
Separation column backflush temperature: 100° C
Oxidation catalyst temperature: 750° C
Reduction catalyst temperature: 100° C (32 VAC)

Condensate Recovery Conditions:

Gas	Regulator Pressure (psig)	Flow Rate (cc/min)
Oxygen	10	150
Air	15	50

Oxidation catalyst temperature: 850° C

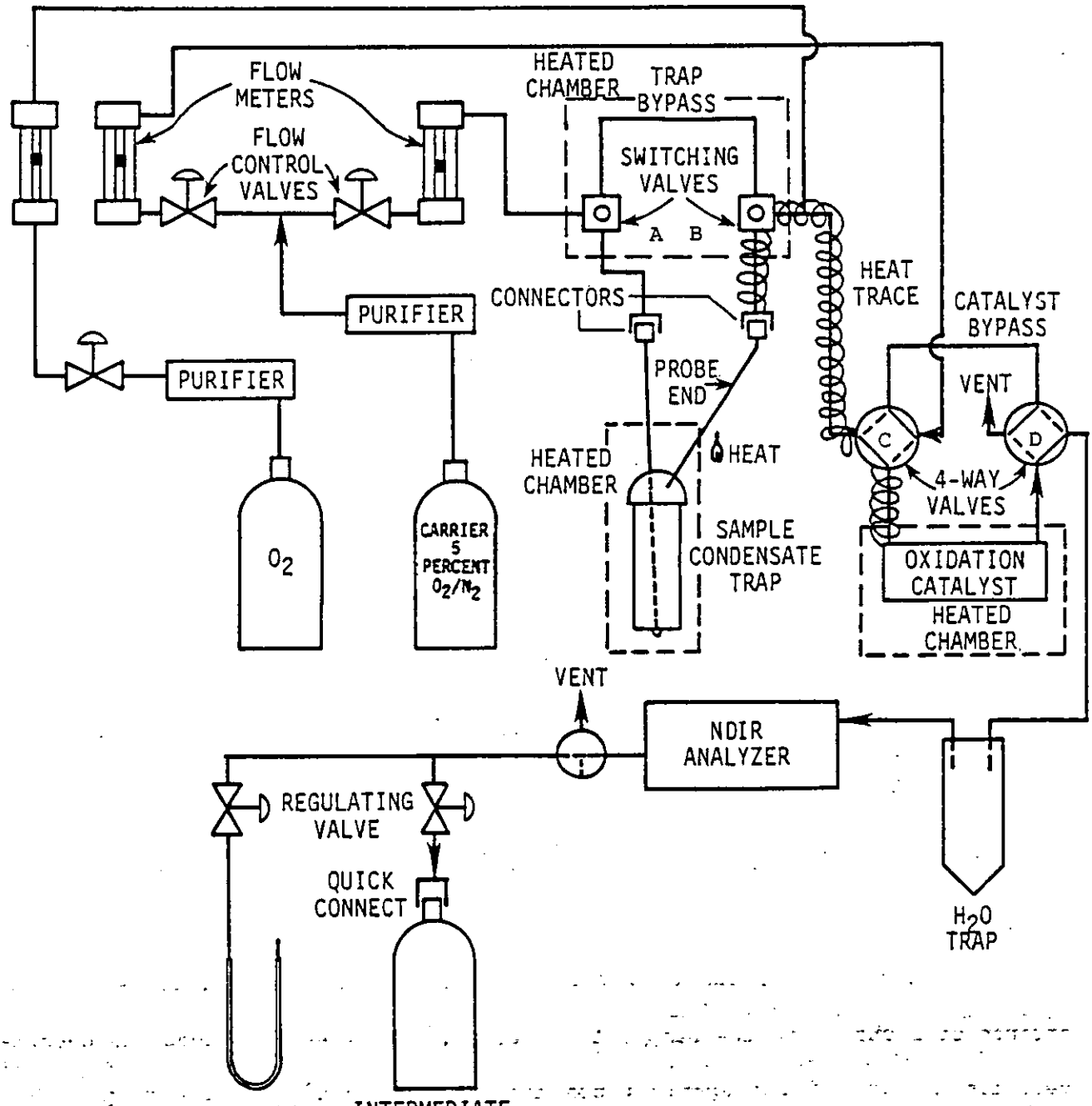


FIGURE 5-6: TRC CONDENSATE RECOVERY AND CONDITIONING APPARATUS

Calibration of the FID was performed using three certified propane standard gases, of the following concentrations: 54.3 ppm, 27[illegible] ppm, and 2382 ppm. Oxidation catalyst efficiency checks were made with a 1 percent methane standard calibration gas prior to sample injections. Reduction catalyst efficiency checks were performed using either a 1.95 percent CO_2 calibration gas run directly through the reduction catalyst or using the 1 percent methane standard, and running it through both the oxidation and reduction catalysts, comparing the integration response to the response of the 1 percent methane standard when it bypassed both catalysts.

5.4.4 Phase I

Sampling

Method 25 sampling was performed on January 13 and 14. The planned tests were as follows:

January 13: exhaust No. 1 - duplicate Method 25 pairs with in-stack filter

exhaust No. 3 - Method 25 pair with in-stack filter
Method 25 pair without in-stack filter

January 14: exhaust No. 2 - Method 25 with in-stack filter

The first day of testing revealed the expected problems with high moisture content streams and resulted in a change of the planned tests. The first pair run at exhaust No. 3 froze up within 45 minutes. This was indicated by the absence of a change in the sample tank vacuum. The freeze-up occurred despite periodic heating of the sample probe and the top portion of the trap with a propane torch. Instead of attempting another sample at exhaust No. 3, a sample pair was run at exhaust No. 1 since the moisture test had indicated a

lower content, approximately 33 percent vs. 55 percent for exhaust No. 3. The freeze-up problem occurred within 25 minutes, again despite heating. The in-stack filter was removed from one sampling train to check if saturation of the filter with water or condensed organics were contributing to the sample flow stoppage. This had no effect and it was concluded that trap freezeup was the cause. A single sampling train was next run at exhaust No. 3 with the trap immersed in water ice instead of dry ice. This mode of operation proved successful in that there was no freezeup and nearly consistent tank pressure changes occurred between readings.

Sampling focused on exhaust No. 2 on the second day as planned. However, significant procedural changes were made in light of the previous day's expe-rience. Initially, a single sampling train was tried in the normal configura-tion with the trap in dry ice. As had previously occurred, sample flow stop-page occurred within 26 minutes. The next sample run employed a sampling train with two traps in series, Figure 5-7. The first trap was immersed in water ice and the second trap in dry ice. No freeze-up occurred. Following this, a pair of samples was obtained with one train using the traps in series approach and one train using a single trap in water ice. No freeze-up occur-red in either sampling train.

Analysis

The samples were analyzed following the procedures described in Section 5.4.3. No problems were encountered.

5.4.5 Phase II

Sampling

Testing was performed at both the veneer dryer and the boiler/wet scrubber system using the modified Method 25 sampling train incorporating traps in

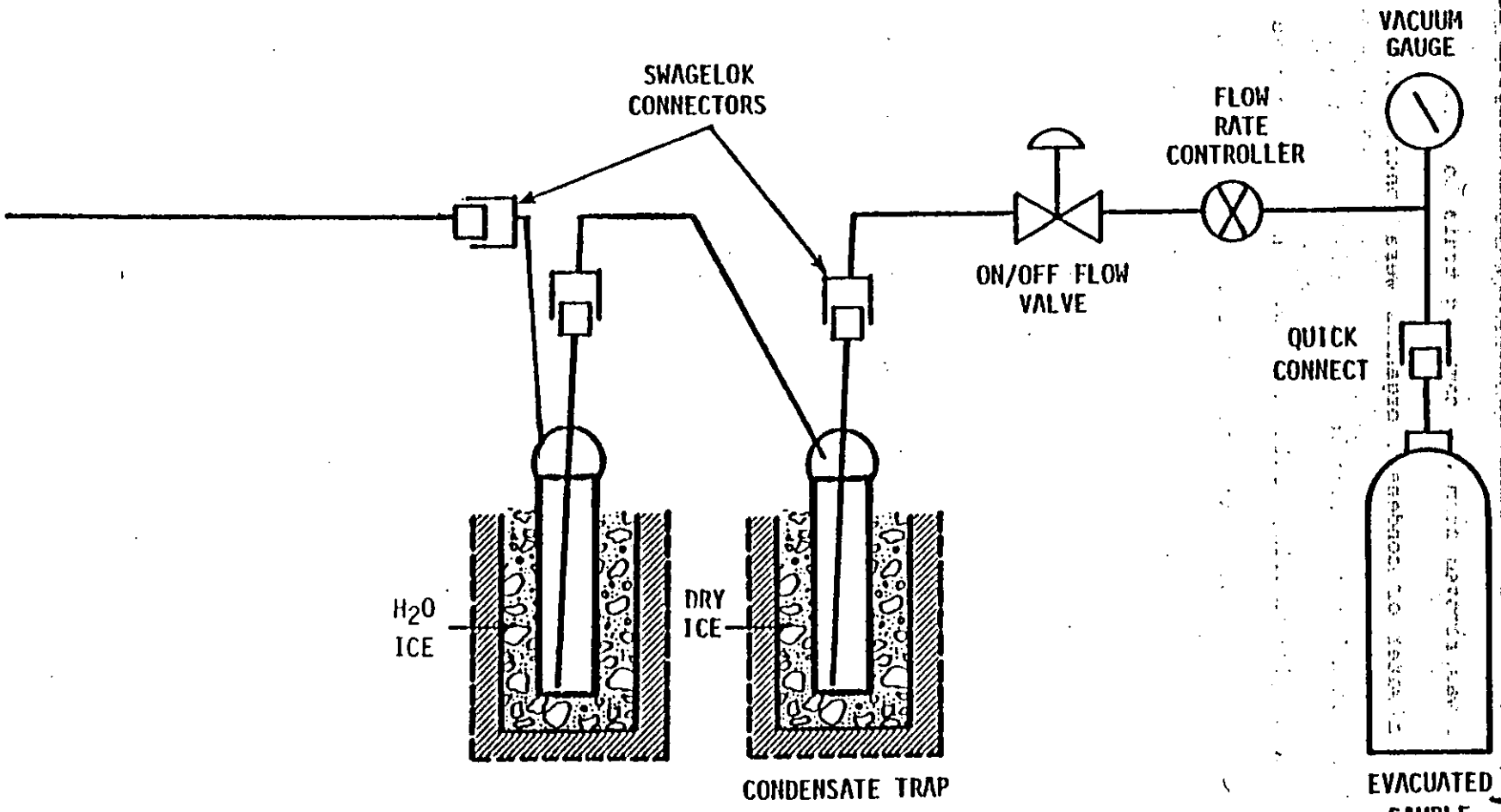


FIGURE 5-7: MODIFIED METHOD 25 SAMPLING TRAIN

series. In-stack filters were used at all sampling locations except the wet scrubber. At this location, the Method 25 samples were extracted from the ODEQ Method 7 sample stream immediately following the hot-box filter, Figure 5-8.

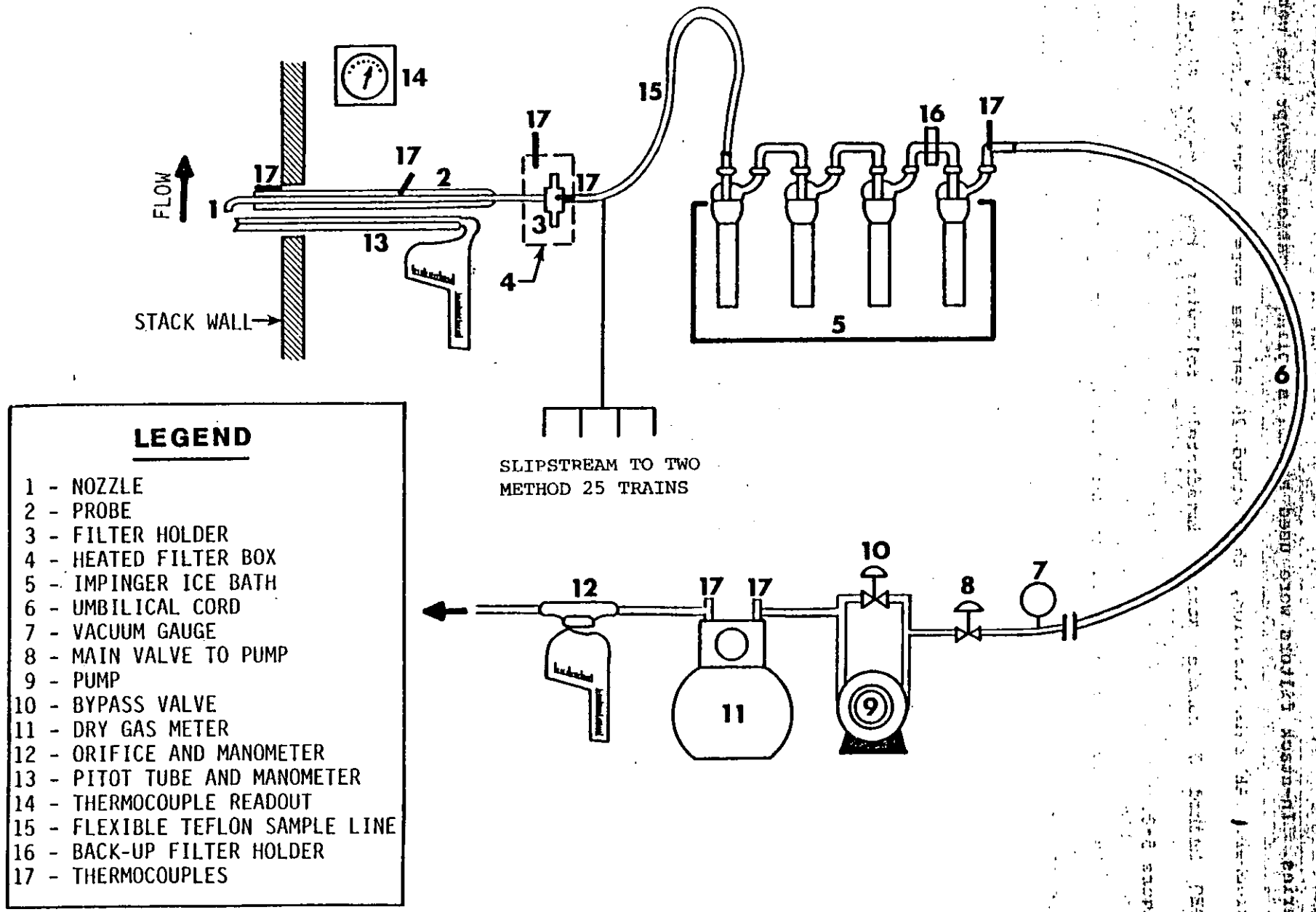
None of the freeze-up problems which occurred during the first phase were encountered.

Analysis

Analyses were performed as described in Section 5.4.3 but several sample related problems required that modifications be made to the general analyzer scheme. The problems were related to the high water content of the veneer dryer exhaust samples. They were not encountered during the first phase sample analysis because total sample volumes collected during this phase were one and one-half to 2-1/2 times greater. The problems were:

- rapid degradation of oxidation catalyst efficiency
- water condensation in interconnecting tubing between the trap and the oxidation catalyst during trap sample recovery
- overload of water trap following the oxidation catalyst
- condensation and water carryover at entrance of the NDIR
- moisture carryover into the sample tank during trap purge

The catalyst regeneration problem was discovered as a consequence of the noticable presence of water in the interconnecting tubing and poor paired sample precision. Consecutive analyses of standard samples both with and without water revealed the catalyst efficiency reduction which was reduced to as low as 25 percent. Interestingly, and very important, the daily catalyst



LEGEND

1 - NOZZLE
2 - PROBE
3 - FILTER HOLDER
4 - HEATED FILTER BOX
5 - IMPINGER ICE BATH
6 - UMBILICAL CORD
7 - VACUUM GAUGE
8 - MAIN VALVE TO PUMP
9 - PUMP
10 - BYPASS VALVE
11 - DRY GAS METER
12 - ORIFICE AND MANOMETER
13 - PITOT TUBE AND MANOMETER
14 - THERMOCOUPLE READOUT
15 - FLEXIBLE TEFLON SAMPLE LINE
16 - BACK-UP FILTER HOLDER
17 - THERMOCOUPLES

FIGURE 5-8: MODIFIED ODEQ METHOD 7 PARTICULATE AND CONDENSIBLE ORGANICS SAMPLING TRAIN

performance check did not reveal the problem. This was due to the catalyst's ability to "dry" and regenerate over a period of time under the influence of the carrier gas and its oxygen content. The Davidson Specialty Chemical hydrocarbon oxidation catalyst was replaced with Hopcalite. Although not as sensitive to water vapor from an efficiency standpoint, the Hopcalite was observed to eventually crystallize and bond to the quartz tubing making replacement necessary due to the resulting flow restriction. The replacement frequency was not definitively determined but could logically be expected to vary with sample moisture content. As a precaution, the catalyst was replaced at least every 2 days.

Condensation between the trap and catalyst during trap sample recovery was eliminated by placing the associated valves and tubing in a thermostatically controlled, 250° F, insulated chamber. Modifications to the water trap and the addition of a supplemental moisture eliminator prior to the NDIR eliminated the problems at these two elements.

In order to ensure a complete carbon dioxide purge from the trap, part of the procedure had been performed with the trap removed from the dry ice bath. Since this procedure obviously contributed to water vapor carryover into the sample tank, the procedure reverted to purging only with the trap in dry ice.

Following the modifications, the samples obtained at the boiler/wet scrubber system were analyzed. No water related problems were encountered. Although this may in part be attributable to the analyzer and procedural modifications, it was also recognized that the gas stream moisture contents at the location were lower by factors of 3 to 5.

5.5 Oregon Department of Environmental Quality Method 7

ODEQ Method 7 was incorporated in both phases of the method development program with only slight modifications to the published procedure, Appendix D.

Sections 5.5.1 and 5.5.2 briefly discuss the general sampling and analytical procedures associated with the method. Sections 5.5.3 and 5.5.4 discuss the modifications and observations of phases I and II, respectively.

5.5.1 Sampling Equipment and Procedures

ODEQ Method 7 is essentially a modified EPA Method 5 approach. The major modifications are the inclusion of the impinger train sample catch in the total sample weight and the addition of an unheated back-up filter between the third and fourth impingers, Figure 5-7. The purpose of the back-up filter was to collect any organic aerosols formed but not collected within the impingers. The hot-box filter may or may not be used depending on whether dry solid particulate is present. However, when the hot-box filter is used, the glass cyclone is also included.

Sampling procedures are identical to those of EPA Method 5 with the exception of sample recovery. The impinger sample is recovered and all the impingers and interconnecting glassware are rinsed with acetone. The back-up filter is also recovered for gravimetric analysis.

5.5.2 Analysis

The analytical prcedures are an extension of EPA Method 5. The major addition are the procedures related to analysis of the impinger catch. Condensed organics are extracted from the impinger water using a chloroform-ethyl ether procedure. The extract and glassware acetone rinses are evaporated separately at 70° F, desiccated for 24 hours and weighed. Following organic extraction, the impinger water is evaporated at 220° F, the residue desiccated for 24 hours and weighed. The back-up filter is also desiccated for

24 hours and weighed. Emission concentrations are determined using EPA Method 5 calculation procedures, including the impinger and rinse residue and back-up filter weight gains.

5.5.3 Phase I

Sampling

A few modifications were made to the sampling apparatus described by the method for the purposes of this program. An in-stack thimble-type filter was used to determine the amount of condensed particulate matter existing at stack temperature. The hot-box filter was also used but the glass cyclone apparatus was not included since it was precluded by the in-stack filter. A flexible teflon tube was used to interconnect the outlet of the hot-box filter and the impinger train. This modification was made primarily to improve the ease of sampling during traverse to the multiple sampling points.

Exhaust No. 1 was not sampled due to its low/no flow characteristic. Exhausts No. 2 and 3 were sampled with little difficulty. The following observations were made during testing and sample recovery.

- The impingers were very warm to the touch despite frequent addition of ice and low ambient temperature. Filter hot-box exit temperatures were maintained in the range of 250° F to 290° F which was within the expected range and does not explain the occurrence.
- Condensed water vapor was evident at both the inlet and outlet of the back-up filter holder. Consequently, the filter was also wet and difficult to recover.
- The in-stack thimble filters were recovered with little evidence of deterioration attributable to the high moisture levels.
- Even after rinsing the impingers with distilled water and acetone, a residue was evidenced in the first impinger by a discoloration of the glass. This could not be removed by additional rinses.

Analysis

No problems were encountered during the analyses.

5.5.4 Phase II

ODEQ Method 7 was used only for the scrubber outlet testing in combination with the modified EPA Method 25 scheme. Sampling was performed following the same procedures that were incorporated in phase I except that the hot-box filter and probe were maintained at 350 $\pm 25^{\circ}$ F. Both the sampling and analysis were performed without difficulty.

APPENDIX A

SUMMARY OF TEST DATA

A.1 Phase I
A.2 Phase II

APPENDIX A.1

PHASE I

PARTICULATE TEST DATA

TEST 1-1 TIME 1300 - 1410

LOCATION STACK #2 DATE JAN 13, 1981

FIRM GEORGIA PACIFIC PROJECT NO. 1460-E80

Input A			
P bar	Barometric Pressure - in. Hg	30.04	
As	Stack Area - Ft^2	3.14	
Dn	Nozzle Diameter - in.	0.382	
Time	Total Sampling Time - min.	64	
Y	Calibration Factor	1.00	
Cp	Pitot Coefficient	0.84	
$(\Delta P)^{1/2}$	Average Square Root of Velocity Head (in. H_2O)	0.394	
ΔH	Average Orifice Pressure Drop - in. H_2O	0.94	
Tm	Average Meter Temperature °F	57	
Pstk	Average Stack Pressure - in. H_2O	-0.05	
Tstk	Average Stack Temperature °F	304	
Vm	Meter Volume at Meter Conditions - Ft^3	34.23	
Vl	Total Water Vapor Collected - ml	607.1	
→ CO_2	% CO_2 in Stack Gas (Dry)	0	
O_2	% O_2 in Stack Gas (Dry)	21	
→ CO	% CO in Stack Gas (Dry)	0	

			Total Particulate	Condensibles
Input B				
Mn		Total Particulate Catch - Mg	317.53	84.41
Input C				
% H		% Hydrogen in Fuel		
% C		% Carbon in Fuel		
% S		% Sulfur in Fuel		
% N		% Nitrogen in Fuel		
% O		% Oxygen in Fuel		
GCV		Gross Califoric Volume of Fuel - BTU/lb		
Calculated				
Vm (std)		Meter Volume at Standard Conditions (Dry)-Ft^3	35.19	35.19
% H_2O		% H_2O Vapor in Stack Gas	44.83	44.83
Mws		Molecular Weight of Stack Gas (Wet)	23.98	23.98
Vs		Average Velocity of Stack Gas - FPM	1748	1748
Qs		Actual Stack Gas Flowrate - ACFM	5489	5489
Qs (std)		Stack Gas Flowrate (0.0% H_2O; STP) - DSCF	2101	2101
% I		% Isokinetic (Avg. Nozzle Vel/Avg. Stk.Vel)	103.3	103.3
Cs		Particulate Concentration-lb/DSCF	1.99×10^{-5}	0.529×10^{-5}
Er		Particulate Emission Rate-lb/hour	2.51	0.667
F		F Factor - DSCF/MM BTU		
E		Particulate Emissions - lbs/MM BTU		

PARTICULATE TEST DATA

AIR TEST SECTIONS

TEST 1-2 TIME 1300-1407

LOCATION STACK #2 DATE JAN 13 1981

FIRM GEORGIA PACIFIC PROJECT NO. 1460-E80

Input A			
P bar	Barometric Pressure - in. Hg	30.04	
As	Stack Area - Ft^2	3.14	
Dn	Nozzle Diameter - in.	0.3811	
Time	Total Sampling Time - min.	64	
Y	Calibration Factor	1.00	
Cp	Pitot Coefficient	0.84	
$(\Delta P)^{1/2}$	Average Square Root of Velocity Head (in. H_2O)	0.339	
ΔH	Average Orifice Pressure Drop - in. H_2O	1.04	
Tm	Average Meter Temperature °F	61	
Pstk	Average Stack Pressure - in. H_2O	-.07	
Tstk	Average Stack Temperature °F	327	
Vm	Meter Volume at Meter Conditions - Ft^3	34.57	
Vl	Total Water Vapor Collected - ml	673.6	
CO_2	% CO_2 in Stack Gas (Dry)	0	
O_2	% O_2 in Stack Gas (Dry)	21	
CO	% CO in Stack Gas (Dry)	0	

		Total Particulate	Condensibles
Input B			
Mn	Total Particulate Catch - Mg	343.09	181.16
Input C			
% H	% Hydrogen in Fuel		
% C	% Carbon in Fuel		
% S	% Sulfur in Fuel		
% N	% Nitrogen in Fuel		
% O	% Oxygen in Fuel		
GCV	Gross Califoric Volume of Fuel - BTU/lb		
Calculated			
Vm (std)	Meter Volume at Standard Conditions (Dry)-Ft^3	35.27	35.27
% H_2O	% H_2O Vapor in Stack Gas	47.36	47.36
Mws	Molecular Weight of Stack Gas (Wet)	23.71	23.71
Vs	Average Velocity of Stack Gas - FPM	1762	1762
Qs	Actual Stack Gas Flowrate - ACFM	5533	5533
Qs (std)	Stack Gas Flowrate (0.0% H_2O; STP) - DSCF	1962	1962
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)	111.4	111.4
Cs	Particulate Concentration-lb/DSCF	2.14×10^{-5}	1.13×10^{-5}
Er	Particulate Emission Rate-lb/hour	2.52	1.33
F	F Factor - DSCF/MM BTU		
E	Particulate Emissions - lbs/MM BTU		

PARTICULATE TEST DATA

TEST 2-1 TIME 1009 to 1116

LOCATION STACK #3 DATE JAN 14, 1981

FIRM GEORGIA PACIFIC PROJECT NO. 1460-E80

Input A		
P bar	Barometric Pressure - in. Hg	30.02
As	Stack Area - Ft^2	3.14
Dn	Nozzle Diameter - in.	0.5065
Time	Total Sampling Time - min.	60
Y	Calibration Factor	1.00
Cp	Pitot Coefficient	0.84
$(\Delta P)^{1/2}$	Average Square Root of Velocity Head (in. H_2O)	0.268
ΔH	Average Orifice Pressure Drop - in. H_2O	1.51
Tm	Average Meter Temperature °F	58
Pstk	Average Stack Pressure - in. H_2O	-.06
Tstk	Average Stack Temperature °F	294
Vm	Meter Volume at Meter Conditions - Ft^3	40.22
Vl	Total Water Vapor Collected - ml	840.5
→ CO_2	% CO_2 in Stack Gas (Dry)	0
O_2	% O_2 in Stack Gas (Dry)	21
→ CO	% CO in Stack Gas (Dry)	0

		Total Particulate	Condensibles
Input B			
Mn	Total Particulate Catch - Mg	514.32	77.85
Input C			
% H	% Hydrogen in Fuel		
% C	% Carbon in Fuel		
% S	% Sulfur in Fuel		
% N	% Nitrogen in Fuel		
% O	% Oxygen in Fuel		
GCV	Gross Califoric Volume of Fuel - BTU/lb		
Calculated			
Vm (std)	Meter Volume at Standard Conditions (Dry) - Ft^3	41.29	41.29
% H_2O	% H_2O Vapor in Stack Gas	48.95	48.95
Mws	Molecular Weight of Stack Gas (Wet)	23.53	23.53
Vs	Average Velocity of Stack Gas - FPM	1193	1193
Qs	Actual Stack Gas Flowrate - ACFM	3746	3746
Qs (std)	Stack Gas Flowrate (0.0% H_2O; STP) - DSCF	1344	1344
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)	115.0	115.0
Cs	Particulate Concentration-lb/DSCF	2.75×10^{-5}	0.416×10^{-5}
Er	Particulate Emission Rate-lb/hour	2.21	0.335
F	F Factor - DSCF/MM BTU		
E	Particulate Emissions - lbs/MM BTU		

PARTICULATE TEST DATA

TEST 2-2 TIME 1009 to 1116

LOCATION STACK #3 DATE JAN 14, 1981

FIRM GEORGIA PACIFIC PROJECT NO. 1460-ESO

Input A			
P bar	Barometric Pressure - in. Hg	30.04	
As	Stack Area - Ft^2	3.14	
Dn	Nozzle Diameter - in.	0.5067	
Time	Total Sampling Time - min.	60	
Y	Calibration Factor	1.00	
Cp	Pitot Coefficient	0.84	
$(\Delta P)^{1/2}$	Average Square Root of Velocity Head (in. H_2O)	0.2311	
ΔH	Average Orifice Pressure Drop - in. H_2O	1.342	
Tm	Average Meter Temperature °F	63.5	
Pstk	Average Stack Pressure - in. H_2O	0	
Tstk	Average Stack Temperature °F	327	
Vm	Meter Volume at Meter Conditions - Ft^3	36.68	
Vl	Total Water Vapor Collected - ml	776.9	
→ CO_2	% CO_2 in Stack Gas (Dry)	0	
O_2	% O_2 in Stack Gas (Dry)	21	
→ CO	% CO in Stack Gas (Dry)	0	

		Total Particulate	Condensibles
Input B			
Mn	Total Particulate Catch - Mg	490.62	69.57
Input C			
% H	% Hydrogen in Fuel		
% C	% Carbon in Fuel		
% S	% Sulfur in Fuel		
% N	% Nitrogen in Fuel		
% O	% Oxygen in Fuel		
GCV	Gross Califoric Volume of Fuel - BTU/lb		
Calculated			
Vm (std)	Meter Volume at Standard Conditions (Dry)-Ft^3	37.27	37.27
% H_2O	% H_2O Vapor in Stack Gas	49.54	49.54
Mws	Molecular Weight of Stack Gas (Wet)	23.47	23.47
Vs	Average Velocity of Stack Gas - FPM	1053	1053
Qs	Actual Stack Gas Flowrate - ACFM	3303	3303
Qs (std)	Stack Gas Flowrate (0.0% H_2O; STP) - DSCF	1122	1122
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)	124.1	124.1
Cs	Particulate Concentration-lb/DSCF	2.90×10^{-5}	0.412×10^{-5}
Er	Particulate Emission Rate-lb/hour	1.95	0.277
F	F Factor - DSCF/MM BTU		
E	Particulate Emissions - lbs/MM BTU		

APPENDIX A.2

PHASE II

PARTICULATE TEST DATA

TEST S07-1 TIME 1111 to 1222

LOCATION Scrubber Outlet DATE March 5, 1981

FIRM G. PROJECT NO. 14160-E80

Input A		
P bar	Barometric Pressure - in. Hg	29.60
As	Stack Area - Ft^2	28.27
Dn	Nozzle Diameter - in.	.255
Time	Total Sampling Time - min.	60
Y	Calibration Factor	0.99
Cp	Pitot Coefficient	0.84
$(\Delta P)^{1/2}$	Average Square Root of Velocity Head (in. H_2O)	0.57
ΔH	Average Orifice Pressure Drop - in. H_2O	0.98
Tm	Average Meter Temperature °F	71
Pstk	Average Stack Pressure - in. H_2O	-.18
Tstk	Average Stack Temperature °F	145
Vm	Meter Volume at Meter Conditions - Ft^3	32.86
Vl	Total Water Vapor Collected - ml	111.3
→ CO_2	% CO_2 in Stack Gas (Dry)	7.0
O_2	% O_2 in Stack Gas (Dry)	13.8
→ CO	% CO in Stack Gas (Dry)	0

		Particulate	Condensibles	Total
Input B				
Mn	Total Particulate Catch - Mg	103.88	24.08	127.96

Input C		
% H	% Hydrogen in Fuel	
% C	% Carbon in Fuel	
% S	% Sulfur in Fuel	
% N	% Nitrogen in Fuel	
% O	% Oxygen in Fuel	
GCV	Gross Califoric Volume of Fuel - BTU/lb	

Calculated				
Vm (std)	Meter Volume at Standard Conditions (Dry)-Ft^3	32.1		
% H_2O	% H_2O Vapor in Stack Gas	14.0		
Mws	Molecular Weight of Stack Gas (Wet)	28.0		
Vs	Average Velocity of Stack Gas - FPM	2100		
Qs	Actual Stack Gas Flowrate - ACFM	59300		
Qs (std)	Stack Gas Flowrate (0.0% H_2O; STP) - DSCF	44000		
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)	97.00		
Cs	Particulate Concentration-lb/DSCF	7.14×10^{-6}	1.65×10^{-6}	8.79×10^{-6}
Er	Particulate Emission Rate-lb/hour	18.8	4.37	23.29
F	F Factor - DSCF/MM BTU			
E	Particulate Emissions - lbs/MM BTU			

PARTICULATE TEST DATA

TEST SO7-2 TIME 1615 to 1826

LOCATION Scrubber Outlet DATE March 5, 1981

FIRM GEORGIA PACIFIC PROJECT NO. 1460-E80

Input A			
P bar	Barometric Pressure - in. Hg	29.60	
As	Stack Area - Ft^2	28.27	
Dn	Nozzle Diameter - in.	0.255	
Time	Total Sampling Time - min.	60	
Y	Calibration Factor	0.99	
Cp	Pitot Coefficient	0.84	
$(\Delta P)^{1/2}$	Average Square Root of Velocity Head (in. H_2O)	0.161	
ΔH	Average Orifice Pressure Drop - in. H_2O	1.21	
Tm	Average Meter Temperature °F	68	
Pstk	Average Stack Pressure - in. H_2O	-0.22	
Tstk	Average Stack Temperature °F	149	
Vm	Meter Volume at Meter Conditions - Ft^3	35.95	
Vl	Total Water Vapor Collected - ml	168.7	
→ CO_2	% CO_2 in Stack Gas (Dry)	10.2	
O_2	% O_2 in Stack Gas (Dry)	10.4	
→ CO	% CO in Stack Gas (Dry)	0	

Input B		PARTICULATE	CONDENSIBLES	Tot ~
Mn	Total Particulate Catch - Mg	169.86	43.72	213.58
Input C				
% H	% Hydrogen in Fuel			
% C	% Carbon in Fuel			
% S	% Sulfur in Fuel			
% N	% Nitrogen in Fuel			
% O	% Oxygen in Fuel			
GCV	Gross Califoric Volume of Fuel - BTU/lb			
Calculated				
Vm (std)	Meter Volume at Standard Conditions (Dry)-Ft^3	35.3		
% H_2O	% H_2O Vapor in Stack Gas	18.4		
Mws	Molecular Weight of Stack Gas (Wet)	27.8		
Vs	Average Velocity of Stack Gas - FPM	2260		
Qs	Actual Stack Gas Flowrate - ACFM	63900		
Qs (std)	Stack Gas Flowrate (0.0% H_2O; STP) - DSCF	44200		
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)	105		
Cs	Particulate Concentration-lb/DSCF	1.0640^{-5}	2.73×10^{-6}	1.33×10
Er	Particulate Emission Rate-lb/hour	28.4	7.32	35.7
F	F Factor - DSCF/MM BTU			
E	Particulate Emissions - lbs/MM BTU			

PARTICULATE TEST DATA

TEST SO7-3 TIME 1000 to 1111

LOCATION Scrubber Outlet DATE March 6, 1981

FIRM Georgia Pacific PROJECT NO. 1460-E90

Input A				
P bar	Barometric Pressure - in. Hg	30.00		
As	Stack Area - Ft^2	28.27		
Dn	Nozzle Diameter - in.	0.255		
Time	Total Sampling Time - min.	60		
Y	Calibration Factor	1.01		
Cp	Pitot Coefficient	0.84		
$(\Delta P)^{1/2}$	Average Square Root of Velocity Head (in. H_2O)	0.57		
ΔH	Average Orifice Pressure Drop - in. H_2O	1.02		
Tm	Average Meter Temperature °F	63		
Pstk	Average Stack Pressure - in. H_2O	-0.19		
Tstk	Average Stack Temperature °F	144		
Vm	Meter Volume at Meter Conditions - Ft^3	31.75		
Vl	Total Water Vapor Collected - ml	113.9		
→ CO_2	% CO_2 in Stack Gas (Dry)	8.6		
O_2	% O_2 in Stack Gas (Dry)	12.1		
→ CO	% CO in Stack Gas (Dry)	0		
				Total
Input B				
Mn	Total Particulate Catch - Mg	134.48	45.29	179.77
Input C				
% H	% Hydrogen in Fuel			
% C	% Carbon in Fuel			
% S	% Sulfur in Fuel			
% N	% Nitrogen in Fuel			
% O	% Oxygen in Fuel			
GCV	Gross Califoric Volume of Fuel - BTU/lb			
Calculated				
Vm (std)	Meter Volume at Standard Conditions (Dry)-Ft^3	32.5		
% H_2O	% H_2O Vapor in Stack Gas	14.2		
Mws	Molecular Weight of Stack Gas (Wet)	29.2		
Vs	Average Velocity of Stack Gas - FPM	2080		
Qs	Actual Stack Gas Flowrate - ACFM	58700		
Qs (std)	Stack Gas Flowrate (0.0% H_2O; STP) - DSCF	44106		
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)	98.0		
Cs	Particulate Concentration-lb/DSCF	9.11×10^{-6}	3.07×10^{-6}	12.2×10^{-6}
Er	Particulate Emission Rate-lb/hour	24.1	8.13	32.2
Ff	F Factor - DSCF/MM BTU			
E	Particulate Emissions - lbs/MM BTU			

APPENDIX B

FIELD DATA SHEETS

B.1 Phase I
B.2 Phase II

APPENDIX B.1

PHASE I

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name [illegible]
Plant Location [illegible] NC
Test Number [illegible]
Sampling Location [illegible]
TRC Project No. [illegible]
Date [illegible]
Tester [illegible]

Orifice No. [illegible]
Ambient Temp. [illegible] °F
Bar. Press. 30.12 "Hg
Probe Ident. No. —
Filter Ident. No. —
Duct Area ____ ft²

Nozzle No. & Dia. — in.
Assumed Moisture ? %
Test Duration 30 min.
Traverse Point Interval 3 min.
Probe Heater Setting — °F
Filter Temp. Setting — °F
Dry Gas Meter Y ____

Nomograph C Factor —
Pitot Coefficient —
Orifice ΔH_A ____
Test Start Time 1440
Test Final Time 1510
Leak Test Start [illegible] CFM@ 15 "Hg
Leak Test Final ____ CFM@ ____ "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	Probe	Cyc. Angle Ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
		3		1.0	41	49			398.50				21	1.0			
		6		[illegible]	48	52			405.32				22	1.0			
		9		[illegible]	49	61			[illegible]				22	1.0			
		12			48	61			403.66				27	2.0			
		15			49	62			405.4[illegible]				32	1.5			
		18			47	49			407.11				35	2.0			
		21			57	45			408.9[illegible]				40	2.0			
		24			44	55			[illegible]				37	2.5			
		27			42	53			413.1[illegible]				39	2.5			
		30			41	50			413.15				38	2.5			
								FINAL	414.3[illegible]								
Average			$\Sigma\sqrt{\Delta P}$														

50.6

H_2O Collected 175 ml
SG Condition ____
SG Weight ____ gm
Total Volume Collected ____ ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: ____

TRC ENVIRONMENTAL CONSULTANTS, INC. **FIELD DATA SHEET**

Firm Name _____
Plant Location _____
Test Number _____
Sampling Location _____
TRC Project No. _____
Date _____
Tester _____

Orifice No. _____
Ambient Temp. _____ °F
Bar. Press. _____ "Hg
Probe Ident. No. _____
Filter Ident. No. _____
Duct Area _____ ft²

Nozzle No. & Dia. _____ in.
Assumed Moisture _____ %
Test Duration _____ min.
Traverse Point Interval _____ min.
Probe Heater Setting _____ °F
Filter Temp. Setting _____ °F
Dry Gas Meter Y _____

Nomograph C Factor _____
Pitot Coefficient _____
Orifice ΔH_A _____
Test Start Time _____
Test Final Time _____
Leak Test Start _____ CFM _____ "Hg
Leak Test Final _____ CFM _____ "Hg

Port	Point	3 4 5 Time Min.	6 7 8 9 10 Velocity ΔP in H_2O	12 13 14 15 ΔH in H_2O	18 19 20 T_M in °F	23 24 25 T_M out °F	26 27 28 29 30 P_{Stack} in H_2O	32 33 34 35 T_{Stack} °F	40 41 42 43 44 45 Gas Sample Volume cu. ft.	50 PROBE	52 53 Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F.	O_2 %	CO_2 %
Average			$\Sigma\sqrt{\Delta P}$			36	3										

H_2O Collected _____ ml
SG Condition _____
SG Weight _____ gm
Total Volume Collected _____ ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: _____

TRC ENVIRONMENTAL CONSULTANTS, INC.

FIELD DATA SHEET

Firm Name [illegible]
Plant Location [illegible]
Test Number [illegible]
Sampling Location [illegible]
TRC Project No. [illegible]
Date [illegible]
Tester [illegible]

Orifice No. [illegible]
Ambient Temp. [illegible] °F
Bar. Press. 30.1[illegible] "Hg
Probe Ident. No. —
Filter Ident. No. —
Duct Area ______ ft²

Nozzle No. & Dia. — in.
Assumed Moisture [illegible] %
Test Duration 30 min.
Traverse Point Interval 3 min.
Probe Heater Setting — °F
Filter Temp. Setting — °F
Dry Gas Meter Y ______

Nomograph C Factor ______
Pitot Coefficient —
Orifice ΔH_A ______
Test Start Time 1605
Test Final Time ______
Leak Test Start ______ CFM@ ______ "Hg
Leak Test Final ______ CFM@ ______ "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
		[illegible]		1.1	115	56			43633				55	1.0			
		6			48	61			43845				42	2.0			
		[illegible]			55	67			44017				44	2.5			
		12			55	69			44179				47	2.5			
		15			57	68			44370				45	2.5			
		18			56	66			44575				47	2.5			
		21			54	66			44712				50	3.0			
		24			54	64			44962				50	3.0			
		27			53	62			45028				52	3.0			
		30			51	6[illegible]			45202				54	3.0			
								Final	45371								
									[illegible]								
Average			$\Sigma\sqrt{\Delta P}$			583			1737								

H_2O Collected 45[illegible] ml
SG Condition ______
SG Weight ______ gm
Total Volume Collected ______ ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS: ______

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT _____

DATE _____

SAMPLING LOCATION _____

INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) _____

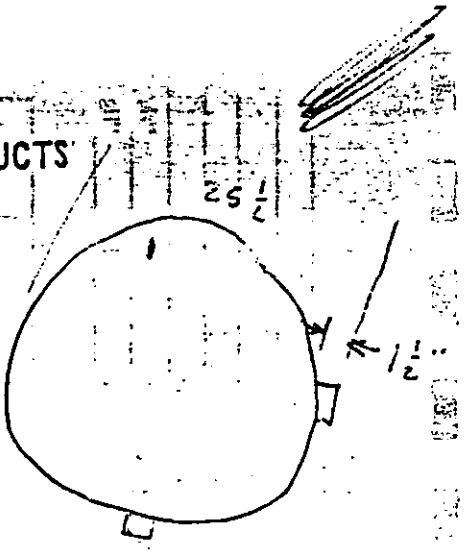
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) _____

STACK I.D., (DISTANCE A - DISTANCE B) 24"

NEAREST UPSTREAM DISTURBANCE _____

NEAREST DOWNSTREAM DISTURBANCE _____

CALCULATOR _____



SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATI FROM OUTSIDE OF N PL (SUM OF COLUMNS 3 5)
1	0.032	24"	0.768		2.27
2	0.105		2.52		4.02
3	0.194		4.66		6.156
4	0.323		7.752		9.25
5	0.677		~~0.677~~ 16.248		17.75
6	0.806		19.34		20.84
7	0.895		21.48		22.98
8	0.968		23.23		24.73

PRELIMINARY VELOCITY TRAVERSE

PLANT _____

DATE January 12, 1981

LOCATION Stack Dryer No. 3

STACK I.D. 24"

BAROMETRIC PRESSURE, in. Hg _____

STACK GAUGE PRESSURE, in. H_2O _____

OPERATORS EDA / RPT

Cp 0.84

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.05	330
2	.06	331
3	.05	335
4	.06	334
5	.05	333
6	.05	332
7	.05	330
8	.05	330
AVERAGE		

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

TRC Environmental Consultants, Inc. **FIELD DATA SHEET**

Firm Name Georgia Pacific
Plant Location Whiteville, NC
Test Number 1-1
Sampling Location 2
TRC Project No. ______
Date 13 Jan 91
Tester JP

Orifice No. T-2
Ambient Temp. 37 °F
Bar. Press. 30.04 "Hg
Probe Ident. No. ______
Filter Ident. No. 10152
Duct Area 3.14 ft²
Ø24"

Nozzle No. & Dia. 1-3 .382 in.
Assumed Moisture 50 %
Test Duration 64 min.
Traverse Point Interval 8 min.
Probe Heater Setting 250 °F
Filter Temp. Setting 250 °F
Dry Gas Meter Y 1.00

Nomograph C Factor ______
Pitot Coefficient .84
Orifice ΔH_A ______
Test Start Time 1300
Test Final Time ______
Leak Test Start .012 CFM@ -16 "Hg
Leak Test Final ______ CFM@ ______ "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle β	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
G	1	4	113	92	57	58		322	561.87			255	37	3.0	220		
	2		14	86	57	57		325	572.09			261	38	3.0	233		
	2		165	99	55	57		325	574.16			265	39	4.0	235		
			165	99	55	56	UL 0.5	327	576.32			251	39	4.5	240		
	3		185	112	55	56		319	578.49			260	41	5.5	244		
			185	112	54	54		315	580.02			256	43	6.0	240		
	4		10	61	55	57		213	583.0[illegible]			249	44	4.5	239		
			115	71	58	58		210	584.77			248	46	5.0	235		
B	1		17	105	58	60		320	586.65			254	43	5.5	232		
			16	97	58	59		325	588.86			256	43	6.0	238		
	2		185	112	57	58		330	591.11			252	42	6.5	249		
			185	112	57	57		327	593.47			253	44	7.0	249		
	3		18	109	57	57		333	595.85			255	43	6.5	245		
			18	109	56	57		333	599.15			256	44	6.5	244		
Average			$\Sigma\sqrt{\Delta P}$		[illegible]	[illegible]											

H_2O Collected [illegible] ml
SG Condition ______
SG Weight 42.1 gm
Total Volume Collected 607.1 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
0	18.21		82

COMMENTS: ______

TRC ENVIRONMENTAL CONSULTANTS, INC.

FIELD DATA SHEET

Firm Name: Georgia Pacific
Plant Location: Tarboro NC
Test Number: 1-1
Sampling Location: 2
TRC Project No.:
Date: 3-30-88
Tester: JP

Orifice No.: I-2
Ambient Temp.: 38 °F
Bar. Press.: 30.09 "Hg
Probe Ident. No.:
Filter Ident. No.: 10152
Duct Area: 3.14 ft² Ø 24"

Nozzle No. & Dia.: 1-3 .382 in.
Assumed Moisture: 50 %
Test Duration: 67 min.
Traverse Point Interval: 8 min.
Probe Heater Setting: 250 °F
Filter Temp. Setting: 250 °F
Dry Gas Meter Y:

Nomograph C Factor:
Pitot Coefficient: .84
Orifice ΔH_A:
Test Start Time: 800
Test Final Time:
Leak Test Start: .012 CFM 13 "Hg
Leak Test Final: .023 CFM 10 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
B	4	4	1.05	.64	56	56		295	600.52			257	45	510	245		
		4	1.05	.64	55	56		239	602.33			252	45	50	240		
								FINAL	604.10								
Total / Average			$\Sigma\sqrt{\Delta P}$	094	55	57	-.05	304	34.23								

.6394

57

ml H₂O Collected:
SG Condition:
SG Weight: gm
Total Volume Collected: ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
0	25		BR

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. FIELD DATA SHEET

Firm Name Georgia-Pacific LLC
Plant Location Wilkesboro, NC
Test Number 1-2
Sampling Location 2
TRC Project No.
Date 13 Jan 21
Tester

Orifice No. D-7
Ambient Temp. °F
Bar. Press. 30.04 "Hg
Probe Ident. No.
Filter Ident. No. 10155
Duct Area 3.14 ft²
DIA STACK 24"

Nozzle No. & Dia. 2-3 0.3811 in.
Assumed Moisture 5.6 %
Test Duration 64 min.
Traverse Point Interval 4 min.
Probe Heater Setting 250±25 °F
Filter Temp. Setting 250±25 °F
Dry Gas Meter Y 1.00

Nomograph C Factor
Pitot Coefficient 0.84
Orifice ΔH@ 2.26
Test Start Time 1300
Test Final Time
Leak Test Start 0.013 CFM @ -16 "Hg
Leak Test Final CFM @ "Hg

PAGE #1 of 2

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle β	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %	BACK HALF
1	1	4	0.11	0.75	58	59	-0.07	314	447.34			251	51	64.5	259			260
	1	1	0.12	0.82	58	59		320	449.22			250	51	5.0	263			261
	2	1	0.17.5	1.20	58	59		327	451.11			250	51	7.0	265			252
	2	1	0.17.7	1.20	58	60		332	453.40			250	59	7.0	270			255
	3	1	0.16.0	1.10	58	60		327	455.71			255	60	8.0	270			262
	3	1	0.16.0	1.10	59	60		326	457.93			259	65	8.5	270			265
	4	1	0.14.0	0.95	59	62		326	460.20			252	67	7.0	271			265
	4	1	0.14.5	0.98	60	62		328	462.28			262	68	7.0	273			265
									464.37									335
2	1	4	0.11.5	0.78	61	63	-0.07	315	464.37			252	70	6.0	270			270
	1	1	0.11.5	0.78	61	63		315	466.27			249	70	6.0	272			271
	2	1	0.18.6	1.25	61	64		334	468.20			249	69	8.0	261			253
	2	1	0.19.0	1.30	61	64		331	470.52			248	69	8.5	269			248
	3	1	0.18.5	1.25	61	64		345	472.92			250	68	8.5	270			240
Average			$\Sigma\sqrt{\Delta P}$															

H_2O Collected ml
SG Condition
SG Weight gm
Total Volume Collected ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
0	21	0	79

COMMENTS:
Change Ports At 1332
Start Port 2 At 1335

TRC ENVIRONMENTAL CONSULTANTS, INC. — FIELD DATA SHEET

Firm Name: Georgia Pacific
Plant Location: Whiteville, NC
Test Number: 1-2
Sampling Location: 2 Stack
TRC Project No: 1460-E8020
Date: Jan 13, 1981
Tester:

Orifice No.: D-7
Ambient Temp.: °F
Bar. Press.: 30.04 "Hg
Probe Ident. No.:
Filter Ident. No.: 10165
Duct Area: 3.14 ft²

Nozzle No. & Dia.: 2-3 0.381 in.
Assumed Moisture: 5% %
Test Duration: 64 min.
Traverse Point Interval: 4 min.
Probe Heater Setting: °F
Filter Temp. Setting: °F
Dry Gas Meter Y:

Nomograph C Factor:
Pitot Coefficient: 0.84
Orifice ΔH_A:
Test Start Time: 1300
Test Final Time: 1407
Leak Test Start: 0.013 CFM @ -16 "Hg
Leak Test Final: 0.006 CFM @ -10 "Hg

PAGE #2 of 2

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %	
#2	3	4	085	125	60	65	-07	342	475.32			269	68	9.0	272			275
	4	1	035	092	61	65		331	477.71			262	68	7.0	273			275
	4+	4	040	095	62	65	↓	323	479.83			250	66	7.5	271			275
									481.91									
Average			Σ√ΔP	104	60	62	-07	327	34.51									
Total		64	6889															

61

H_2O Collected: 650 ml
SG Condition:
SG Weight: 23.6 gm
Total Volume Collected: 673.6 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
0	2%	0	82

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. **FIELD DATA SHEET**

Firm Name G.P
Plant Location Whitewater
Test Number 2-1
Sampling Location 3
TRC Project No.
Date 14 Jan 81
Tester JP

Orifice No. T-2
Ambient Temp. 40 °F
Bar. Press. 30.02 "Hg
Probe Ident. No.
Filter Ident. No. 10171
Duct Area 3.14 ft²
Ø 24"

Nozzle No. & Dia. .5065 1-4 in.
Assumed Moisture 50 %
Test Duration 60 min.
Traverse Point Interval 3 min.
Probe Heater Setting 250 °F
Filter Temp. Setting 250 °F
Dry Gas Meter Y 1.00

Nomograph C Factor
Pitot Coefficient .84
Orifice ΔH_A
Test Start Time 1009
Test Final Time
Leak Test Start 0 CFM 15 "Hg
Leak Test Final .02 CFM 18 "Hg

Page 2-2

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in. Hg	Probe Temp. °F	O_2 %	CO_2 %
B	1	3	075	155	66	62		325	624.97			253	56	10.5	237		
	2		080	170	64	64		338	627.15			260	51	10.5	240		
	3		080	170	64	63		330	629.31			249	48	10.5	245		
	4		078	170	63	64		329	631.44			253	44	10.5	244		
	5		075	155	64	64		327	633.60			251	42	10.5	243		
	6		070	145	65	65		325	635.61			250	41	10.0	245		
	7		075	155	64	63		320	637.61			252	41	10.0	244		
	8		070	145	64	64		321	639.65			253	42	10.0	245		
	9		065	131	63	63		200	641.97			251	40	9.5	243		
	10		055	115	64	64		112	643.55			252	40	8.5	244		
								FINAL	645.35								
Average			$\Sigma\sqrt{\Delta P}$ 0268	151	58.4		-06	294	40.22								

H_2O Collected 810 ml
SG Condition
SG Weight 365 gm
Total Volume Collected 840.5 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
0	28	0	82

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC.

FIELD DATA SHEET

Firm Name Carolina Pacific NC
Plant Location Wilmington
Test Number 2-1
Sampling Location 3
TRC Project No.
Date 14 Jan 81
Tester JP

Orifice No. T-2
Ambient Temp. 40 °F
Bar. Press. 30.02 "Hg
Probe Ident. No.
Filter Ident. No. 1017
Duct Area 3.14 ft²

Nozzle No. & Dia. .5065 1-4 in.
Assumed Moisture 50 %
Test Duration 60 min.
Traverse Point Interval 5 min.
Probe Heater Setting 250 °F
Filter Temp. Setting 250 °F
Dry Gas Meter Y

Nomograph C Factor
Pitot Coefficient .84
Orifice ΔH_A
Test Start Time 1009
Test Final Time
Leak Test Start 0 : Circle 15 "Hg
Leak Test Final : Circle "Hg

Page 1-2

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
A	1	3	.06	1.22	51	44	.06	324	60513			261	36	7.0	242		
	2		.075	1.55	51	44		326	60702			259	34	9.0	259		
	3		.080	1.70	51	43		326	60893			256	37	9.5	267		
	4		.075	1.55	50	43		330	61111			252	57	9.5	239		
	5		.08	1.70	51	45		329	61313			246	67	12.0	225		
	6		.08	1.70	55	49		325	61523			263	68	13	233		
	7		.08	1.70	58	55		325	—			253	69	14	244		
	8		.075	1.55	61	57		313	61925			256	69	14	254		
	9		.065	1.31	64	61		219	62127			259	70	15	256		
	10	1	.05	1.10	64	62		130	62320			247	70	11	242		
Over Average			$\Sigma\sqrt{\Delta P}$														

58.4

Run Number
H_2O Collected ml
SG Condition
SG Weight gm
Total Volume Collected ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
0	21	0	79

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. **FIELD DATA SHEET**

Page #1 of 2

Firm Name Georgia Pacific
Plant Location Whiteville
Test Number 2-7
Sampling Location Stack #3
TRC Project No. 1466-E80
Date Jan 14, 1991
Tester EDR/RPT

Orifice No. D-7
Ambient Temp. 44 °F
Bar. Press. 30.04 "Hg
Probe Ident. No.
Filter Ident. No.
Duct Area 3.14 ft²

INSTACK #4
DIA STACK 24"

Nozzle No. & Dia. 2-4 0.5067 in.
Assumed Moisture 61. %
Test Duration 60 min.
Traverse Point Interval 5 min.
Probe Heater Setting 250 ± 25 °F
Filter Temp. Setting 250 25 °F
Dry Gas Meter Y 1

Nomograph C Factor
Pitot Coefficient 0.84
Orifice ΔH_A
Test Start Time 1009
Test Final Time
Leak Test Start 0.015 CFM @ -15 "Hg
Leak Test Final CFM @ "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg.	Probe Temp. °F	O_2 %	CO_2 %	BACK HALF
1	1	3	0.04	0.98	51	51		300	498.23			240	40	3.0	268			260
	2		0.07	1.75	51	52		322	499.78			261	40	5.0	266			250
	3		0.075	1.85	51	52		330	501.78			255	42	6.5	266			250
	4		0.060	1.45	52	52		338	503.87			248	42	6.0	266			251
	5		0.085	2.10	53	52		335	505.78			248	53	8.5	266			255
	6		0.043	1.05	54	53		334	507.98			254	65	6.5	269			269
	7		0.045	1.10	56	54		337	509.77			255	69	6.0	270			270
	8		0.045	1.10	57	55		382	511.43			257	69	6.0	271			270
	9		0.045	1.10	58	57		332	513.09			244	69	6.0	271			270
	10		0.040	0.98	61	61		323	514.75			265	68	5.0	258			277
									516.35									
2	1	3	0.055	1.35	67	70		318	516.42			246	57	5.0	267			260
	2		0.072	1.80	75	70		321	518.29			243	57	5.5	266			249
	3		0.065	1.60	69	77		325	520.41			260	55	6.0	262			252
Average			$\Sigma\sqrt{\Delta P}$ 0.23	1.342	63.5 64													

H_2O Collected _____ ml
SG Condition _____
SG Weight _____ gm
Total Volume Collected _____ ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
0	21	0	79

COMMENTS:

1046 START PORT #2

TRC ENVIRONMENTAL CONSULTANTS, INC.

FIELD DATA SHEET

Firm Name: Georgia Pacific
Plant Location: Dublin NC
Test Number: 2-2
Sampling Location: Stack #3
TRC Project No.: 1460-E60-20
Date: Jan 14, 1981
Tester: EDA / RPT

Orifice No.: D-7
Ambient Temp.: 41 °F
Bar. Press.: 30.04 "Hg
Probe Ident. No.:
Filter Ident. No.:
Duct Area: 3.14 ft²

Nozzle No. & Dia.: 2-4 0.5067 in.
Assumed Moisture: 51 %
Test Duration: 60 min.
Traverse Point Interval: 3 min.
Probe Heater Setting: 260±25 °F
Filter Temp. Setting: 260±25 °F
Dry Gas Meter Y:

Nomograph C Factor:
Pitot Coefficient: 0.84
Orifice ΔH_A:
Test Start Time: 1009
Test Final Time:
Leak Test Start: 0.015 CFM @ -15 "Hg
Leak Test Final: 0.010 CFM @ -10 "Hg

Page #2 of 2

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %	
2	4	3	0.065	1.60	70	75		334	522245			255	57	7.0	264			265
	5		0.080	2.00	70	75		333	524477			245	57	7.0	264			265
	6		0.055	1.35	72	83		334	526722			251	53	6.0	271			265
	7		0.040	0.98	72	82		333	528663			251	53	6.0	271			265
	8		0.035	0.86	69	79		336	530333			264	53	6.0	272			274
	9		0.040	0.98	67	77		331	531846			253	52	6.0	272			274
	10		0.035	0.86	65	74		294	533491			250	52	6.0	271			277
								2	534911									
Average			0.231	1.34	62	65		327	36.68									

~~63.5~~ 64

H_2O Collected: 760 ml
SG Condition:
SG Weight: 26.9 gm
Total Volume Collected: 776.9 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
0	28	0	BAL

COMMENTS:

TGNMO FIELD DATA SHEET

FACILITY G-P WHITEVILLE NC | SAMPLE LOCATION #3 OUTLET

PROCESS TYPE VENEER DRYING | OPERATOR SDP

DATE 1/13/81 | RUN NUMBER 1-A

TANK I.D.(s) 11 | TRAP I.D. (s) 102 | FILTER I.D.(s) 1

REG #1

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) (mm Hg) / GAUGE (In.Hg)	14.2 / 27.9 / 28.5	229	30.09	~~+2~~ -5
POST TEST (MANOMETER) (mm Hg) / GAUGE (In.Hg)	11.1 / 10.7 / 21.8 / 23	11	11 764	+2

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST	—	-.4
POST TEST	X	0

FLOW REGULATOR SETTING _____ cc/min.

TIME	GAUGE VACUUM, Inches Hg		COMMENTS
~~START~~ AFTER TANK TEST	26.8		
AFTER TRAIN TEST	~~26.9~~		
START 10:38	26.0		on
10:39	25.7		off - due to Loading dryer
49	25.7		on
54	24.8		Line heated
59	24.2		Heating line
11:04	23.8		"
11:10	23.8		HEAT TOP OF TRAP
11:14	23.2		"
11:19	23.0		"
11 23	23.0		
STOP 11 25	23.0	Lab	TRAP TOP HOT
1/29		20.6	

* FILTER BROKEN ~~BLEW~~ BLEW ON TO ROOF. SOME FIXED TO FILTER HOLDER W/ O-RING

TGNMO FIELD DATA SHEET

FACILITY G-P WHITEVILLE NC SAMPLE LOCATION #3

PROCESS TYPE VENEER DRYING OPERATOR SOP

DATE 1/13/81 RUN NUMBER 1-B

TANK I.D.(s) 3 TRAP I.D. (s) 104 FILTER I.D.(s) 6

REG # 3

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 265 (mm Hg) GAUGE 26.5 (In.Hg)	229	30.09	-5
POST TEST (MANOMETER) 199 (mm Hg) GAUGE 28.5 (In.Hg)	11	11	+2

10.18 & 8

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST	1.6(?)	.4
POST TEST	X	

FLOW REGULATOR SETTING _____ cc/min.

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
AFTER TANK		
~~START~~ TEST	24.9	
AFTER PUMPING	24.5	
START 10:38	24.2	on
~~10:39~~	23.9	off due to loading dryer
48	23.9	on
54	22.8	Line Heated
59	21.9	Heating Line
11:04	21.8	
11:10	21.8	
11:14	21.8	HEAT TRAP TOP
11 19	21	HEAT TRAP TOP
1123	20.5	
STOP 1125	20.5	TRAP TOP HOT

TGNMO FIELD DATA SHEET

FACILITY GP WHITEVILLE, NC2 SAMPLE LOCATION DRYER #1

PROCESS TYPE PUELLER DRYING OPERATOR SDP

DATE 1/10/91 RUN NUMBER 2-A

TANK I.D.(s) 22 TRAP I.D. (s) 115 FILTER I.D.(s) 5

REG # 2

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 1" (mm Hg)	29.7	GAUGE 30 (In.Hg)	293	30.09	+2
POST TEST (MANOMETER) 1" (mm Hg) 12.5:12	24.5	GAUGE 25 (In.Hg)	16	11	+9

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0		_____ cc/min.
POST TEST	X		

	TIME	GAUGE VACUUM, Inches Hg	COMMENTS
START	1258	30	
	1303	28.1	
	1308	27.4	START HEAT ≈ 105 °C
	1312	26.87	1310 HEAT ≈ 103 °C
	1318	26.5	1311 HEAT FROM REG ≈ ~~30~~ °C
	1323	25.5	1318 " " " 150 cc
STOP	1328	25.5	HEAT AS NEED TO END OF TEST

TGNMO FIELD DATA SHEET

FACILITY GP-WHITEVILLE, NC SAMPLE LOCATION DRYER #1 ~~#3~~

PROCESS TYPE VENEER DRYING OPERATOR SDP

DATE 1/13/81 RUN NUMBER 2-B

TANK I.D.(s) 23 TRAP I.D. (s) 105 FILTER I.D.(s) ~~BLANK~~ 2

RSC # 4

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 29.5 IN (~~mm~~ Hg) GAUGE ~~289~~ (In.Hg)	293	30.09	+2
POST TEST (MANOMETER) 22.65 IN (~~mm~~ Hg) GAUGE ~~228~~ (In.Hg)	11	11	+9

11.5 11.1

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	~~0~~.1	.0	_____ cc/min.
POST TEST	X	0	

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
START 1258	27.0	
~~1258~~ 1303	25.0	
1308	29.1	HEAT ≈ 10 SEC
1312	23.3	1311 HEAT FLOW REG ≈ ~~3~~ SEC
1318	23.1	TO 1315 " " "
1320	22.8	SHUT OFF TRAP REMOVE FILTER
1322	22.8	START TRAIN W/O FILTER
1323	22.8	HEAT AS NEEDED TO END OF TEST
STOP 1328	22.8	

* SAMPLE TRAIN ASSEMBLED ~ 2HR PRIOR TO TEST

TGNMO FIELD DATA SHEET

FACILITY G P, WHITEVILLE, NC SAMPLE LOCATION DRYER #3

PROCESS TYPE VENEER DRYING OPERATOR JDP

DATE 1/13/81 RUN NUMBER 3

TANK I.D.(s) 13 / 1 TRAP I.D. (s) 108 FILTER I.D.(s) NONE

RE6 # 4

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, IN Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) (mm Hg)	14.82 14.4 29.22 GAUGE (In.Hg) 28.7	318	30.09	+7 (45°F)
POST TEST (MANOMETER) (mm Hg)	8.4 8.05 16.45 GAUGE (In.Hg) 16.2	325	30.09	+7

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0	0.4	_____ cc/min.
POST TEST	X	DROP .1 IN Hg AFTER PLUGGING PROBE	

TIME Exact to Sec.	GAUGE VACUUM, Inches Hg	COMMENTS
AFTER BRAIN VALVE	OPEN 28.3	NO DRY ICE
START → 1511	28.3 > 1.8	ONLY H_2O ICE
1516	26.5 > 1.7	
1521	24.8 > 1.7	
1526	23.1 > 1.9	
1531	21.2 > 1.7	
1536	19.5 > 1.4	
1540	18.1 > 1.8	
STOP → 1545	16.34	1.8
	14	

TGNMO FIELD DATA SHEET

FACILITY G P—WHITEVILLE, NC SAMPLE LOCATION DRYER #2

PROCESS TYPE VENEER DRYING OPERATOR SDP

DATE 1/14/81 RUN NUMBER 4

TANK I.D.(s) 16 TRAP I.D. (s) 107 FILTER I.D.(s) NONE

REG #4

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, IN Hg	AMBIENT TEMPERATURE, °C
14.4 +14.65 PRETEST (MANOMETER) (mm Hg) 29.05 GAUGE (In.Hg) 28	307	30.02	+1 (34°F)
12 POST TEST (MANOMETER) (mm Hg) 24.19 GAUGE (In.Hg) 24.2	319	30.02	+7 (45°F)

274
280

LEAK RATE, mm Hg/10 min.: IN		TANK	TRAIN	FLOW REGULATOR SETTING
	PRETEST	0	.2	______ cc/min.
	POST TEST	X	0	

START 0945?

TIME	GAUGE VACUUM, Inches Hg		COMMENTS
AFTER OPENING VALVE	DROP TO 27.8		
0951	27.0	.8	
0956	25.9	1.1	APPLY HEAT AS NEEDED
1001	25.2	.7	
1006	24.8	.4	TOP 1/2" OF TANK HEATED
1012	24.2	.6	
1017	24.2	0	
1022	24.2		
			* partial Sample loss during warmout

NOTE GET METAL CONTAINERS FOR DRY ICE

TGNMO FIELD DATA SHEET

FACILITY GP - WHITEVILLE, NC SAMPLE LOCATION SB - #2

PROCESS TYPE VENEER DRYING OPERATOR SOP

DATE 1/14/81 RUN NUMBER 5

TANK I.D.(s) 5 TRAP I.D.(s) 106 DRYICE FILTER I.D.(s) NONE

REG # 4 112 H_2O ICE

	TANK VACUUM, mm Hg		STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) IN (mm Hg)	28.7	GAUGE (In.Hg) 28.0	323	30.02	7 (45°F)
POST TEST (MANOMETER) (mm Hg)	18.2	GAUGE (In.Hg) 18.0	322	30.02	10 (48°F)

LEAK RATE, IN Hg/10 min.:

	TANK	TRAIN
PRETEST	0	.1
POST TEST	X	-.2

FLOW REGULATOR SETTING _____ cc/min.

TIME	GAUGE VACUUM, Inches Hg		COMMENTS
DROP AFTER VALVE OPENED	27.9		
START 1058	27.9		
1103	26.3	1.6	
1108	24.6	1.7	
1113	22.9	1.7	
1118	21.0	1.9	
1123	19.8	1.2	
STOP 1128	18.2	1.6	
DROPPED AFTER SEALING PROBE TO	18		

TGNMO FIELD DATA SHEET

#2

FACILITY GP-WHITEVILLE, NC SAMPLE LOCATION

PROCESS TYPE VENTED DRYING OPERATOR SLP

DATE 1/14/81 RUN NUMBER 6A

TANK I.D.(s) 4 TRAP I.D. (s) 109 ~~DRY ICE~~ H2O ICE FILTER I.D.(s) ~~7~~ 3

REG #4 114 ~~DRY ICE~~ DRY ICE

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST	(MANOMETER) 29.12 IN (~~mm~~ Hg) GAUGE 28.5 (In.Hg)	317	29.93	+13 (56°F)
POST TEST	(MANOMETER) 14.04 (mm Hg) GAUGE 13.8 (In.Hg)	318	29.93	+14 (57°F)

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST	0	.2
POST TEST	X	.1

FLOW REGULATOR SETTING: _____ cc/min.

TIME	GAUGE VACUUM, Inches Hg		COMMENTS
DROP AFTER VALVE OPEN	28.3		
1409	28.3	1.7	
1414	26.6		
~~14~~ 1419	24.9	1.7	
1424	23.2	1.7	
1429	21.8	1.4	
1434	20.1	1.7	
1439	18.5	1.6	
1444	17.0	1.5	
1449	15.3	1.7	
1454	13.9	1.4	
DROP AFTER			
VALVE OPENED	13.8		

TGNMO FIELD DATA SHEET

FACILITY GP-WHITEVILLE NC SAMPLE LOCATION #2

PROCESS TYPE VENEER DRYING OPERATOR SDP

DATE 1/14/81 RUN NUMBER 6-B

TANK I.D.(s) 20 TRAP I.D. (s) 103 FILTER I.D.(s) 10 ✱

REG # 3 H2O ILEONLY

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST	14.65 ~~14.5~~ (MANOMETER) 29.15 (mm Hg) GAUGE ~~29.1~~ (In.Hg)	317	29.93	+13 (55°F)
POST TEST	86649 (MANOMETER) 355 (mm Hg) GAUGE 140 (In.Hg)	318	29.93	+9 (57°F)

LEAK RATE, mm Hg/10 min.: ✱ DROPPED SLIGHTLY

	TANK	TRAIN
PRETEST	0	~~0~~
POST TEST	X	.1

FLOW REGULATOR SETTING _____ cc/min.

TIME	GAUGE VACUUM, Inches Hg		COMMENTS
1409	29.1	1.7	
1414	27.4	1.8	
1419	25.6	1.8	
1424	23.8	1.8	
1429	22.1	1.7	
1434	20.5	1.6	
1439	18.9	1.6	
1444	17.2	1.7	
1449	15.5	1.7	
1454	14.1	1.4	
DROP AFTER VALVE OPENED	14.0		

APPENDIX B.2

PHASE II

VELOCITY TRAVERSE DATA FORM

#1

Client EPA / PLYWOOD Stack Ident. No. [illegible] Stack I.D. _____ Ft. 24 In.

Location [illegible] NC Pitot Ident. No. TRC #CE-7 Stack O.D. _____ Ft. _____ In.

te 2-3-21 Test by MAA/SDP Pitot Cal. No., F_s .99

Barometric Pressure, P_B 30.15 "Hg

AMBIENT 50°F

GUSTY WINDS 10 → 15 KNOTS

0-.5" Run 1100

Port	Point	VP "H_2O	SP "H_2O	T_F °F	T_R °R	$\sqrt{VP*T_R}$
A	1	.025		300	760	4.36
	2	.023	±.01 TO ±.03			4.18
	3	.015				3.38
	4	.013				3.14
	#1 .01 .075					2.76
	2	.023	-.03			4.18
	3	.020				3.90
	4	.020		↓	↓	3.90
		0.015				
	Total					
	Average			300	760	3.72

0-.25" Run 1200

Port	Point	VP "H_2O	SP "H_2O	T_F °F	T_R °R	$\sqrt{VP*T_R}$
A	1	.019	-.03	306	766	3.81
	2	.027	-.04 TO			4.55
	3	.022				4.11
	4	.013				3.16
	1	.014	-.045			3.27
	2	.024	TO			4.29
	3	.024	-.050	↓		4.29
	4	.015		↓	↓	3.39
		0.019				
	Total					
	Average			306	766	3.86
	Overall Average			303	763	3.79

Absolute Stack Pressure, P_s

$$P_s = P_B + \overline{SP}/13.6 = 30.15 + 0.00226 = 30.148$$

M_s = molecular weight of stack gas (wet basis)

Velocity, V_s

$$V_s = 2.90 * F_s * \sqrt{VP*T_R} * \sqrt{\frac{29.92}{P_s} * \frac{28.84}{M_s}} \qquad V_s = 108 \text{ FPS}$$

Volume, standard conditions T_{std} = 528 °R

$$Q = V_s * A * 60 * T_{std}/T_R * P_s/29.92 = 108 * 3.14 * 60 * 0.692 * 1.01$$

= 1420 SCFM

VELOCITY TRAVERSE DATA FORM

Client EPA-PLYWOOD Stack Ident. No. DRYER EXHAUST #3 Stack I.D. 24 Ft. 88 In.

Location WHITEVILLE, NC Pitot Ident. No. RECCE-7 Stack O.D. Ft. In.

Date 3-3-81 Test by MAA/SOP Pitot Cal. No., F_s .99

Barometric Pressure, P_B 30.15 "Hg

Run 1100 Run 1200

Port	Point	VP "H_2O	SP "H_2O	T_F °F	T_R °R	$\sqrt{VP*T_R}$	Port	Point	VP "H_2O	SP "H_2O	T_F °F	T_R °R	$\sqrt{VP*T_R}$
A	1	.020		332	792	3.96	B	1	.015		332	792	3.43
	2	.023				4.24		2	.017				3.6
	3	.023	-.04			4.24		3	.019	-.04			3.86
	4	.023				4.24		4	.020				3.91
	5	.023				4.24		5	.021				4.05
	6	.023				4.24		6	.022				4.15
	7	.025				4.42		7	.025				4.42
	8	.029				4.84		8	.029				4.77
	9	.032				5.08		9	.029				4.7
	10	.020				3.96		10	.020				3.91
									0.021				
Total							Total						
Average				332	792		Average						
							Overall Average				332	792	4.22

Absolute Stack Pressure, P_s

$P_s = P_B + \overline{SP}/13.6 = 30.15 + -.04/13.6 = 30.147$

Velocity, V_s

$$V_s = 2.90 * F_s * \sqrt{VP*T_R} * \sqrt{\frac{29.92}{P_s} * \frac{28.84}{M_s}}$$

M_s = molecular weight of stack gas (wet basis)

V_s = 12.1 FPS

Volume, standard conditions T_{std} = 528 °R

$Q = V_s * A * 60 * T_{std}/T_R * P_s/29.92 = 12.1 * 3.14 * 60 * 0.667 * 1.0$

= 1540 SCFM

VELOCITY TRAVERSE
DATA FORM

Client EPA/Plywood Stack Ident. No. Dryer Exhaust #2 Stack I.D. _____ Ft. 24 In.

Location Whiteville, NC Pitot Ident. No. TRC FC1-7 Stack O.D. _____ Ft. _____ In.

Date 3-3-81 Test by MA/SOP Pitot Cal. No., F_s _____

Barometric Pressure, P_B 30.15 "Hg

Run 11:00 Run _____

Port	Point	VP "H_2O	SP "H_2O	T_F °F	T_R °R	$\sqrt{VP*T_R}$	Port	Point	VP "H_2O	SP "H_2O	T_F °F	T_R °R	$\sqrt{VP*T_R}$
A	1	.060	-.02	323	783	6.85							
	2	.095				8.62							
	3	.085				8.16							
	4	.053				6.44							
B	1	.085				8.16							
	2	.090				8.39							
	3	.090				7.91							
	4	.050				6.26							
		0.074											
Total							Total						
Average			323	783	7.60		Average						
							Overall Average						

Absolute Stack Pressure, P_s

$P_s = P_B + \overline{SP}/13.6 = 30.15 + -.02/13.6 = 30.149$

Velocity, V_s

$V_s = 2.90 * F_s * \sqrt{VP*T_R} * \sqrt{\frac{29.92}{P_s} * \frac{28.84}{M_s}}$ V_s = 21.7 FPS

M_s = molecular weight of stack gas (wet basis)

Volume, standard conditions T_{std} = 528 °R

$Q = V_s * A * 60 * T_{std}/T_R * P_s/29.92 = 21.7 * 3.14 * 60 * 0.674 * .00$

= 2780 SCFM

NOMOGRAPH DATA

PLANT G.P. Whitewater

DATE 3/4/81

SAMPLING LOCATION Boiler Scrubber Outlet

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.91
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m_{avg.}}$	865
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	19
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	30.10
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	150
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.40
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	
C FACTOR		.62
CALCULATED NOZZLE DIAMETER, in.		.250
ACTUAL NOZZLE DIAMETER, in.		.255
REFERENCE Δp, in. H_2O		

EPA (Dur) 234
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TRC ENVIRONMENTAL CONSULTANTS, INC.

FIELD DATA SHEET

Firm Name: Georgia Pacific
Plant Location: Whiteville
Test Number: 1-Moisture
Sampling Location:
TRC Project No.:
Date: 3/3/81
Tester: DE/JP

Orifice No.:
Ambient Temp.: 62 °F
Bar. Press.: 30.15 "Hg
Probe Ident. No.:
Filter Ident. No.:
Duct Area: 24" dia

Nozzle No. & Dia.: in.
Assumed Moisture: %
Test Duration: 30 min.
Traverse Point Interval: min.
Probe Heater Setting: °F
Filter Temp. Setting: °F
Dry Gas Meter Y:

Nomograph C Factor:
Pitot Coefficient:
Orifice ΔH_A:
Test Start Time: 1200
Test Final Time: 1230
Leak Test Start: 0 CFM @ 6 "Hg
Leak Test Final: CFM @ "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
1	1	00		1.0	63	63			138429				40				
		5		1.0	63	63			141899				38				
		10		1.0	63	64			144589				39				
		15		1.2	64	64			147233				39				
		20		1.0	65	64			149944				39				
		25		1.0	65	65			152631				38				
		30							155532								
	Average		$\Sigma\sqrt{\Delta P}$														

H_2O Collected: 300 ml
SG Condition:
SG Weight: gm
Total Volume Collected: ml

45%

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. FIELD DATA SHEET

Firm Name Georgia Pacific
Plant Location Whiteville
Test Number 2 - Moisture
Sampling Location
TRC Project No.
Date 2/3/81
Tester DE/JP

Orifice No.
Ambient Temp. 62 °F
Bar. Press. 30.15 "Hg
Probe Ident. No.
Filter Ident. No.
Duct Area 24" dia.

Nozzle No. & Dia. in.
Assumed Moisture %
Test Duration 30 min.
Traverse Point Interval min.
Probe Heater Setting °F
Filter Temp. Setting °F
Dry Gas Meter Y

Nomograph C Factor
Pitot Coefficient
Orifice ΔH_A
Test Start Time 1115
Test Final Time 1145
Leak Test Start 0 CFM @ 8 "Hg
Leak Test Final CFM @ "Hg

Port	Point	Time Min. (3 4 5)	Velocity ΔP in H_2O (6 7 8 9 10)	ΔH in H_2O (12 13 14 15)	T_M in °F (18 19 20)	T_M out °F (23 24 25)	P_{Stack} in H_2O (26 27 28 29 30)	T_{Stack} °F (32 33 34 35)	Gas Sample Volume cu. ft. (40 41 42 43 44 45)	PROBE (50)	Cyc. Angle Ø (52 53)	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in. Hg	Probe Temp. °F	O_2 %	CO_2 %
1	1	00		10	61	63			122120				41				
		05		10	62	63			125011				41				
		10		10	60	63			127700				43				
		15		10	60	63			130066				43				
		20		10	60	62			133255				44				
		25		10	59	61			135599				46				
		30							138233								
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected 575 ml
SG Condition
SG Weight gm
Total Volume Collected ml

60%

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC.

FIELD DATA SHEET

Firm Name: Georgia Pacific
Plant Location: Whiteville
Test Number: 3 - Moisture
Sampling Location: Dryer Exhaust #3
TRC Project No.:
Date: 2/3/9[illegible]
Tester: DE/JP

Orifice No.:
Ambient Temp.: 62 °F
Bar. Press.: 30.15 "Hg
Probe Ident. No.:
Filter Ident. No.:
Duct Area: 24" dia. ft²

Nozzle No. & Dia.: in.
Assumed Moisture: %
Test Duration: 30 min.
Traverse Point Interval: min.
Probe Heater Setting: °F
Filter Temp. Setting: °F
Dry Gas Meter Y:

Nomograph C Factor:
Pitot Coefficient:
Orifice ΔH_A:
Test Start Time: 1030
Test Final Time:
Leak Test Start: 0 CFM 10 "Hg
Leak Test Final: CFM "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
		00		1.0	59	61			106055				37	2.0			
		5		1.0	59	61			109041				36	2.0			
		10		1.0	60	61			111144				37	2.0			
		15		1.0	60	61			114955				38	2.0			
		20		1.0	62	63			117022				40	2.0			
		25		1.0	62	64			119926				41	2.0			
		30							122022								
Average			$\Sigma\sqrt{\Delta P}$														

Total Time: 30
H_2O Collected: 480 ml
SG Condition:
SG Weight: gm
Total Volume Collected: ml

58% H_2O

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. **FIELD DATA SHEET**

Firm Name B.P. - Whiting
Plant Location
Test Number S.O. Mastuk
Sampling Location Scrubber Outlet (Boiler)
TRC Project No. 1460-E80
Date 3/4/81
Tester JP

Orifice No. T-2
Ambient Temp. 60 °F
Bar. Press. 30.10 "Hg
Probe Ident. No. —
Filter Ident. No. —
Duct Area ft²
6' ϕ

Nozzle No. & Dia. — in.
Assumed Moisture 2 %
Test Duration min.
Traverse Point Interval min.
Probe Heater Setting °F
Filter Temp. Setting °F
Dry Gas Meter Y

Nomograph C Factor
Pitot Coefficient
Orifice ΔH_A
Test Start Time
Test Final Time
Leak Test Start CFM "Hg
Leak Test Final CFM "Hg

Port	Point	3 4 5 Time Min.	6 7 8 9 10 Velocity ΔP in H_2O	12 13 14 15 ΔH in H_2O	18 19 20 T_M in °F	23 24 25 T_M out °F	26 27 28 29 30 P_{Stack} in H_2O	32 33 34 35 T_{Stack} °F	40 41 42 43 44 45 Gas Sample Volume cu. ft.	50 PROBE	52 53 Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
		5		1.0	61	57	NA	NA	157.54		2		52				
		10			62	58			159.93				52				
		15			62	59			162.40				53				
		20			64	61			164.90				52				
		25			66	62			167.40				53				
		30			66	62			171.15				53				
								FINAL	173.83								
Average			$\Sigma\sqrt{\Delta P}$						16.29				16.65@STP				

H_2O Collected 82 ml
SG Condition
SG Weight gm
Total Volume Collected ml

19% H_2O

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC Environmental Consultants, Inc.

FIELD DATA SHEET

Firm Name: Lehigh Pacific
Plant Location:
Test Number: Inlet Moisture
Sampling Location:
TRC Project No.:
Date: 3/5/91
Tester: DF

Orifice No.:
Ambient Temp.: 65 °F
Bar. Press.: 29.60 "Hg
Probe Ident. No.:
Filter Ident. No.:
Duct Area: ft²

Nozzle No. & Dia.: in.
Assumed Moisture: %
Test Duration: 30 min.
Traverse Point Interval: min.
Probe Heater Setting: °F
Filter Temp. Setting: °F
Dry Gas Meter Y:

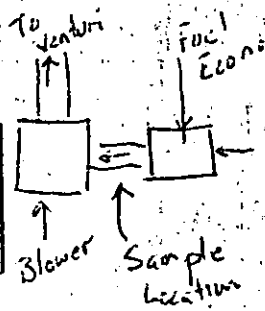
Nomograph
C Factor:
Pitot Coefficient:
Orifice ΔH@:
Test Start Time: 1005
Test Final Time: 1035
Leak Test Start: 0 CFM 8 "Hg
Leak Test Final: 0 CFM 7 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
	1	0		1.0	70	69			307.34				55	2.5			
	2	5		1.0	71	70			309.96				51	2.7			
	3	10		1.0	72	71			312.21				50	2.7			
	4	15		1.0	72	71			316.23				50	2.8			
	5	20		1.0	73	72			317.34				50	2.8			
	6	25		1.0	73	72			320.54				50	2.9			
	1	30							323.12								
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected: 32 ml
SG Condition:
SG Weight: gm
Total Volume Collected: ml

Orsat Bag Sample
Triplicate Analysis, %

CO_2	O_2	CO	N_2



COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. — FIELD DATA SHEET

Firm Name G.P. Whitmire
Plant Location
Test Number SO-7-1
Sampling Location Scrub Outlet
TRC Project No. 1460-880
Date 3/27/81
Tester HS, MA, SDP

Orifice No. I-2
Ambient Temp. 60 °F
Bar. Press. ~~29.60~~ 29.60 in Hg
Probe Ident. No. 8'x2"
Filter Ident. No.
Duct Area 28.27 ft² (6'Φ)

Nozzle No. & Dia I-2 .255 in.
Assumed Moisture 19 %
Test Duration 60 min.
Traverse Point Interval 2.5 min.
Probe Heater Setting 250 °F
Filter Temp. Setting 250 °F
Dry Gas Meter Y .99

Nomograph C Factor .62
Pitot Coefficient .84
Orifice ΔH_A 1.91
Test Start Time 1111
Test Final Time 1222
Leak Test Start OK CFM .15 in Hg
Leak Test Final .02 CFM .8 in Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle Ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
A	1	2.5	.30	.90	68	67		150	174.565			256	47	2.0	241		
	2	5	.30	.90	68	67		155	175.633			258	48	2.0	242		
	3	7.5	.29	.87	67	67		161	177.000			258	49	2.0	245		
	4	10	.29	.87	69	68	VL .18	156	178.225			255	51	2.5	243		
	5	12.5	.36	1.07	68	69		163	179.550			246	52	3.0	246		
	6	15	.38	1.14	69	69		148	181.000			254	54	3.0	245		
	7	17.5	.36	1.07	69	69		145	182.250			247	54	3.0	244		
	8	20	.38	1.14	70	70		151	183.944			255	54	3.0	245		
	9	22.5	.35	1.10	71	71		138	185.444			248	55	3.0	246		
	10	25	.34	.98	71	71		115	186.900			256	55	3.0	244		
	11	27.5	.32	.93	71	71		125	188.428			252	55	3.0	247		
	12	30	.28	.84	71	72		120	189.959			250	55	3.0	243		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected 105 ml
SG Condition
SG Weight 6.3 gm
Total Volume Collected 111.3 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
7			

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. **FIELD DATA SHEET**

Firm Name G.P
Plant Location Whiteville
Test Number 50-2-1
Sampling Location Scrub Outlet
TRC Project No. 1460-E80
Date 3/5/81
Tester JR/MA/SDP

Orifice No. T-2
Ambient Temp. 60 °F
Bar. Press. 29.60 "Hg
Probe Ident. No. 8'x2"
Filter Ident. No.
Duct Area 28.27 ft² 6'ϕ

Nozzle No. & Dia. 1-2 .255 in.
Assumed Moisture 19 %
Test Duration 60 min.
Traverse Point Interval 2.5 min.
Probe Heater Setting 250 °F
Filter Temp. Setting 250 °F
Dry Gas Meter Y .99

Nomograph C Factor .62
Pitot Coefficient .84
Orifice ΔH@ 1.91
Test Start Time 1111
Test Final Time 1227
Leak Test Start OK CFM @ 15 "Hg
Leak Test Final .02 CFM @ 8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
B	1	2.5	30	1.00	74	73		131	190.887			254	60	3.0	247		
	2	5	24	.72	73	72		138	192.208			246	58	2.5	244		
	3	7.5	23	.68	73	73		146	193.447			251	59	2.5	245		
	4	10	23	.68	73	73		147	194.663			252	58	2.5	244		
	5	12.5	27	.80	73	71		149	195.775			250	57	3.0	245		
	6	15	28	.82	71	71		149	197.000			249	57	3.0	243		
	7	17.5	39	1.16	71	71		150	198.824			260	58	3.5	242		
	8	20	42	1.25	71	71		150	199.775			225	59	3.5	243		
	9	22.5	37	1.10	71	71		151	201.130			245	59	3.0	244		
	10	25	37	1.10	71	71		147	202.880			250	59	3.0	245		
	11	27.5	37	1.10	72	72		149	204.277			270	59	3.5	244		
	12	30	44	1.31	72	72		150	205.714			255	59	4.0	245		
								FINAL	207.311								
Average			$\Sigma\sqrt{\Delta P}$	.98	71	71	-.18	145	32.86								
			570														

H_2O Collected 105 ml
SG Condition
SG Weight 6.3 gm
Total Volume Collected 111.3 ml

Orsat Bag Sample
Triplicate Analysis, %

CO_2	O_2	CO	N_2
7.0	13.8	0.0	79.2
7.0	13.8	0.0	79.2

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. — FIELD DATA SHEET

Firm Name Ga. Pac
Plant Location Whiteville
Test Number 507 - 2
Sampling Location Scrubber Outlet
TRC Project No. 1460-E80
Date 2/5/81
Tester JP, MA, SM

Orifice No. T-2
Ambient Temp. 60 °F
Bar. Press. 29.60 "Hg
Probe Ident. No. 8'x2"
Filter Ident. No.
Duct Area ft²

6'ϕ

Nozzle No. & Dia. 1-2 .255 in.
Assumed Moisture 19 %
Test Duration 60 min.
Traverse Point Interval 2.5 min.
Probe Heater Setting 350 °F
Filter Temp. Setting 350 °F
Dry Gas Meter Y .99

Nomograph C Factor .159
Pitot Coefficient .84
Orifice ΔH_A 1.91
Test Start Time 1615
Test Final Time
Leak Test Start 0 CFM 15 "Hg
Leak Test Final CFM "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
B	1	2 5	9 3	1 7 5	7 1	7 1	V L	1 5 3	2 0 7 5 1			370	61	5.5	352		
	2	5	4 8	1 5 8	7 1	7 1		1 4 9	2 0 9 3 5			344	52	5.0	340		
	3	7 5	4 6	1 4 7	7 2	7 1		1 5 0	2 1 1 1 0			375	52	5.0	344		
	4	10	3 6	1 1 5	7 2	7 1		1 5 6	2 1 2 7 5			325	53	4.5	335		
	5	12 5	4 0	1 2 7	7 2	7 2		1 5 3	2 1 4 2 8			360	53	5.0	339		
	6	15	4 7	1 5 0	7 2	7 2		1 5 1	2 1 5 8 4			365	54	5.0	332		
	7	17 5	5 0	1 6 0	7 2	7 1		1 5 2	2 1 7 5 3			325	55	6.0	331		
	8	20	2 8	8 9	7 2	7 1		1 4 9	2 1 9 2 6			352	54	3.5	328		
	9	22 5	2 3	7 4	7 2	7 2		1 5 0	2 2 0 6 0			375	53	3.0	330		
	10	25	2 3	7 4	7 1	7 1		1 4 6	2 2 1 8 0			329	54	3.0	335		
	11	27 5	2 3	7 4	7 1	7 1		1 4 2	2 2 2 9 7			375	54	3.0	340		
	12	30	2 0	6 4	7 2	7 2		1 3 1	2 2 4 1 7			375	53	3.0	331		
Average			Σ√ΔP														

H_2O Collected 160 ml
SG Condition
SG Weight 8.7 gm
Total Volume Collected 168.7 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC.

FIELD DATA SHEET

Firm Name: Georgia Pacific
Plant Location: Milledgeville
Test Number: 507-2
Sampling Location: Outlet
TRC Project No: 1460.680
Date: 3/5/81
Tester: JP, MA, [illegible]

Orifice No.: T-2
Ambient Temp.: 60 °F
Bar. Press.: 29.60 "Hg
Probe Ident. No.: 8'x2"
Filter Ident. No.:
Duct Area: 6'Φ ft²

Nozzle No. & Dia.: 1-2 .225 in.
Assumed Moisture: 19 %
Test Duration: 60 min.
Traverse Point Interval: 2.5 min.
Probe Heater Setting: 350 °F
Filter Temp. Setting: 350 °F
Dry Gas Meter Y: .99

Nomograph C Factor: .8 .62 .59
Pitot Coefficient: .84
Orifice ΔH_A: 1.91
Test Start Time:
Test Final Time: 1826
Leak Test Start: 0 CFM @ 15 "Hg
Leak Test Final: 015 CFM @ 10 "Hg

Port	Point	Time Min.	Velocity ΔP in H₂O	ΔH in H₂O	T_M in °F	T_M out °F	P_Stack in H₂O	T_Stack °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle Ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O₂ %	CO₂ %
A	1	2.5	.36	1.12	72	72		134	225.25			380	54	4.0	339		
	2	5	.31	1.07	72	72		148	226.80			370	53	4.0	333		
	3	7.5	.33	1.01	72	72		148	228.21			380	52	4.0	333		
	4	10	.33	1.01	72	72		149	229.60			400	53	4.0	329		
	5	12.5	.48	1.55	65	63		152	230.85			360	50	5.5	310		
	6	15	.56	1.75	62	63		154	232.30			372	45	6.0	314		
	5	17.5	.45	1.41	61	62		154	233.99			357	45	5.5	321		
	8	20	.40	1.25	61	62		153	235.74			320	46	5.0	330		
	9	22.5	.40	1.25	61	62		153	237.29			324	47	5.0	333		
	10	25	.40	1.25	61	62		152	238.82			367	47	5.0	335		
	11	27.5	.42	1.31	61	62		151	240.07			344	48	5.5	336		
	12	30	.37	1.15	61	61		145	241.00			320	48	5.0	340		
								FINAL	243.46								
Average			Σ√ΔP	1.21	68	68	-.22	149	35.95								
			.61														

STOP 1700 LIGHTNING
START 1806

H₂O Collected: 160 ml
SG Condition:
SG Weight: 3.7 gm
Total Volume Collected: 168.7 ml

Orsat Bag Sample Triplicate Analysis, %

CO₂	O₂	CO	N₂
10.2	10.4		
10.2	10.4		

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. FIELD DATA SHEET

Firm Name: Georgia Pacific
Plant Location: Whiteville
Test Number: 507-3
Sampling Location: Scrubber Outlet
TRC Project No: 1460-E80
Date: 3/6/81
Tester: JP, MA

Orifice No.: D-7
Ambient Temp.: 40 °F
Bar. Press.: 30.00 "Hg
Probe Ident. No.: 2" x 8'
Filter Ident. No.:
Duct Area: 6'ϕ ft²

Nozzle No. & Dia.: 1-2 .255 in.
Assumed Moisture: 19 %
Test Duration: 60 min.
Traverse Point Interval: 2.5 min.
Probe Heater Setting: 350 °F
Filter Temp. Setting: 350 °F
Dry Gas Meter Y: 1.01

Nomograph C Factor: .60
Pitot Coefficient: 0.84
Orifice ΔH@: 2.00
Test Start Time: 1000
Test Final Time:
Leak Test Start: OK CFM: .05 "Hg
Leak Test Final: CFM: "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
B	1	2.5	.44	1.36	62	63		145	329.199			347	49	6.0	348		
	2	5	.44	1.36	61	62	VL -.19	147	330.666			341	49	6.0	344		
	3	7.5	.40	1.23	61	62		142	332.199			361	49	5.5	336		
	4	10	.37	1.14	61	62		145	333.666			355	49	5.5	335		
	5	12.5	.40	1.23	60	63		144	335.110			339	50	5.5	330		
	6	15	.40	1.23	60	63		144	336.555			354	51	5.5	328		
	7	17.5	.42	1.30	61	63		145	338.003			345	51	5.5	324		
	8	20	.32	.99	61	63		144	339.554			353	50	4.5	324		
	9	22.5	.23	.72	61	63		144	340.854			352	50	4.0	325		
	10	25	.23	.72	61	63		145	341.997			350	51	4.0	321		
	11	27.5	.20	.62	62	63		144	343.110			360	50	3.5	331		
	12	30	.20	.62	62	64		140	344.147			360	50	3.5	335		
Average			$\Sigma\sqrt{\Delta P}$ .57	1.02	62	64	-.019										

H_2O Collected: 100 ml
SG Condition:
SG Weight: 13.9 gm
Total Volume Collected: 113.9 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
8.6	12.1		
8.6	12.1		

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC.

FIELD DATA SHEET

Firm Name: Georgia Pacific
Plant Location: Whitesville
Test Number: 307-3
Sampling Location: Scrubber Outlet
TRC Project No.: 1460-E80
Date: 5/6/81
Tester: JP, MA, SJP

Orifice No.: D-7
Ambient Temp.: 45 °F
Bar. Press.: 30.00 "Hg
Probe Ident. No.: 2" x 8'
Filter Ident. No.:
Duct Area: 6'Φ ft²

Nozzle No. & Dia.: 1-2 .255 in.
Assumed Moisture: 19 %
Test Duration: 60 min.
Traverse Point Interval: 2.5 min.
Probe Heater Setting: 350 °F
Filter Temp. Setting: 350 °F
Dry Gas Meter Y: 1.01

Nomograph C Factor: .60
Pitot Coefficient: .84
Orifice ΔH@: 2.00
Test Start Time: 1000
Test Final Time: 1111
Leak Test Start: OK CFM@ 15 "Hg
Leak Test Final: OK CFM@ 15 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle Ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
A	1	2.5	27	.82	64	66		146	345.16			380	51	4.0	337		
	2	5	29	.90	64	66		146	346.45			350	51	4.0	336		
	3	7.5	29	.90	64	66		147	347.70			341	51	4.0	335		
	4	10	30	.93	63	65		146	349.00			355	51	4.0	338		
	5	12.5	30	.93	63	65		148	—			350	51	4.0	335		
	6	15	34	1.05	63	66		147	351.55			346	52	5.0	338		
	7	17.5	41	1.27	63	66		147	352.80			361	52	5.5	338		
	8	20	38	1.16	63	66		147	354.33			351	52	5.5	338		
	9	22.5	38	1.16	63	66		148	—			361	52	5.5	340		
	10	25	30	.93	64	67		134	357.22			353	52	4.5	338		
	11	27.5	29	.90	64	67		133	358.48			350	52	4.5	338		
	12	30	29	.90	64	67		136	359.70			340	52	4.5	303		
								FINAL	360.94								
Average			$\xi\sqrt{\Delta P}$ 1.57	1.02	62	64		144	31.0.75								

H_2O Collected: 100 ml
SG Condition:
SG Weight: 13.9 gm
Total Volume Collected: 113.9 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2

COMMENTS:

TGNMO FIELD DATA SHEET

FACILITY GP — SAMPLE LOCATION Dryer Exhaust #1

PROCESS TYPE Plywood — OPERATOR DE

DATE ~~Date~~ 3/3/91 — RUN NUMBER 1-1-A

TANK I.D.(s) #1 — TRAP I.D. (s) ~~Cyc~~ 29 H_2O 106 CO_2 — FILTER I.D.(s) YES

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, ~~mm Hg~~	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 730 (mm Hg) GAUGE 29 (In.Hg)	277	30.15	13
POST TEST (MANOMETER) 170 (mm Hg) GAUGE 6.5 (In.Hg)	286	30.15	13

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST	0	1 ⊗
POST TEST	⊗	6.5 0

FLOW REGULATOR SETTING _____ cc/min.

REGULATOR I.D. 2

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
→ 1515	28.0	
1520	26.5	
1525	24.0	
1530	22.0	
1535	20.0	
1540	17.5	
1545	15.5	
1550	13.3	
1555	11.4	
1600	10.0	
1605	8.3	
1610	7.6	
~~1615~~ 1613	6.6	
Tank #1 3/20	-5.5 Final +1.73	
Init Tank #18	-27.3 10.7	H_2O 8.0,
Init Tank #7	-28.7 +18.9	CO_2 6.0.

TGNMO FIELD DATA SHEET

FACILITY GP SAMPLE LOCATION DRYER EXHAUST #1

PROCESS TYPE Plywood OPERATOR DE

DATE 3/3/81 RUN NUMBER 1-1-B

TANK I.D.(s) #16 TRAP I.D. (s) 16 & 20 112 CO. FILTER I.D.(s) YES

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 738 (mm Hg) GAUGE 28 (In.Hg)	277	30.15	13
POST TEST (MANOMETER) 194 (mm Hg) GAUGE 6.6 (In.Hg)	286	30.15	13

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN
PRETEST	0	0
POST TEST	X	6.6 0

FLOW REGULATOR SETTING _____ cc/min.

REGULATOR I.D. 1

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1515	26.0	
1520	24.5	
1525	23.3	
1530	20.5	
1595	19.0	
1540	17.0	
1545	15.0	
1550	13.5	
1555	11.6	
1600	10.0	
1605	8.5	
1610	7.4	
1615	6.9	
Tank #16 3/20	16 Hg 22.1	
Tank #3	22.2 15.9	1/2 B.G.
Tank #16	22.3 19.8	1/2 B.G.

TGNMO FIELD DATA SHEET

FACILITY Georgia Pacific - Whiteville SAMPLE LOCATION Dryer Exhaust #2

PROCESS TYPE Veneer Dryer OPERATOR SP

DATE 3 March 81 RUN NUMBER 2-1-A

TANK I.D.(s) ~~#~~ 11 TRAP I.D. (s) H_2O - 31 FILTER I.D.(s) _____

CO_2 -

Rylacor #4

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, ~~mm Hg~~	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) ~~730~~ (mm Hg) GAUGE 28 (In.Hg)	319	30.15	13
POST TEST (MANOMETER) 200 (mm Hg) GAUGE 7.5 (In.Hg)	321	30.15	

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0	0	_____ cc/min.
POST TEST	X	0	

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1515	28	
1520	25.9	
25	23.9	
30	21.5	
35	19.2	
40	17.1	
45	15.1	
50	13.2	
55	11.2	
1600	9.9	
05	7.9	
10	7.5	
~~PS~~ 1613	7.5	
Tank #11 3/21	6.8	

TGNMO FIELD DATA SHEET

FACILITY Georgia-Pacific - Whitmire SAMPLE LOCATION Drier Exhaust #2

PROCESS TYPE Veneer Dryer OPERATOR JP

DATE 3 March 81 RUN NUMBER 2-1-B

TANK I.D.(s) 22 TRAP I.D. (s) H_2O - 24 FILTER I.D.(s) Reg #3
CO_2 - 15

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) (mm Hg)	715 GAUGE (In.Hg) 28	319	30.15	13
POST TEST (MANOMETER) (mm Hg)	199 GAUGE (In.Hg) 7.9	321	30.15	13

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN
PRETEST	0	0
POST TEST	X	0

FLOW REGULATOR SETTING _____ cc/min.

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1315	27.9	
20	26.0	
25	24.0	
30	22.0	
35	20.1	
40	18.5	
45	16.9	
50	14.9	
55	13.2	
1600	11.9	
05	10.0	
10	8.5	
1613	7.9	
Tank #22 - 3/21	7.0 - 25.51	
Tank #19	25.8 - 11.16	4.0 Trp 24
Tank #20	27.5 - 10.5	

TGNMO FIELD DATA SHEET

FACILITY G-A Pacific SAMPLE LOCATION Whiteville

PROCESS TYPE Veneer Dryer OPERATOR MAA

DATE 3-3-81 RUN NUMBER 3 - 1 - A

TANK I.D.(s) 13 TRAP I.D. (s) H2O-22 CO2 - 1101 FILTER I.D.(s)

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) (mm Hg) 728 GAUGE (In.Hg) 28	728	320°F	31.50 / 29.91	13°C — 55°F
POST TEST (MANOMETER) (mm Hg) 212 GAUGE (In.Hg) 28	728	320°F	31.54 / 29.91	13°C — 55°F

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0	0	_____ cc/min.
POST TEST	X	0	REG ID = #6

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1514	28.3	
1519	26.1	
1524	24.5	
1529	22.5	
1534	21.0	
1539	19.2	
1544	17.3	
1549	15.3	
1554	13.8	
1559	12.0	
1604	10.3	
1609	9.0	
~~1614~~ 1612:30	8.4	
3/18 1400	-7.0 Final +9.5	Ftting heat #13
Int. Tank # 18	-28 Lost	H_2O Trap
Int Tank #19	-18.8 Final 8.8	CO_2 Trap

Tank #53 - Blank Burnett

-28.5 +23

TGNMO FIELD DATA SHEET

FACILITY GA. Pacific SAMPLE LOCATION DRYER 3 Whitesville

PROCESS TYPE Veneer Dryer OPERATOR MAN

DATE 3-3-81 RUN NUMBER 3-1-B

TANK I.D.(s) 58 TRAP I.D. (s) H_2O-15 CO_2-210 FILTER I.D.(s)

TANK VACUUM, mm Hg 733	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 733 (mm Hg) GAUGE 29.0 (In.Hg)	320 °F	31.15	13°C
POST TEST (MANOMETER) 192 (mm Hg) GAUGE 7.6 (In.Hg)	320°F	31.15	13°C

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0	0	cc/min.
POST TEST	X	0	REG #5

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1514	28.8	
1519	26.8	
1524	24.8	
1529	22.8	
1534	21.0	
1539	19.1	
1544	17.2	
1549	15.2	
1554	13.2	
1559	11.5	
1604	9.9	
1609	8.5	
1612:30	7.6	
3/20 1614	6.7 = 111.7 ft.³	CO₂ Purge
Tank #20	28.1 = 115.4	210 B.U.
Tank #7	24.7	1530

TGNMO FIELD DATA SHEET

FACILITY GP — SAMPLE LOCATION Dryer Exhaust #1

PROCESS TYPE — OPERATOR DE

DATE 3/2/81 — RUN NUMBER 1-2-A

TANK I.D.(s) 57 — TRAP I.D. (s) 23 H_2O 211 CO_2 — FILTER I.D.(s)

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) (mm Hg)	714 GAUGE (In.Hg) 28	294	30.15	13
POST TEST (MANOMETER) (mm Hg)	238 GAUGE (In.Hg) 9.0	263	30.15	10

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST	0	0
POST TEST	X	0

FLOW REGULATOR SETTING _____ cc/min.

REGULATOR I.D. 6

TIME	GAUGE VACUUM, Inches Hg		COMMENTS
1745	27.8		
1750	26.0		
1755	23.8		
1800	22.0		
1805	19.5		
1810	17.5		
1815	16.0		
1820	14.3		
1825	[redacted] 13.5		
1830	11.0		
1835	9.2		
1840	9.0		
1845	9.0		
In Tank #3	[redacted] -27.2	19.2	Temp 23
In Tank #5	-27.3	+25	Temp 21
Tank #57	-8.5	+24.1	VOC

TGNMO FIELD DATA SHEET

FACILITY GP — SAMPLE LOCATION Dryer Exhaust #1

PROCESS TYPE _____ — OPERATOR OF

DATE 3/3/81 — RUN NUMBER 1-2-B

TANK I.D.(s) 21 — TRAP I.D. (s) ~~2130~~ 21 H₂O — FILTER I.D.(s) _____

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 732 (mm Hg) GAUGE 27.5 (In.Hg)	294	30.15	13
POST TEST (MANOMETER) 197 (mm Hg) GAUGE 6.8 (In.Hg)	263	30.15	10

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0	0	_____ cc/min.
POST TEST	X	0	REGULATOR I.D. 1

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1745	27.2	
1750	25.5	
1755	23.3	
1800	21.8	
1805	19.5	
1810	17.3	
1815	15.8	
1820	14.0	
1825	12.2	
1830	10.9	
1835	13.8	
1840	7.9	
1845	6.9	
#2 12 ~~3300~~ 3/23	6.0 23.2	VOC
#6 ~~75~~	25.6 25.1	TVOC 2-3
#16 ~~1~~	25.2 17.3	

TGNMO FIELD DATA SHEET

FACILITY G.P. Whitewater SAMPLE LOCATION Dryer Exhaust #2

PROCESS TYPE Vinyl Drum OPERATOR JP

DATE 3 March 80 RUN NUMBER 2-2-A

TANK I.D.(s) 960 TRAP I.D. (s) H_2O-20 CO_2-227 FILTER I.D.(s)

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST	(MANOMETER) 720 (mm Hg) GAUGE 28 (In.Hg)	307	30.15	13 (55°F) 10
POST TEST	(MANOMETER) 248 (mm Hg) GAUGE 9.1 (In.Hg)	310	30.15	10

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0	0.2	_____ cc/min.
POST TEST	X	0	REGULATOR I.D. 4

TIME	GAUGE VACUUM, Inches Hg		COMMENTS
1745	27.8		
50	25.0		
55	23.1		
1800	21.0		
05	18.7		
10	16.2		
15	14.3		Sundown
20	12.5		Dusk
25	10.5		It's getting dark
30	9.3		
35	9.1		Some lights
40	9.1		
1845	9.1		
Tank 1.C	9.1	17.4	VOC
Imp Tank #6	27.4	14.4	Trip 237
Imp Tank #15	25.3	20.2	Trip 3.0

TGNMO FIELD DATA SHEET

FACILITY G.P. Whitsville SAMPLE LOCATION Dryer Exhaust #2

PROCESS TYPE Veneer Dryer OPERATOR JD

DATE 3 March 81 RUN NUMBER 2-2-B

TANK I.D.(s) 61 TRAP I.D. (s) H_2O - 48 [illegible] FILTER I.D.(s) ____

CO_2 - 205

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST	(MANOMETER) (mm Hg) 704 GAUGE (In.Hg) 27.9	307	30.15	~~10~~ 13 [illegible]
POST TEST	(MANOMETER) (mm Hg) 196 GAUGE (In.Hg) 7.8		760	10 20 [illegible]

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST	0	0 [illegible]
POST TEST	X	0

FLOW REGULATOR SETTING ____ cc/min.

REGULATOR I.D. 3

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1745	27.5	
50	24.9	
55	23.1	
1800	21.5	
05	19.5	
10	17.1	
15	15.4	
20	14.0	
25	12.1	
30	10.5	
35	9.5	
40	8.5	
1845	7.8	
Tank [illegible]	-10.5 18.4	[illegible]
T [illegible] 7	-25.8 14.7	T [illegible] 205
T [illegible]	-29.4 21.4	T [illegible]

TGNMO FIELD DATA SHEET

FACILITY Ga. Pacific SAMPLE LOCATION Dryer 3 Whiteville

PROCESS TYPE Veneer Dryer OPERATOR MAA

DATE 3-3-81 RUN NUMBER 3-2-A

TANK I.D.(s) 8 TRAP I.D. (s) 1120-17 CO2-234 FILTER I.D.(s)

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) (mm Hg)	728 GAUGE (In.Hg) 28.8	284	30.45	13 ~~10~~
POST TEST (MANOMETER) (mm Hg)	178 GAUGE (In.Hg) 7.0	331	30.15	10

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0	0	Reg. # 2 cc/min.
POST TEST	X	0	REGULATOR I.D. 2

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1743	28.4	
1748	25.8	
1753	24.0	
1758	21.9	
1803	19.8	
1808	17.7	
1813	15.7	
1818	13.6	
1822	12.0	
1827	10.3	
1832	8.8	
1837	7.6	
1842	7.0	
3/27 Tnk 8	-5.5 15.6	Vac
Fnt #7	-21.5 22.2	234 Tnk
Fnt #19		17

TGNMO FIELD DATA SHEET

FACILITY Ga. Pacific SAMPLE LOCATION Whiteville DRYER 3

PROCESS TYPE Veneer Dryer OPERATOR MAA

DATE 3-3-81 RUN NUMBER 3-2-B

TANK I.D.(s) 65 TRAP I.D. (s) CO_2-223 H_2O-4 FILTER I.D.(s)

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm.Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER)	220 GAUGE 28.5 (In.Hg)	284	30.15	13 ~~°C~~
POST TEST (MANOMETER)	180 GAUGE 7.2 (In.Hg)	331	30.15	10

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN
PRETEST	0	0
POST TEST	X	0

FLOW REGULATOR SETTING Reg# 5 cc/min.

REGULATOR I.D. 5

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1743	28.3	
1748	26.0	
1753	24.3	
1758	22.3	
1803	20.4	
1808	18.2	
1813	16.4	
1818	14.5	
1822	12.8	
1827	11.2	
1832	9.5	
1837	8.3	
1842	7.2	
3/24	-5.6	

100.0
9.32
4.87, CO_2

95.2
79.0
16.27.0 O_2

TGNMO FIELD DATA SHEET

FACILITY GP whiteville NC SAMPLE LOCATION scubber inlet

PROCESS TYPE Boiler scrubber OPERATOR DE

DATE 3-5-81 RUN NUMBER SI-25-1-A

TANK I.D.(s) 23 TRAP I.D. (s) H_2O-27 / CO_2-220 FILTER I.D.(s) ~~N/A~~

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 132 (mm Hg) GAUGE 22.5 (In.Hg)	330	29.6	16 (65°F)
POST TEST (MANOMETER) 220 (mm Hg) GAUGE ___ (In.Hg)	338	29.6	23 (73°F)

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0	-.5	___ cc/min.
POST TEST	X	0	REGULATOR I.D. 1

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1110	27.0	
1115		
1120		
1124	~~22.5~~ 22.5	
1134	19.0	
1139	17.2	
1149	16.8	
1159	13.3	
1209	10.4	
1216	8.5	
1220	8.0	
#23	-9.2 17.0	#
~~#4~~	17	Typ 27
#21	17	Typ 220

Switch Ports on Outlet

TGNMO FIELD DATA SHEET

FACILITY GP Whiteville NC SAMPLE LOCATION Scubber Inlet

PROCESS TYPE Boiler Scubber OPERATOR DE

DATE 3-5-81 RUN NUMBER SI-25-1-A B

TANK I.D.(s) 12 TRAP I.D. (s) H_2O-3 FILTER I.D.(s) YES
CO_2-228

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) (mm Hg)	722 GAUGE 28.5 (In.Hg)	330	29.6	16 (65°F)
POST TEST (MANOMETER) (mm Hg)	202 GAUGE 8.4 (In.Hg)	338	11	23 (74°F)

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST	0	-.4
POST TEST	X	0

FLOW REGULATOR SETTING _____ cc/min.

REGULATOR I.D. 3

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1100	28.1	
1115		
1120		
1125	23.3	
1134	19.4	
1139	17.8	Switch Ports on Outlet
1149	17.3	
1159	13.8	
1209	10.1	
1216	9.1	
1220	8.4	
#12	7.2	
#9	17	3
#10	17	28

TGNMO FIELD DATA SHEET

FACILITY GP Whiteville — SAMPLE LOCATION Scrubber out-let

PROCESS TYPE Boiler - Scrubber — OPERATOR SDD

DATE 3-5-81 — RUN NUMBER SO-2S-1-A

TANK I.D.(s) 17 — TRAP I.D. (s) H_2O -26, CO_2 -201 — FILTER I.D.(s) NO ~~N/A~~

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 728 (mm Hg) GAUGE 28.5 (In.Hg)		29.6	18° (65°F)
POST ~~TEST~~ (MANOMETER) 220 (mm Hg) GAUGE 8.8 (In.Hg)		11	23 (74°F)

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST	0	-.3
POST TEST	X	0

FLOW REGULATOR SETTING _____ cc/min.

REGULATOR I.D. 6

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1109	~~28.5~~ 28.2	
1114	26.9	
1119	25.1	
1124	22.4	TRAIN OUT ON SIDERAIL
1129	21.5	VAC GAUGE ~~HEAD~~ DOWN
1134	19.8	
1139	NO READING	STOP SAMPLING
		MOVE FADEN RIG
1148	[illegible]	START NEW POINT SAMPLE
	FAN OFF READINGS	
≈1206	≈12.1	
≈1208	≈11.5	
1213	~~10.5~~ 10.0	
~~1218~~ 1218	~~8.8~~ 8.8	STOP TEST
#17	8.7	
~~#14~~	~~17~~	26
#16		29

TGNMO FIELD DATA SHEET

FACILITY GP Whiteville SAMPLE LOCATION Scrubber outlet

PROCESS TYPE Boiler - Scrubber OPERATOR SDP

DATE 3-5-81 RUN NUMBER SO-25-1-B

TANK I.D.(s) 24 TRAP I.D. (s) H_2O - 6 / CO_2 - 221 FILTER I.D.(s) NA

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 724 (mm Hg) GAUGE 27.9 (In.Hg)		29.6	18 (65°F)
POST TEST (MANOMETER) 138 (mm Hg) GAUGE 5.5 (In.Hg)		11	23 (74°F)

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST	0	-.2
POST TEST	X	0

FLOW REGULATOR SETTING _____ cc/min.

REGULATOR I.D. 4

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1109	~~27.9~~ 27.7	
1114	26.0	
1119	25.9	
1124	21.5	TRAIN OUT OF MERCURY
1129	19.5	U-C. GAUGE READING FELL
1134	17.5	
1139	~~OIL~~ NOT READ	STOP SAMPLE
		MOVE PROBE
1148	CANNOT READ GAUGE	START NEW RUN - 4 POINT SAMPLE
≈ 1205	≈ 8.1	
≈ 1208	≈ 7.5	
1213	≈ 6.5	
1218	5.5	STOP TEST

TGNMO FIELD DATA SHEET

FACILITY GP -   SAMPLE LOCATION SCRUBBER INLET

PROCESS TYPE   OPERATOR DE

DATE 5-MARCH 81   RUN NUMBER SI-25-2-A

TANK I.D.(s) #4   TRAP I.D. (s) H_2O 214 / CO_2 111   FILTER I.D.(s)

TANK VACUUM, mm Hg		STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) (mm Hg) 370+347	GAUGE (In.Hg) 28.4	380	29.6	22. (70°F)
POST TEST (MANOMETER) (mm Hg) 141+117	GAUGE (In.Hg) 10.2	380		

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST		-.40
POST TEST	X	

FLOW REGULATOR SETTING ______ cc/min.

REGULATOR I.D. 6

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1615	28.0-	
1620	26.3	
1625	24.8	
1630	23.2	
1635	21.0	
1640	20.0	
1645	18.8	
1650	18.8	
1655	17.2	
~~1700~~ 1805	16.2	
1810	14.2	
1815	13.0	
1820	11.2	
1825	10.2	
4	7.8 17.0	
Tank # 9	17.0	214
Tank 15	17.0	111

Pause for port change (1645–1655)

thunderstorm (→ 1805)

Ellis

Neoto T.I. 25 wt. 3550 0071

TGNMO FIELD DATA SHEET

FACILITY G-P — SAMPLE LOCATION SCRUBBER INLET

PROCESS TYPE — OPERATOR DE

DATE 5 MARCH 81 — RUN NUMBER SI-25-2-B

TANK I.D.(s) #14 — TRAP I.D. (s) H_2O 219, CO_2-202 — FILTER I.D.(s)

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 373+350 (mm Hg) GAUGE 280 (In.Hg)	380	29.6	22 (70°F)
POST TEST (MANOMETER) 104+73 (mm Hg) GAUGE 6.4 (In.Hg)	380		606°F

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST		-.5	cc/min.
POST TEST	X		REGULATOR I.D. 4

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1615	27.5	
1620	25.6	
1625	23.5	
1630	21.4	
1635	18.5	
1640	17.5	
1645	15.6	Pause for port change
1650	15.6	
1655	13.6	
1805	12.5	Thunderstorm
1810	10.3	
1815	8.8	
1820	7.3	
1825	6.4	
#14	1= (6.7+17.0	
#60	+17.0	Tank 219
#21	17.0	Tank 202

TGNMO FIELD DATA SHEET

FACILITY G-P WHITEVILLE, NC SAMPLE LOCATION SCRUBBER OUTLET

PROCESS TYPE BOILER/SCRUBBER OPERATOR SDP

DATE 5 MARCH 81 RUN NUMBER SO-25-2-A

TANK I.D.(s) #9 TRAP I.D. (s) H_2O 226 FILTER I.D.(s) _____
CO_2 110

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 376+353 (mm Hg) GAUGE 27.5 (In.Hg)		26.9	22 (70°F)
POST TEST (MANOMETER) 147+110 (mm Hg) GAUGE 8.6 (In.Hg)			

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST	0	-.3
POST TEST	X	

FLOW REGULATOR SETTING _____ cc/min.

REGULATOR I.D. I

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1613	27.2	
1617	25.5	
1622	23.9	
1630	22	
1632	20.5	
1637	18.5	
1642	17.0	
1652	15.3	
1801		RE-START SAMPLE
1804	13.0	
1811	~~11.2~~	
1817	~~8.6~~	
[illegible]	8.6	[illegible]
4/17	-3.5	
#9 Pf =	(+3.0) +17.0	CO_2 purge # 220 #1.0
Inc #60 Pi = 28	18.4	Trap # 110
I-T #21 Δ = 28	17.0	Trap # 226

34

TGNMO FIELD DATA SHEET

FACILITY _____ SAMPLE LOCATION SCRUBBER OUTLET

PROCESS TYPE _____ OPERATOR SDP

DATE 5 MARCH 81 RUN NUMBER 50-25-2-B

TANK I.D.(s) #15 REG #3 TRAP I.D. (s) H_2O 209 CO_2 212 FILTER I.D.(s) _____

TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 373+350 (mm Hg) GAUGE 28.6 (In.Hg)		29.6	22 (90°F)
POST TEST (MANOMETER) 134+102 (mm Hg) GAUGE 7.3 (In.Hg)			

LEAK RATE, mm Hg/10 min.:

	TANK	TRAIN
PRETEST	0	-.2
POST TEST	X	

FLOW REGULATOR SETTING _____ cc/min.

REGULATOR I.D. 3

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1613	28.4	
1617	26.4	
1622	24.9	
1627	23.1	
1632	20.0	
1637	18.5	
1642	17.8	
1652	16.0	
[illegible]	[illegible]	RECENT SAMPLE
[illegible]	[illegible]	
1811	[illegible]	
1817	10.2	
[illegible]	[illegible]	
[illegible]	-9.0	
#15 [illegible]	+3.0 17	
Tank #60	17.2	Trap 204
Tank #21	17.5	

TGNMO FIELD DATA SHEET

FACILITY GP - WHITEVILLE NC SAMPLE LOCATION SCRUBBER INLET

PROCESS TYPE SCRUBBER / BOILER OPERATOR DE

DATE 6 MARCH 81 RUN NUMBER SE-25-3-A

TANK I.D.(s) 51 TRAP I.D. (s) HD-222 FILTER I.D.(s) _____
CO2215

	TANK VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, ~~mm Hg~~	AMBIENT TEMPERATURE, °C
	388 ~~+363~~ 28.2			
PRETEST (MANOMETER) (mm Hg)	~~368 + 363~~ GAUGE ~~28.3~~ (In.Hg)	370	30.0	10 (44°F)
POST TEST (MANOMETER) (mm Hg)	137 ~~+14~~ GAUGE 22 (In.Hg)	365	11	12 (53°F)

* LEAK RATE, mm Hg/10 min.:

* TRAIN LEAKED BUT FIXED AND USED FOR TEST

	TANK	TRAIN
PRETEST	0	-.6
POST TEST	X	

FLOW REGULATOR SETTING _____ cc/min.

REGULATOR I.D. 1

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1000	27.6	
1005	25.2	
1010	23.3	
1015	21.4	
1020	20.0	
1025	18.6	
1030	17.0	
1035	17.0	
1045	15.0	
1053	13.0	
1057	12.0	
1102	11.2	
1107	9.8	
1118	9.2	

TGNMO FIELD DATA SHEET

FACILITY G-P WHITEVILLE, NC SAMPLE LOCATION SCRUBBER INLET

PROCESS TYPE BOILER/SCRUBBER OPERATOR DE

DATE 6 MARCH 81 RUN NUMBER SI-25-3-B

TANK I.D.(s) 63 TRAP I.D. (s) H2O-216 FILTER I.D.(s) _____
CO2-225

TANK VACUUM, mm Hg		STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) 389+363 (mm Hg)	GAUGE 29.0 (In.Hg)	370	30	10 (49°F)
POST TEST (MANOMETER) 89+66 (mm Hg)	GAUGE (In.Hg)	365	30	12 (53°F)

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0	-.2	_____ cc/min.
POST TEST	X		REGULATOR I.D. 4

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1000	28.8	
1005	25.9	
1010	24.0	
1015	21.4	
1020	20.0	
1025	17.9	
1030	16.4	
1037	16.1	
1045	13.8	
1053	11.3	
1057	9.6	
1100	8.3	
1107	6.8	
1110	7.2	

TGNMO FIELD DATA SHEET

FACILITY G-P WHITEVILLE, NC SAMPLE LOCATION SCRUBBER OUTLET

PROCESS TYPE BOILER - SCRUBBER OPERATOR SDP

DATE 6 MARCH 81 RUN NUMBER 50-25-3-B

TANK I.D.(s) 10 TRAP I.D. (s) ~~H2O~~ 217 FILTER I.D.(s) _____
CO_2 203

TANK VACUUM, mm Hg		STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
386+361 PRETEST (MANOMETER) (mm Hg)	29.4 GAUGE (In.Hg)		30.0	10 (49°F)
120+97 POST TEST (MANOMETER) (mm Hg)	GAUGE (In.Hg)		30.0	12 (53°F)

LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0	-.4	_____ cc/min.
POST TEST	X		REGULATOR I.D. 6

~~X~~ TIME	GAUGE VACUUM, Inches Hg	COMMENTS
0955	29.0	
1000	27.0	
1005	25.2	
1010	23.5	
1015	21.7	
~~1020~~ 1020	18.8	CHANGE PORTS
?	18.2	
1025	18.2	
1041	16.1	
1050	13.0	
1105	9.2	STOP TEST

TGNMO FIELD DATA SHEET

FACILITY G-P WHITEVILLE, NC SAMPLE LOCATION SCRUBBER OUTLET

PROCESS TYPE BOILER / SCRUBBER OPERATOR SDP

DATE 6 MARCH 81 RUN NUMBER 50-25-3-A

TANK I.D.(s) 3 TRAP I.D. (s) H_2O 206 FILTER I.D.(s) _____
CO_2 113

TANK VACUUM, mm Hg		STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
387 + 362 PRETEST (MANOMETER) (mm Hg)	29.5 GAUGE (In.Hg)		30.0	10 (49°F)
1157 + 92 POST TEST (MANOMETER) (mm Hg)	GAUGE 27 (In.Hg)		30.0	12 (53°F)

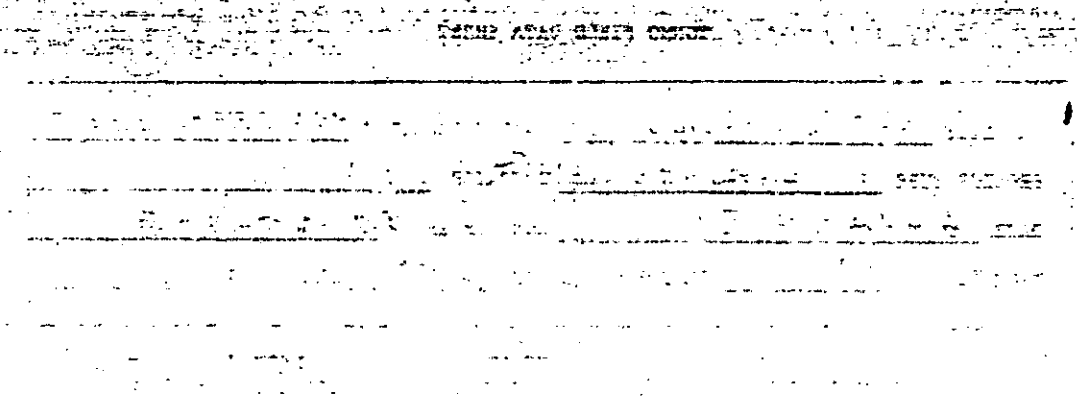
LEAK RATE, mm Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	0	~~-.02~~	_____ cc/min.
POST TEST	X		REGULATOR I.D. 3

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
955	29.3	
1000	27.1	
1005	25.2	
1010	23.5	
1015	21.7	
1020	19.8	
~~1030~~ ?1	17.0	Y-CHART OFF
1035	17.9	
1041	17.7	
1050	12.6	
1105	8.7	STOP TEST

APPENDIX C

SAMPLING LOGS

C.1 Phase I
C.2 Phase II



APPENDIX C.1

PHASE I

From Page No.

1/13/80 10:50 AM

Stack Temp 176°C 320°F

$\Delta P = 0.18$ in H_2O

$C_P = 0.84$

$T_2 = 60$

D-7 =

Calculation for Nomograph for D-7

$$\Delta H = \left(846.72\ D_N^4\ \Delta H@\ C_P^2 \left(1 - B_{WS}\right)^2 \frac{M_d}{M_s} \frac{T_m}{T_s} \frac{P_s}{P_m}\right)$$

$$\Delta H = \left(846.72 (0.84)^2 (1 - 56\%)^2 \cancel{\text{---}}\ 2.26 \frac{M_d}{M_s} \frac{460+60}{460+320} D_N^4\right)$$

~~$\Delta H =$ [illegible]~~

$$\Delta H = \left(174.269 \frac{M_d}{M_s} D_N^4\right) \Delta P$$

$$\Delta H = \left(174.269 \left(\frac{M_d = 29.00}{15.68}\right) D_N^4\right) \Delta P$$

$$\Delta H = \left(322.\overset{31}{\cancel{24}}\ D_N^4\right) \Delta P$$

Nozzle 2-4 0.6067

$\Delta H = 3.82$

$\Delta P = 0.18$

Nozzle 2-2 0.2614

$\Delta H = 0.27$

$\Delta P = 0.18$

To Page

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

From Page No.

1/13/81

TRAIN #1

INSTACK FILTER #12 — FILTER 10152 — FILTER LAST IMPINGER 2000

TRAIN #2

INSTACK FILTER #21 — FILTER 10153 — FILTER LAST IMPINGER 2002

1/13/81

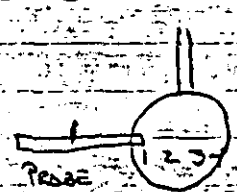
Today we had a problem with one of the new probes Because it burned out. We lost about 2 hours do to it.

Start the method 7 about 1300

Shut down at 1332 to change parts

Start on second part at 1335

End tests 1-1 and 1-2 at 1407



START PROBE FOR TEST NO. 1-1 all the way Inside Stack ALL THE WAY OUT

To Page No

Witnessed & Understood by me. Date Invented by Date Starts

Recorded by

Project No.
Book No. TITLE

Page No.

Nozzle 0.3811 Z-3 USED FOR Ed's Tests

$$\Delta H = \left(\frac{322.24}{D_N^4}\right) \Delta P$$

$\Delta H = 1.22$

$\Delta P = 0.18$

Calculation for Nomograph T-2

$$\Delta H = \left(846.72\ \Delta H_a\ D_N^4\ (1-0.56)^2\ C_p^2\ \frac{Md}{Ms}\ \frac{Tm}{Ts}\ \frac{Ps}{Pm}\right) \Delta P$$

$$\Delta H = \left(846.72\ (1.86)(1-0.56)^2\ (0.84)^2 \left(\frac{29.00}{15.68}\right)\left(\frac{460+60}{460+320}\right) D_N^4\right) \Delta P$$

$$\Delta H = \left(265.26 (D_N)^4\right) 0.18$$

$$\Delta H = \left(265.26 \left(0.3823\right)^4\right) 0.18$$

Nozzle 1-3 0.3823

$\Delta H = 1.0199$
$\Delta P = 0.18$

used for John Passell's test

Nozzle Z-4 0.5067

$\Delta H = 3.147$

$\Delta P = 0.18$

Nozzle 1-8 0.3170

$\Delta P = 0.18$
$\Delta H = 0.482$

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date

Project No._____
Book No._____ TITLE _____

Page No.__

1/14/80 8.00

$\Delta P = 0.06$ in H_2O

$T_m = 60$

$T_s = 315$

Ave H_2O % = $\frac{47.22}{54.81} = 51.01$

Nomograph calculations for TRAIN with Module D-7

$$\Delta H = \left(846.72\ D_N^4\ \Delta H@\ C_p^2\ (1-B_{ws})^2\ \frac{M_d}{M_s}\ \frac{T_m}{T_s}\ \frac{P_s}{P_m}\right)\Delta P$$

$$\Delta H = \left(846.72\ (2.26)\ (684)^2\ (1-.51.01)^2\ \frac{29.00}{16.87}\ \frac{520}{775}\ D_N^4\right)\Delta P$$

$$\Delta H = \left(373.77\ D_N^4\right)\Delta P$$

Nozzle 2-3 0.3811

$\Delta H = 0.47$

$\Delta P = 0.06$

Nozzle 2-4 0.5067

$\Delta H = 1.478$

$\Delta P = 0.06$

Nomograph calculations for train with Module T-2

$$\Delta H = \left(846.72\ (1.86)\ (0.84)^2\ (1-0.5101)^2\ \frac{29.00}{16.87}\ \frac{520}{775}\ D_N^4\right)\Delta P$$

$$\Delta H = \left(307.617\ D_N^4\right)\Delta P$$

To Page No.__

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

TITLE _____ Project No. _____ Book No. _____

From Page No. _____

Nozzle 1-3 0.3823

ΔH = 0.394

ΔP = 0.06

Nozzle 1-5 0.7495

ΔH = 5.8

ΔP = 0.06

Nozzle 1-4 0.5065

ΔH = 1.2147

ΔP = 0.06

TRAIN 2-1 John STACK NO. 3

H_2O collection 810 ml

INSTACK FILTER #3 Last Filter

4" Filter 1017 2001

TRAIN 2-2

H_2O collection 750ml

INSTACK FILTER #4

4" Filter 0172

Last Filter 2004

To P

Witnessed & Understood by me.	Date	Invented by	Date

APPENDIX C.2

PHASE II

Project No. [illegible]

TITLE G.P. Whiteville EPA Plywood Book No.

From Page No.

28 Feb 1100 - Leave TRC, Wethersfield

2000 - Stop @ Fredericksburg, Va (Shuaton) for nite

1 March 1130 - Leave F'burg

1330 - Drive train noises, banging

Stop in Richmond, check tranny fluid (add 1 qt)

add 1 qt oil

1700 Try again

1500 Arrive Davis Truck Stop, Stony Creek, Va.

- Rear wheel bearing shot

No parts on Sunday

1800 Check into Stony Creek Motel (worst I ever stayed in!)

2 March 0830 Still looking for parts

1330 New wheel bearings arrive

1530 Leave Davis Truck Plaza

2030 Arrive Holiday Motel, Whiteville

3 March 0830 Arrive G.P. Plant

Check in

Prepare for moisture runs on drier exhausts

1030 Begin moisture test - Drier Stack #3

1000 Finish → 480 mL H_2O collected

15.97 ft^3 @ 61°F = 16.35 ft^3 @ STP

P_b = 30.15

$$\%H_2O = \frac{4.11 \times 480}{16.35 + (0.0471 \times 480)} = 58\%$$

1115 Begin moisture run - Exhaust #2

1145 Finish → 515 mL H_2O

16.11 ft^3 @ 62°F = 16.46 ft^3 @ STP

$$\%H_2O = \frac{4.71 \times 515}{16.46 + (.0471 \times 515)} = 60\%$$

1200 Begin moisture run - Ex # B1

1230 Finish → 300 mL H_2O

16.90 ft^3 @ 64°F = 17.20 ft^3 @ STP

$$\%H_2O = \frac{4.11 \times 300}{17.2 + (.0471 \times 300)} = 45\%$$

Bring Down Equip

1300 Go to lunch

To Pag

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

Project No. 1460-080

TITLE G.P. Whiteville (coal) Book No.

From Page No.

5 March 0845 Arrive plant
Prep
1000 Ready to go
Wait for SDP + #25
1111 Start Test SO7-1
1222 Finish Test
Clean-up 105 mL H_2O 7% CO_2, 13.8% O_2
1300-1400 Lunch
1400 Prep for next test
1500 Ready to go, wait for SDP
1615 Start Test SO7-1 C=.59
1700 Stop - Thunderstorm R 10.4
1806 Start again - R blew fuse controllers
1826 Finish Test SO7-1 160 mL H_2O 10.2% CO_2, 10
Clean-up
Inlet Orsat 10.8% O2 1
1930 Go to hotel 10.2

6 March 0800 Arrive plant
Prep for test — Module D-7 C=.60
0900 Ready to go - wait for SDP
Clean out truck
1000 Start test SO7-3 (SI25-3 + SO25-3)
1111 Finish test 100 mL H_2O, CO_2- O_2-
Clean-up Inlet Orsat CO_2-10.4%; O_2-10
1230 Leave plant 10.0
1330 Start back to Wethersfield
2030 Stop in Fredburg, Va for nite

7 March 0930 Leave F'burg
1930 Arrive TRC

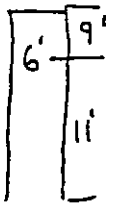
To F

Witnessed & Understood by me,	Date	Invented by	Date

Book No. _____ TITLE EPA Plywood (G.P. - Whitewater)

Prep for #25 on drive
Finish #25's
Clean up - go home

0830 Arrive plant
Discuss sampling strategy
1000 Begin prep for scrubber outlet tests
1100 Start moisture run
1130 Finish → 82 mL H_2O collected
16.29 ft^3 @ 62° = 16.65 ft^3 @ STP
19% H_2O
1200 - 1300 - Lunch
1330 Prep for Ore #7 w/ #25
1530 Ready to go
Inlet scaffolding not ready - wait for welder
Scrubber Outlet



24 points @ 2½ min.

	%Φ	Dist from wall	+9.5" Port
1	2.1	1.5	11
2	6.7	4.8	14.3
3	14.8	8.5	18
4	17.7	12.7	22.2
5	25.0	18	27.5
6	35.6	25.6	35.1
7	64.4	46.4	55.9
8	75.0	54	63.5
9	82.3	59.3	68.8
10	88.2	63.5	73
11	93.3	67.2	76.7
12	97.9	70.5	80

$\Delta P \approx .40$
$T_s \approx 150°F$
$H_2O = 19\%$
$C = .162$
$P_B = 30.10$

Mod - T - 2
Probe 2" x 8'
Nozzle 1-2 .255
~~Stack Test SO-7-1~~

1715 Welder done
Port cover won't budge - Abandon test effort for today!
1800 All packed up
Go home

To Page No. _____

derstood by me,	Date	Invented by	Date
		Recorded by	

APPENDIX D

SAMPLING AND ANALYTICAL PROCEDURES

EPA METHOD 1
SAMPLE AND VELOCITY TRAVERSES
FOR STATIONARY SOURCES

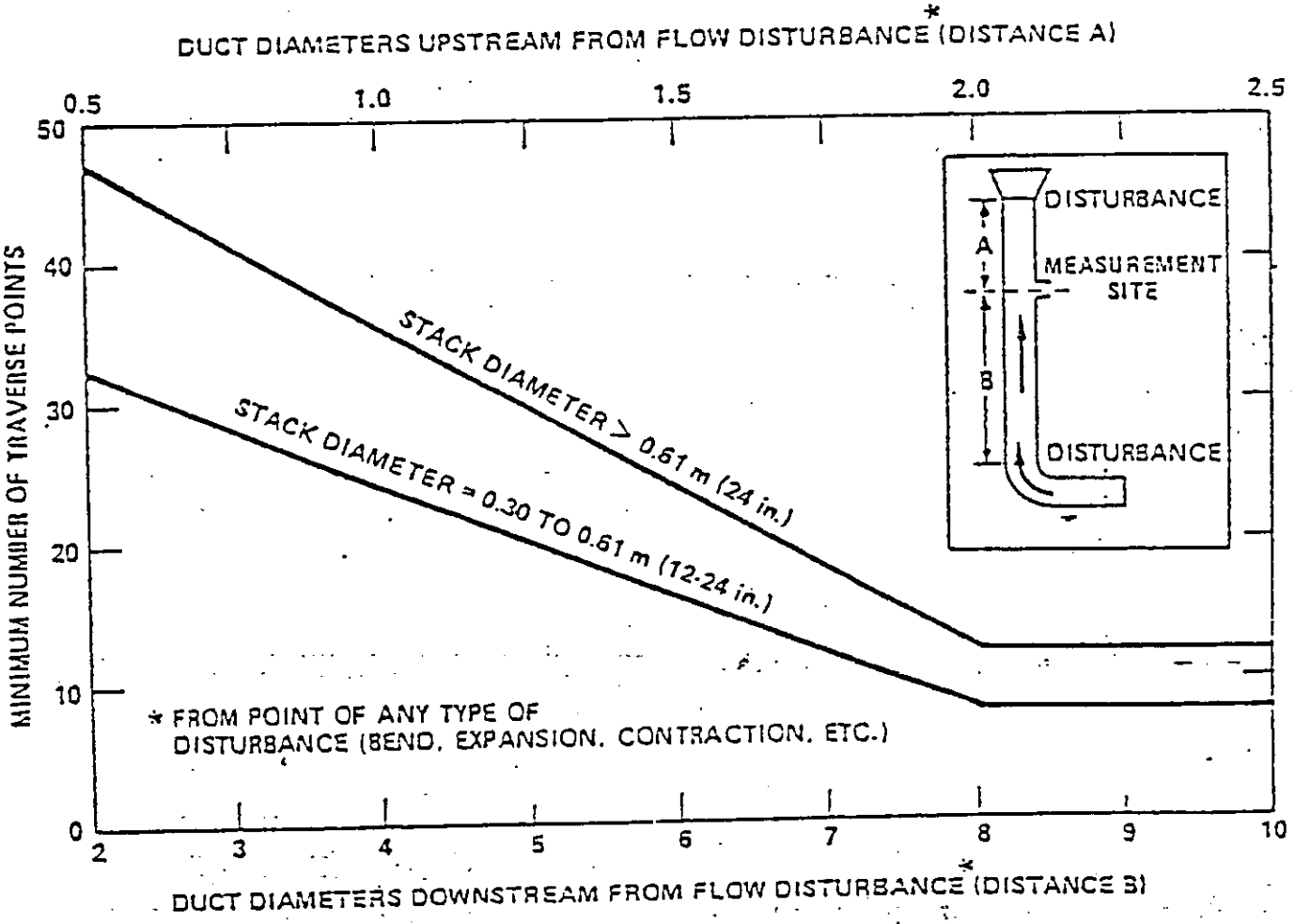


Figure 1-1. Minimum number of traverse points for particulate traverses.

EPA METHOD #2

DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE (TYPE S PITOT TUBE)

Determinations of stack gas velocity and volumetric flow rate will be made according to EPA Method #2 as described in the Federal Register of September 7, 1979. An S-type pitot tube connected to an inclined manometer will be utilized. All calibrations will be in accordance with the Method.

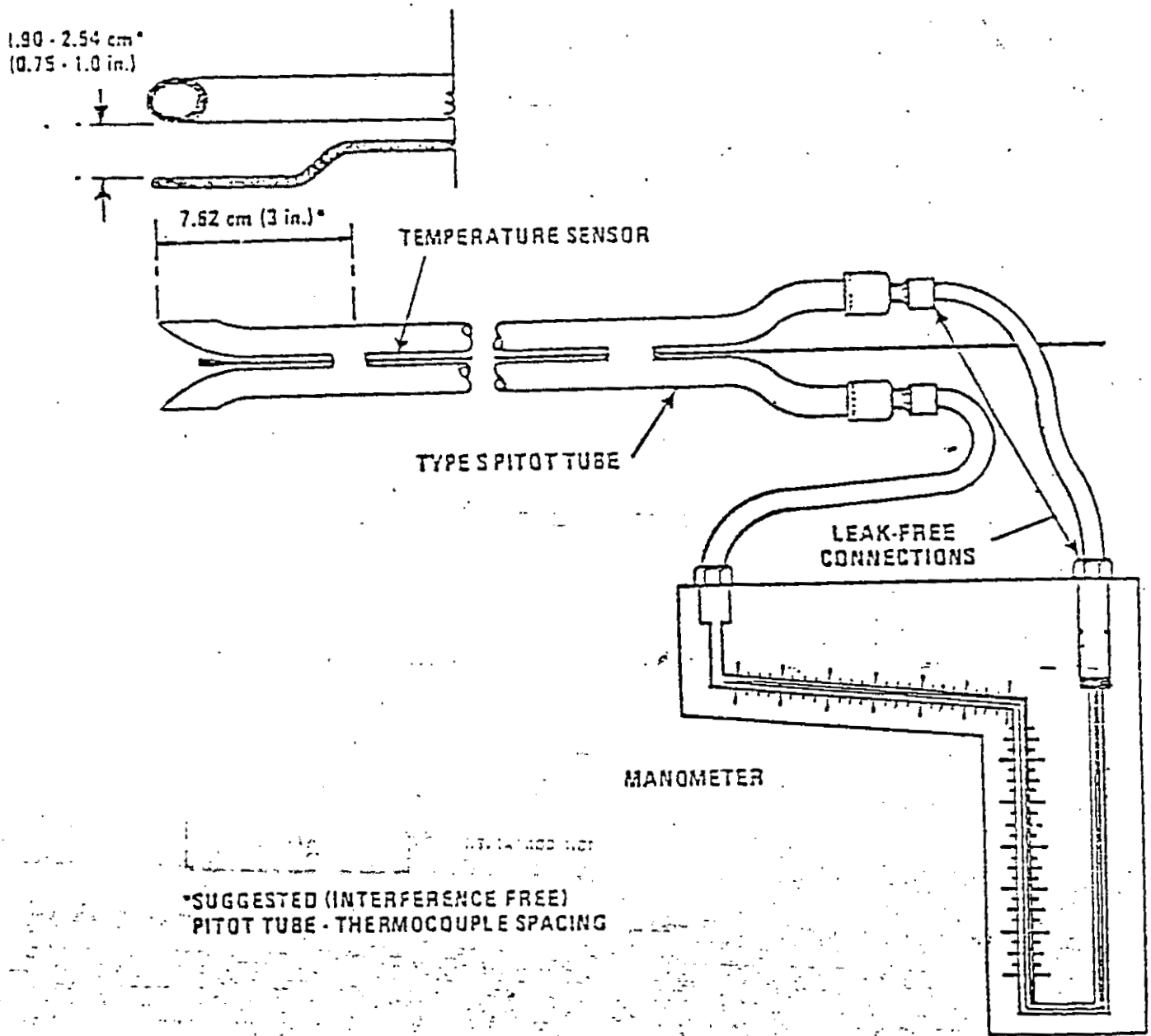


Figure 2-1. Type S pitot tube manometer assembly.

TRAVERSE POINT	DISTANCE, % of diameter
1	4.4
2	14.7
3	29.5
4	70.5
5	85.3
6	95.6

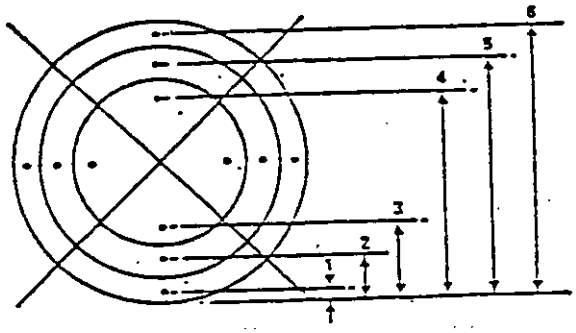


Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points indicated.

Table 1-2. LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

(Percent of stack diameter from inside wall to traverse point)

Traverse point number on a diameter	Number of traverse points on a diameter											
	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	85.4	80.6
18									98.6	93.3	88.4	83.9
19										96.1	91.3	86.8
20										98.7	94.0	89.5
21											96.5	92.1
22											98.9	94.5
23												96.8
24												98.9

EPA METHOD #4
DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Determinations of stack gas moisture content will be made according to EPA Method #4 as recorded in the Federal Register, September 7, 1979. A schematic of the required sampling train is presented below. Moisture determinations will be made using calculations presented in the Method utilizing the corrected dry gas meter volume, the amount of liquid collected in the condenser, and the weight gain of the silica gel.

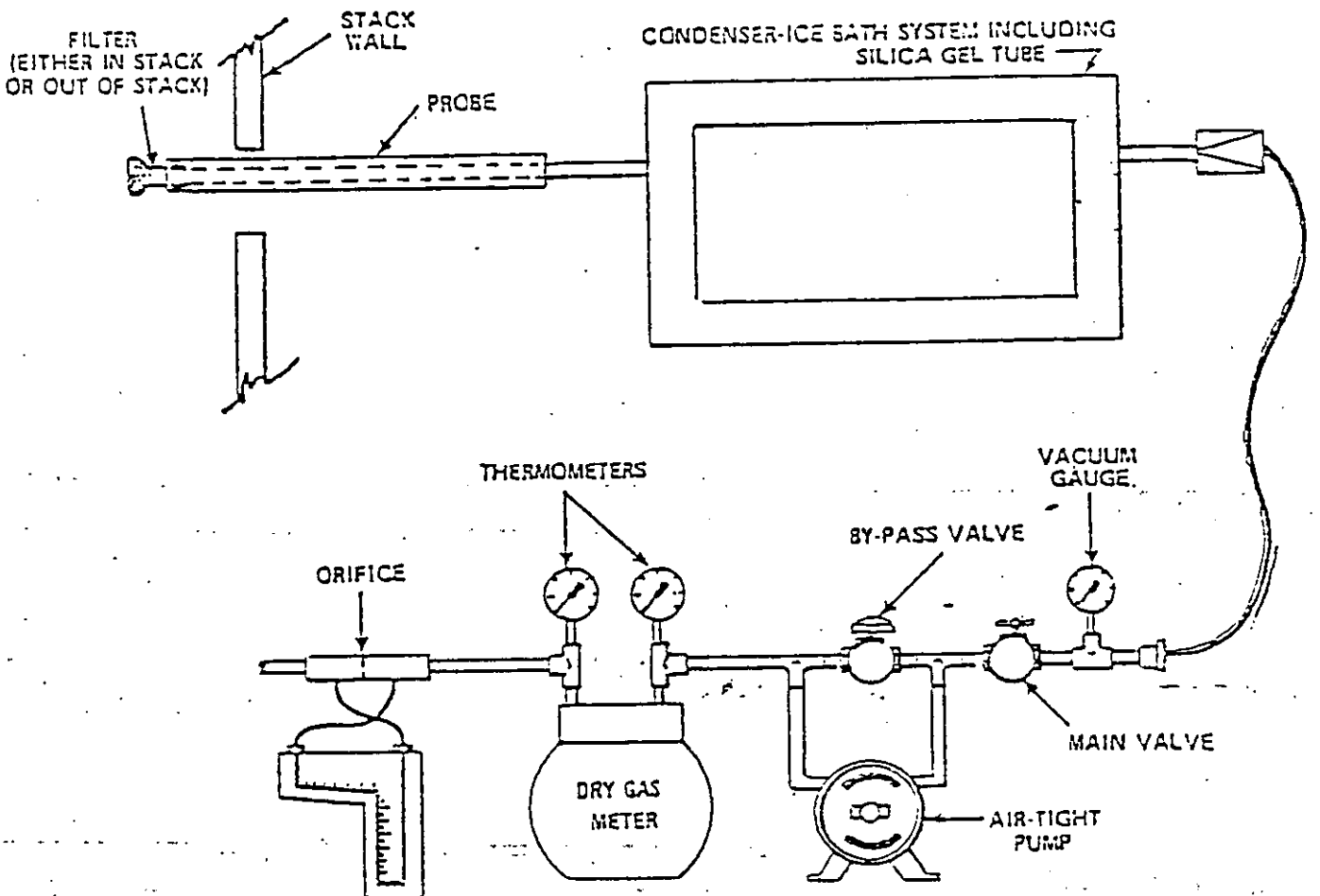


Figure 4-1. Moisture sampling train-reference method.

EPA METHOD #3

GAS ANALYSIS FOR CARBON DIOXIDE, OXYGEN, EXCESS AIR, AND DRY MOLECULAR WEIGHT

A gas sample is drawn from the stack using a multi-poimt integrated sampling procedure and the gas sampling train presented below. The sampling train will be leak-checked prior to use. Each traverse point shall be sampled for an equal length of time at approximately the same flowrate. Sampling data shall be recorded on the appropriate data sheet.

Analysis of the integrated bag sample shall be performed within eight hours after completion of the sampling. The Orsat analyzer shall be leak-checked prior to use. To ensure complete absorption of CO_2, O_2 and CO, repeated passes shall be made through each absorbing solution until two consecutive passes agree. Each reading shall be recorded on the appropriate data sheet. Molecular weight shall be determined to the nearest 0.01 lb/lb-mole.

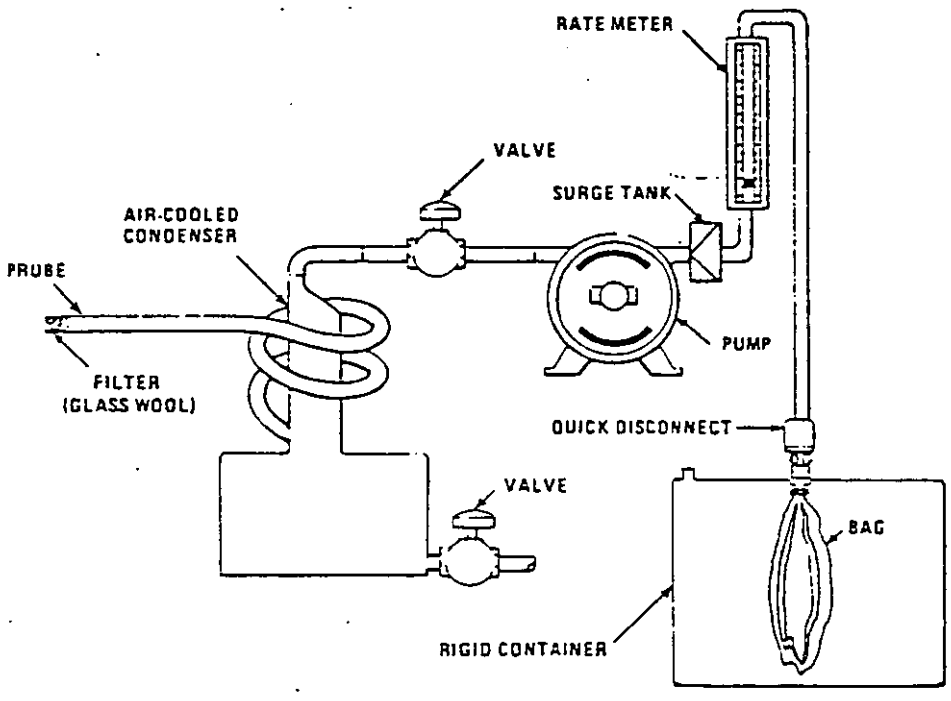


Figure 3-2. Integrated gas-sampling train.

Test data recorded will include test time, sampling duration at each traverse point, pitot pressure, stack temperature, meter volume, meter inlet-outlet temperature, and orifice pressure drop. A sample field data sheet is included in Appendix B. At the end of each test, three sample containers will be used as follows:

Container #1 - Filter

Container #2 - Acetone wash of probe and front half of filter. The probe and nozzles are washed and brushed three times.

Container #3 - Silica gel from the fourth impinger.

The samples will be transported to the laboratory and the following analyses performed:

Container #1 - Transfer the filter, and any loose particulate matter from the sample container to a tared glass weighing dish, desiccate and dry to a constant weight. Report results to the nearest 0.1 mg.

Container #2 - Transfer the acetone washings to a tared beaker and evaporate to dryness at ambient temperature and pressure. Desiccate and dry to a constant weight. Report results to the nearest 0.1 mg.

Container #3 - Weigh silica gel to the nearest 0.5 g. The weight of the moisture entrapped in the silica gel, along with the volume of moisture which is condensed in the impingers, is used to calculate the moisture content of the flue gas.

The following procedures are followed to assure the quality of the samples and data collected. Acetone blanks are run prior to the field use and only acetone with low blank value ($\leq$ 0.001 percent) is used. All filters are permanently numbered. The filter number and tare weight are recorded in a bound notebook which is in the custody of the chemistry laboratory supervisor. The filter numbers and corresponding tare weights will be provided prior to sampling.

Each filter is placed in a filter holder and sealed to prevent any contamination. The sealed filter holder is clearly labeled with the filter number. The sealed filter holders are placed in a fiberglass transport case. When used in the field, the filter number is recorded on a field data sheet. A sample field data sheet is attached (see Appendix B). At the conclusion of the sample run, the filter holder is sealed and returned to the fiberglass foam-lined transport case.

EPA METHOD #5
DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES

Particulate sampling will be accomplished by using the modified EPA collection train, Method 5, described in the August 18, 1977 edition of the Federal Register. It is shown schematically in Figure 5-1 and consists of a nozzle, probe, filter, four impingers, vacuum pump, dry gas meter, and an orifice flow meter. TRC manufactures their own sampling train.

The nozzle (1) is attached to a stainless steel glass-lined probe (2) that is wrapped with nichrome heating wire and jacketed. This prevents condensation of the sampling gas. Following the probe, the gas stream impacts on a 4-1/2" glass filter holder (3). Gelman Spectro Grade No. 64948 filter paper is used. Enclosing the whole filter assembly is a heated box (4) to maintain temperatures at 248° ± 25°F. Again, condensation is prevented. An ice bath containing four impingers (5) is attached to the back end of the filter via a flexible umbilical cord. All condensible material in the sample stream is collected here. The first two impingers contain distilled water, the third is dry, and the fourth contains silica gel to remove any remaining moisture. Leaving the fourth impinger, the sample stream flows through flexible tubing (6), a vacuum gauge (7) needle valve (8), a leakless vacuum pump (9) in parallel with a bypass valve (10) and a dry gas meter (11). A calibrated orifice and inclined manometer (12) complete the sampling train. The stack velocity pressure is measured using a pitot tube and inclined manometer (13). The stack temperature is monitored by a thermocouple that is attached to the pitot and connected to a potentiometer (14).

A nomograph is used to quickly determine the orifice pressure drop required for any pitot velocity pressure and stack temperature in order to maintain isokinetic sampling conditions. Sampling flow is adjusted by means of the bypass valve. Before and after each particulate test run the sampling train is leak checked.

CO_2 reduced to CH_4 and measured by a FID. In this manner, the variable response of the FID associated with different types of organics is eliminated.

2. Apparatus

The sampling system consists of a condensate trap, flow control system, and sample tank (Figure 1). The analytical system consists of two major sub-systems: an oxidation system for the recovery and conditioning of the condensate trap contents and a NMO analyzer. The NMO analyzer is a GC with backflush capability for NMO analysis and is equipped with an oxidation catalyst, reduction catalyst, and FID. (Figures 2 and 3 are schematics of a typical NMO analyzer.) The system for the recovery and conditioning of the organics captured in the condensate trap consists of a heat source, oxidation catalyst, nondispersive infrared (NDIR) analyzer and an intermediate collection vessel (Figure 4 is a schematic of a typical system.) TGNMO sampling equipment can be constructed from commercially available components and components fabricated in a machine shop. NMO analyzers are available commercially or can be constructed from available components by a qualified instrument laboratory.

2.1 *Sampling.* The following equipment is required:

2.1.1 Probe. 3.2-mm OD (⅛-in.) stainless steel tubing.

2.1.2 Condensate Trap. Constructed of 316 stainless steel; construction details of a suitable trap are shown in Figure 5.

2.1.3 Flow Shut-off Valve. Stainless steel control valve for starting and stopping sample flow.

2.1.4 Flow Control System. Any system capable of maintaining the sampling rate to within ±10 percent of the selected flow rate (50 to 100 cc/min range).

2.1.5 Vacuum Gauge. Gauge for monitoring the vacuum of the sample tank during leak checks and sampling.

2.1.6 Sample Tank. Stainless steel or aluminum tank with a volume of 4 to 8 liters, equipped with a stainless steel female quick connect for assembly to the sample train and analytical system.

2.1.7 Mercury Manometer. U-tube mercury manometer capable of measuring pressure to within 1 mm Hg in the 0–900 mm range.

2.1.8 Vacuum Pump. Capable of evacuating to an absolute pressure of 10 mm Hg.

2.2 Analysis. The following equipment is required:

2.2.1 Condensate Recovery and Conditioning Apparatus. An apparatus for recovering and catalytically oxidizing the condensate trap contents is required. Figure 4 is a schematic of such a system. The analyst must demonstrate prior to initial use that the analytical system is capable of proper oxidation and recovery, as specified in section 5.1. The condensate recovery and conditioning apparatus consists of the following major components.

2.2.1.1 Heat Source. A heat source sufficient to heat the condensate trap (including probe) to a temperature where the trap turns a "dull red" color. A system using both a propane torch and an electric muffle-type furnace is recommended.

2.2.1.2 Oxidation Catalyst. A catalyst system capable of meeting the catalyst efficiency criteria of this method (section 5.1.2). Addendum I of this method lists a catalyst system found to be acceptable.

2.2.1.3 Water Trap. Any leak-proof moisture trap capable of removing moisture from the gas stream.

2.2.1.4 NDIR Detector. A detector capable of indicating CO_2 concentration in the zero to 1 percent range. This detector is required for monitoring the progress of combustion of the organic compounds from the condensate trap.

2.2.1.5 Pressure Regulator. Stainless steel needle valve required to maintain the trap conditioning system at a near constant pressure.

2.2.1.6 Intermediate Collection Vessel. Stainless steel or aluminum collection vessel equipped with a female quick connect. Tanks with nominal volumes in the 1 to 4 liter range are recommended.

2.2.1.7 Mercury Manometer. U-tube mercury manometer capable of measuring pressure to within 1 mm Hg in the 0–900 mm range.

2.2.1.8 Gas Purifiers. Gas purification systems sufficient to maintain CO_2 and organic impurities in the carrier gas and auxiliary oxygen at a level of less than 10 ppm (may not be required depending on quality of cylinder gases used).

2.2.2 NMO Analyzer. Semi-continuous GC/FID analyzer capable of: (1) separating CO, CO_2, and CH_4 from nonmethane organic compounds, (2) reducing the CO_2 to CH_4 and quantifying as CH_4, and (3) oxidizing the nonmethane organic compounds to CO_2, reducing the CO_2 to CH_4, and quantifying as CH_4. The analyst must demonstrate prior to initial use that the analyzer is capable of proper separation, oxidation, reduction, and measurement (section 5.2). The analyzer consists of the following major components:

2.2.2.1 Oxidation Catalyst. A catalyst system capable of meeting the catalyst efficiency criteria of this method (section 5.2.1). Addendum I of this method lists a catalyst system found to be acceptable.

2.2.2.2 Reduction Catalyst. A catalyst system capable of meeting the catalyst efficiency criteria of this method (section 5.2.3). Addendum I of this method lists a catalyst system found to be acceptable.

2.2.2.3 Separation Column(s). Gas chromatographic column(s) capable of separating CO, CO_2, and CH_4 from NMO compounds as demonstrated according to the procedures established in this method (section 5.2.5). Addendum I of this method lists a column found to be acceptable.

2.2.2.4 Sample Injection System. A GC sample injection valve fitted with a sample loop properly sized to interface with the NMO analyzer (1 cc loop recommended).

2.2.2.5 FID. A FID meeting the following specifications is required.

2.2.2.5.1 Linearity. A linear response (± 5%) over the operating range as demonstrated by the procedures established in section 5.2.2.

2.2.2.5.2 Range. Signal attenuators shall be available to produce a minimum signal response of 10 percent of full scale for a full scale range of 10 to 50000 ppm CH_4.

2.2.2.6 Data Recording System. Analog strip chart recorder or digital integration system compatible with the FID for permanently recording the analytical results.

2.2.3 *Barometer.* Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 1 mm Hg.

2.2.4 Thermometer. Capable of measuring the laboratory temperature within 1°C.

2.2.5 Vacuum Pump. Capable of evacuating to an absolute pressure of 10 mm Hg.

2.2.6 Syringe (2). 10 µl and 100 µl liquid injection syringes.

2.2.7 Liquid Sample Injection Unit. 316 SS U-tube fitted with a Teflon injection septum, see Figure 6.

3. Reagents

3.1 *Sampling.* Crushed dry ice is required during sampling.

3.2 Analysis.

3.2.1 *NMO Analyzer.* The following gases are needed:

3.2.1.1 Carrier Gas. Zero grade gas containing less than 1 ppm C. Addendum I of this method lists a carrier gas found to be acceptable.

3.2.1.2 Fuel Gas. Pure hydrogen, containing less than 1 ppm C.

3.2.1.3 Combustion Gas. Zero grade air or oxygen as required by the detector.

3.2.2 Condensate Recovery and Conditioning Apparatus.

3.2.2.1 Carrier Gas. Five percent O_2 in N_2, containing less than 1 ppm C.

3.2.2.2 Auxiliary Oxygen. Zero grade oxygen containing less than 1 ppm C.

3.2.2.3 Hexane. ACS grade, for liquid injection.

3.2.2.4 Toluene. ACS grade, for liquid injection.

3.3 Calibration. For all calibration gases, the manufacturer must recommend a maximum shelf life for each cylinder (i.e., the length of time the gas concentration is not expected to change more than ± 5 percent from its certified value). The date of gas cylinder preparation, certified organic concentration and recommended maximum shelf life must be affixed to each cylinder before shipment from the gas manufacturer to the buyer. The following calibration gases are required.

3.3.1 Oxidation Catalyst Efficiency Check Calibration Gas. Gas mixture standard with nominal concentration of 1 percent methane in air.

3.3.2 Flame Ionization Detector Linearity and Nonmethane Organic Calibration Gases (3). Gas mixture standards with nominal propane concentrations of 20 ppm, 200 ppm, and 3000 ppm, in air.

3.3.3 *Carbon Dioxide Calibration Gases* (3). Gas mixture standards with nominal CO_2 concentrations of 50 ppm, 500 ppm, and 1 percent, in air. *Note:* total NMO less than 1 ppm required for 1 percent mixture.

3.3.4 NMO Analyzer System Check Calibration Gases (4).

3.3.4.1 Propane Mixture. Gas mixture standard containing (nominal) 50 ppm CO, 50 ppm CH_4, 2 percent CO_2, and 20 ppm C_3H_8, prepared in air.

3.3.4.2 Hexane. Gas mixture standard containing (nominal) 50 ppm hexane in air.

Method 25—Determination of Total Gaseous Nonmethane Organic Emissions as Carbon

1. Applicability and Principle.

1.1 Applicability. This method applies to the measurement of volatile organic compounds (VOC) as total gaseous nonmethane organics (TGNMO) as carbon in source emissions. Organic particulate matter will interfere with the analysis and therefore, in some cases, an in-stack particulate filter is required. This method is not the only method that applies to the measurement of TGNMO.

Costs, logistics, and other practicalities of source testing may make other test methods more desirable for measuring VOC of certain effluent streams. Proper judgment is required in determining the most applicable VOC test method. For example, depending upon the molecular weight of the organics in the effluent stream, a totally automated semi-continuous nonmethane organic (NMO) analyzer interfaced directly to the source may yield accurate results. This approach has the advantage of providing emission data semi-continuously over an extended time period.

Direct measurement of an effluent with a flame ionization detector (FID) analyzer may be appropriate with prior characterization of the gas stream and knowledge that the detector responds predictably to the organic compounds in the stream. If present, methane will, of course, also be measured. In practice, the FID can be applied to the determination of the mass concentration of the total molecular structure of the organic emissions under the following limited conditions: (1) Where only one compound is known to exist; (2) when the organic compounds consist of only hydrogen and carbon; (3) where the relative percentage of the compounds is known or can be determined, and the FID response to the compounds is known; (4) where a consistent mixture of compounds exists before and after emission control and *only* the relative concentrations are to be assessed; or (5) where the FID can be calibrated against mass standards of the compounds emitted (solvent emissions, for example).

Another example of the use of a direct FID is as a screening method. If there is enough information available to provide a rough estimate of the analyzer accuracy, the FID analyzer can be used to determine the VOC content of an uncharacterized gas stream. With a sufficient buffer to account for possible inaccuracies, the direct FID can be a useful tool to obtain the desired results without costly exact determination.

In situations where a qualitative/quantitative analysis of an effluent stream is desired or required, a gas chromatographic FID system may apply. However, for sources emitting numerous organics, the time and expense of this approach will be formidable.

1.2 Principle. An emission sample is withdrawn from the stack at a constant rate through a chilled condensate trap by means of an evacuated sample tank. TGNMO are determined by combining the analytical results obtained from independent analyses of the condensate trap and sample tank fractions. After sampling is completed, the organic contents of the condensate trap are oxidized to carbon dioxide (CO_2) which is quantitatively collected in an evacuated vessel; then a portion of the CO_2 is reduced to methane (CH_4) and measured by a FID. The organic content of the sample fraction collected in the sampling tank is measured by injecting a portion into a gas chromatographic (GC) column to achieve separation of the nonmethane organics from carbon monoxide (CO), CO_2, and CH_4; the nonmethane organics (NMO) are oxidized to

Hg (nominal). When the vessel is pressurized, vent the carrier, measure and record the final intermediate collection vessel pressure (P_f) as well as the barometric pressure (P_{bar}), ambient temperature (T_a), and collection vessel volume (V_v).

4.4 Analysis. Prior to putting the NMO analyzer into routine operation, an initial performance test must be conducted. Start the analyzer and perform all the necessary functions in order to put the analyzer in proper working order, then conduct the performance test according to the procedures established in section 5.2. Once the performance test has been successfully completed and the CO_2 and NMO calibration response factors determined, proceed with sample analysis as follows:

4.4.1 Daily operations and calibration checks. Prior to and immediately following the analysis of each set of samples or on a daily basis (whichever occurs first) conduct a calibration test according to the procedures established in section 5.3. If the criteria of the daily calibration test cannot be met, repeat the NMO analyzer performance test (section 5.2) before proceeding.

4.4.2 Analysis of Recovered Condensate Sample. Purge the sample loop with sample and then inject a preliminary sample in order to determine the appropriate FID attenuation. Inject triplicate samples from the intermediate collection vessel and record the values obtained for the condensible organics as CO_2 (C_{mo}).

4.4.3 Analysis of Sample Tank. Purge the sample loop with sample and inject a preliminary sample in order to determine the appropriate FID attenuation for monitoring the backflushed non-methane organics. Inject triplicate samples from the sample tank and record the values obtained for the nonmethane organics (C_{mo}).

5. *Calibration and Operational Checks*

Maintain a record of performance of each item.

5.1 Initial Performance Check of Condensate Recovery and Conditioning Apparatus.

5.1.1 Carrier Gas and Auxiliary Oxygen Blank. Set equal flow rates for both the carrier gas and auxiliary oxygen. With the trap switching valves in the bypass position and the catalyst in-line, fill an evacuated intermediate collection vessel with carrier gas. Analyze the collection vessel for CO_2; the carrier blank is acceptable if the CO_2 concentration is less than 10 ppm.

5.1.2 Catalyst Efficiency Check. Set up the condensate trap recovery system so that the carrier flow bypasses the trap inlet and is vented to the atmosphere at the system outlet. Assure that the valves isolating the collection system from the atmospheric vent and vacuum pump are closed and then attach an evacuated intermediate collection vessel to the system. Connect the methane standard gas cylinder (section 3.3.1) to the system's condensate trap connector (probe end, Figure 4). Adjust the system valving so that the standard gas cylinder acts as the carrier gas and adjust the flow rate to the rate normally used during trap sample recovery. Switch off the auxiliary oxygen flow and then switch from vent to collect in order to begin collecting a sample. Continue collecting a sample in a normal manner until the intermediate vessel is filled to a nominal gauge pressure of 300 mm Hg. Remove the intermediate vessel from the system and vent the carrier flow to the atmosphere. Switch the valving to return the system to its normal carrier gas and normal operating conditions. Analyze the collection vessel for CO_2; the catalyst efficiency is acceptable if the CO_2 concentration is within ±5 percent of the expected value.

5.1.3 System Performance Check. Construct a liquid sample injection unit similar in design to the unit shown in Figure 8. Insert this unit into the condensate recovery and conditioning system in place of a condensate trap and set the carrier gas and auxiliary oxygen flow rates to normal operating levels. Attach an evacuated intermediate collection vessel to the system and switch from system vent to collect. With the carrier gas routed through the injection unit and the oxidation catalyst, inject a liquid sample (see 5.1.3.1 to 5.1.3.4) via the injection septum. Heat the injection unit with a torch while monitoring the oxidation reaction on the NDIR. Continue the purge until the reaction is complete. Measure the final collection vessel pressure and then analyze the vessel to determine the CO_2 concentration. For each injection, calculate the percent recovery using the equation in section 6.6.

The performance test is acceptable if the average percent recovery is 100 ± 10 percent with a relative standard deviation (section 6.7) of less than 5 percent for each set of triplicate injections as follows:

5.1.3.1 100 µl hexane.
5.1.3.2 10 µl hexane.
5.1.3.3 100 µl toluene.
5.1.3.4 10 µl toluene.

5.2 Initial NMO Analyzer Performance Test.

5.2.1 Oxidation Catalyst Efficiency Check. Turn off or bypass the NMO analyzer reduction catalyst. Make triplicate injections of the high level methane standard (section 3.3.1). The oxidation catalyst operation is acceptable if no FID response is noted.

5.2.2 Analyzer Linearity Check and NMO Calibration. Operating both the oxidation and reduction catalysts, conduct a linearity check of the analyzer using the propane standards specified in section 3.3. Make triplicate injections of each calibration gas and then calculate the average response factor (area/ppm C) for each gas, as well as the overall mean of the response factor values. The instrument linearity is acceptable if the average response factor of each calibration gas is within ±5 percent of the overall mean value and if the relative standard deviation (section 6.7) for each set of triplicate injections is less than ±5 percent. Record the overall mean of the propane response factor values as the NMO calibration response factor (RF_{NMO}).

5.2.3 Reduction Catalyst Efficiency Check and CO_2 Calibration. An exact determination of the reduction catalyst efficiency is not required. Instead, proper catalyst operation is indirectly checked and continuously monitored by establishing a CO_2 response factor and comparing it to the NMO response factor. Operating both the oxidation and reduction catalysts make triplicate injections of each of the CO_2 calibration gases (section 3.3.3). Calculate the average response factor (area/ppm) for each calibration gas, as well as the overall mean of the response factor values. The reduction catalyst operation is acceptable if the average response factor of each calibration gas is within ±5 percent of the overall mean value and if the relative standard deviation (section 6.7) for each set of triplicate injections is less than ±5 percent. Additionally, the CO_2 overall mean response factor must be within ±10 percent of the NMO calibration response factor (RF_{NMO}) calculated in section 5.2.2. Record the overall mean of the response factor values as the CO_2 calibration response factor (RF_{CO_2}).

5.2.4 NMO System Blank. For the high level CO_2 calibration gas (section 3.3.3) record the NMO value measured during the CO_2 calibration conducted in section 5.2.3. This value is the NMO blank value for the analyzer (B_o) and should be less than 10 ppm.

5.2.5 System Performance Check. Check the column separation and overall performance of the analyzer by making triplicate injections of the calibration gases listed in section 3.3.4. The analyzer performance is acceptable if the measured NMO value for each gas (average of triplicate injections) is within ±12 percent of the expected value.

5.3 NMO Analyzer Daily Calibration.

5.3.1 NMO Blank and CO_2. Inject triplicate samples of the high level CO_2 calibration gas (section 3.3.3) and calculate the average response factor. The system operation is adequate if the calculated response factor is within ±10 percent of the RF_{CO_2} calculated during the initial performance test (section 5.2.2). Use the daily response factor (DRF_{CO_2}) for analyzer calibration and the calculation of measured CO_2 concentrations in the collection vessel samples. In addition, record the NMO blank value (B_o); this value should be less than 10 ppm.

5.3.2 NMO Calibration. Inject triplicate samples of the mixed propane calibration cylinder (section 3.3.4.1) and calculate the average NMO response factor. The system operation is adequate if the calculated response factor is within ±10 percent of the RF_{NMO} calculated during the initial performance test (section 5.2.1). Use the daily response factor (DRF_{NMO}) for analyzer calibration and calculation of NMO concentrations in the sample tanks.

5.4 Sample Tank. The volume of the gas sampling tanks used must be determined. Prior to putting each tank in service, determine the tank volume by weighing the tanks empty and then filled with deionized distilled water; weigh to the nearest 5 gm and record the results. Alternatively, measure the volume of water used to fill the tanks to the nearest 5 ml.

5.5 Intermediate Collection Vessel. The volume of the intermediate collection vessels used to collect CO_2 during the analysis of the condensate traps must be determined. Prior to putting each vessel into service, determine the volume by weighing the vessel empty and then filled with deionized distilled water; weigh to the nearest 5 gm and record the results. Alternatively, measure the volume of water used to fill the tanks to the nearest 5 ml.

3.3.4.3 Toluene. Gas mixture standard containing (nominal) 20 ppm toluene in air.

3.3.4.4 Methanol. Gas mixture standard containing (nominal) 100 ppm methanol in air.

4. *Procedure.*

4.1 Sampling.

4.1.1 Sample Tank Evacuation and Leak Check. Either in the laboratory or in the field, evacuate the sample tank to 10 mm Hg absolute pressure or less (measured by a mercury U-tube manometer) then leak check the sample tank by isolating the tank from the vacuum pump and allowing the tank to sit for 10 minutes. The tank is acceptable if no change in tank vacuum is noted.

4.1.2 Sample Train Assembly. Just prior to assembly, measure the tank vacuum using a mercury U-tube manometer. Record this vacuum (P_{si}), the ambient temperature (T_{si}), and the barometric pressure (P_{bi}) at this time. Assuring that the flow shut-off valve is in the closed position, assemble the sampling system as shown in Figure 1. Immerse the condensate trap body in dry ice to within 2.5 or 5 cm of the point where the inlet tube joins the trap body.

4.1.3 Pretest Leak Check. A pretest leak check is required. After the sampling train is assembled, record the tank vacuum as indicated by the vacuum gauge. Wait a minimum period of 10 minutes and recheck the indicated vacuum. If the vacuum has not changed, the portion of the sampling train behind the shut-off valve does not leak and is considered acceptable. To check the front portion of the sampling train, assure that the probe tip is tightly plugged and then open the sample train flow shut-off valve. Allow the sample train to sit for a minimum period of 10 minutes. The leak check is acceptable if no visible change in the tank vacuum gauge occurs. Record the pretest leak rate (cm/Hg per 10 minutes). At the completion of the leak check period, close the sample flow shut-off valve.

4.1.4 Sample Train Operation. Place the probe into the stack such that the probe is perpendicular to the direction of stack gas flow; locate the probe tip at a single preselected point. If a probe extension which will not be analyzed as part of the condensate trap is being used, assure that at least a 15 cm section of the probe which will be analyzed with the trap is in the stack effluent. For stacks having a negative static pressure, assure that the sample port is sufficiently sealed to prevent air in-leakage around the probe. Check the dry ice level and add ice if necessary. Record the clock time and sample tank gauge vacuum. To begin sampling, open the flow shut-off valve and adjust (if applicable) the control valve of the flow control system used in the sample train to maintain a constant flow rate (±10 percent) throughout the duration of the sampling period. Record the gauge vacuum and flowmeter setting (if applicable) at 5-minute intervals. Select a total sample time greater than or equal to the minimum sampling time specified in the applicable subpart of the regulation; end the sampling when this time period is reached or when a constant flow rate can no longer be maintained due to reduced sample tank vacuum. When the sampling is completed, close the flow shut-off valve and record the final sample time and gauge vacuum readings. Note: If the sampling had to be stopped before obtaining the minimum sampling time (specified in the applicable subpart) because a constant flow rate could not be maintained, proceed as follows: After removing the probe from the stack, remove the used sample tank from the sampling train (without disconnecting other portions of the sampling train) and connect another sample tank to the sampling train. Prior to attaching the new tank to the sampling train, assure that the tank vacuum (measured on-site by the U-tube manometer) has been recorded on the data form and that the tank has been leak-checked (on-site). After the new tank is attached to the sample train, proceed with the sampling until the required minimum sampling time has been exceeded.

4.1.5 Post Test Leak Check. A leak check is mandatory at the conclusion of each test run. After sampling is completed, remove the probe from the stack and plug the probe tip. Open the sample train flow shut-off valve and monitor the sample tank vacuum gauge for a period of 10 minutes. The leak check is acceptable if no visible change in the tank vacuum gauge occurs. Record the post test leak rate (cm Hg per 10 minutes). If the sampling train does not pass the post leak check, invalidate the run or use a procedure acceptable to the Administrator to adjust the data.

4.2 Sample Recovery. After the post test leak check is completed, disconnect the condensate trap at the flow metering system and tightly seal both ends of the condensate trap. Keep the trap packed in dry ice until the samples are returned to the laboratory for analysis. Remove the flow metering system from the sample tank. Attach the U-tube manometer to the tank (keep length of connecting line to a minimum) and record the final tank vacuum (P_{sf}); record the tank temperature (T_s) and barometric pressure at this time. Disconnect the manometer from the tank. Assure that the test run number is properly identified on the condensate trap and the sample tank(s).

4.3 Condensate Recovery and Conditioning. Prepare the condensate recovery and conditioning apparatus by setting the carrier gas flow rate and heating the catalyst to its operating temperature. Prior to initial use of the condensate recovery and conditioning apparatus, a system performance test must be conducted according to the procedures established in section 5.1 of this method. After successful completion of the initial performance test, the system is routinely used for sample conditioning according to the following procedures:

4.3.1 System Blank and Catalyst Efficiency Check. Prior to and immediately following the conditioning of each set of sample traps, or on a daily basis (whichever occurs first) conduct the carrier gas blank test and catalyst efficiency test as specified in sections 5.1.1 and 5.1.2 of this method. Record the carrier gas initial and final blank values, B_{wi} and B_{wf}, respectively. If the criteria of the tests cannot be met, make the necessary repairs to the system before proceeding.

4.3.2 Condensate Trap Carbon Dioxide Purge and Sample Tank Pressurization. The first step in analysis is to purge the condensate trap of any CO_2 which it may contain and to simultaneously pressurize the sample tank. This is accomplished as follows: Obtain both the sample tank and condensate trap from the test run to be analyzed. Set up the condensate recovery and conditioning apparatus so that the carrier flow bypasses the condensate trap hook-up terminals, bypasses the oxidation catalyst, and is vented to the atmosphere. Next, attach the condensate trap to the apparatus and pack the trap in dry ice. Assure that the valves isolating the collection vessel connection from the atmospheric vent and the vacuum pump are closed and then attach the sample tank to the system as if it were the intermediate collection vessel. Record the tank vacuum on the laboratory data form. Assure that the NDIR analyzer indicates a zero output level and then switch the carrier flow through the condensate trap; immediately switch the carrier flow from vent to collect. The condensate trap recovery and conditioning apparatus should now be set up as indicated in Figure 8. Monitor the NDIR; when CO_2 is no longer being passed through the system, switch the carrier flow so that it once again bypasses the condensate trap. Continue in this manner until the gas sample tank is pressurized to a nominal gauge pressure of 800 mm Hg. At this time, isolate the tank, vent the carrier flow, and record the sample tank pressure (P_{sf}), barometric pressure (P_{bf}), and ambient temperature (T_{sf}). Remove the sample tank from the system.

4.3.3 Recovery of Condensate Trap Sample. Oxidation and collection of the sample in the condensate trap is now ready to begin. From the step just completed in section 4.3.1.2 above, the system should be set up so that the carrier flow bypasses the condensate trap, bypasses the oxidation catalyst, and is vented to the atmosphere. Attach an evacuated intermediate collection vessel to the system and then switch the carrier so that it flows through the oxidation catalyst. Switch the carrier from vent to collect and open the valve to the collection vessel; remove the dry ice from the trap and then switch the carrier flow through the trap. The system should now be set up to operate as indicated in Figure 9. During oxidation of the condensate trap sample, monitor the NDIR to determine when all the sample has been removed and oxidized (indicated by return to baseline of NDIR analyzer output). Begin heating the condensate trap and probe with a propane torch. The trap should be heated to a temperature at which the trap glows a "dull red" (approximately 500°C). During the early part of the trap "burn out," adjust the carrier and auxiliary oxygen flow rates so that an excess of oxygen is being fed to the catalyst system. Gradually increase the flow of carrier gas through the trap. After the NDIR indicates that most of the organic matter has been purged, place the trap in a muffle furnace (500°C). Continue to heat the probe with a torch or some other procedure (e.g., electrical resistance heater). Continue this procedure for at least 5 minutes after the NDIR has returned to baseline. Remove the heat from the trap but continue the carrier flow until the intermediate collection vessel is pressurized to a gauge pressure of 800 mm

Where:

B_a = Measured NMO blank value for NMO analyzer, ppm C.

B_c = Measured CO_2 [illegible] ppm CO_2.

C = total gaseous nonmethane organic (TGNMO) concentration of the effluent, ppm C equivalent.

C_c = Calculated condensible organic (condensate trap) concentration of the effluent, ppm C equivalent.

C_{ma} = Measured concentration (NMO analyzer) for the condensate trap (intermediate collection vessel), ppm CO_2.

C_s = Calculated noncondensible organic concentration (sample tank) of the effluent, ppm C equivalent.

C_{sa} = Measured concentration (NMO analyzer) for the sample tank, ppm NMO.

L = Volume of liquid injected, microliters.

M = Molecular weight of the liquid injected, g/g-mole.

M_c = total gaseous non-methane organic (TGNMO) mass concentration of the effluent, mg C/dscm.

N = Carbon number of the liquid compound injected (N = 7 for toluene, N = 6 for hexane).

P_f = Final pressure of the intermediate collection vessel, mm Hg absolute.

P_s = Gas sample tank pressure prior to sampling, mm Hg absolute.

P_i = Gas sample tank pressure after sampling, but prior to pressurizing, mm Hg absolute.

P_u = Final gas sample tank pressure after pressurizing, mm Hg absolute.

T_f = Final temperature of intermediate collection vessel, °K.

T_s = Sample tank temperature prior to sampling, °K.

T_i = Sample tank temperature at completion of sampling, °K.

T_u = Sample tank temperature after pressurizing °K.

V = Sample tank volume, cm.

V_f = Intermediate collection vessel volume, cm.

V_s = Gas volume sampled, dscm.

n = Number of data points.

q = Total number of analyzer injections of intermediate collection vessel during analysis (where k = injection number, 1 . . . q).

r = Total number of analyzer injections of sample tank during analysis (where j = injection number, 1 . . . r).

x_i = Individual measurements.

X = Mean value.

ρ = Density of liquid injected, g/cc.

2. Bibliography

2.1 Salo, Albert E., Samuel Witz, and Robert D. MacPhee. Determination of Solvent Vapor Concentrations by Total Combustion Analysis: A Comparison of Infrared with Flame Ionization Detectors. Paper No. 75–33.2 (Presented at the 68th Annual Meeting of the Air Pollution Control Association, Boston, MA, June 15–20, 1975.) 14 p.

2.2 Salo, Albert E., William L. Oaks, and Robert D. MacPhee. Measuring the Organic Carbon Content of Source Emissions for Air Pollution Control. Paper No. 74–190. (Presented at the 67th Annual Meeting of the Air Pollution Control Association, Denver, CO, June 9–13, 1974.) 25 p.

Method 25

Addendum I. System Components

In test Method 25 several important system components are not specified; instead minimum performance specifications are provided. The method is written in this manner to permit individual preference in choosing components, as well as to encourage development and use of improved components. This addendum is added to the method in order to provide users with some specific information regarding components which have been found satisfactory for use with the method. This listing is given only for the purpose of providing information and does not constitute an endorsement of any product by the Environmental Protection Agency. This list is not meant to imply that other components not listed are not acceptable.

1. Condensate Recovery and Conditioning System Oxidation Catalyst. ⅜" OD×14" Inconel tubing packed with 8 inches of hopcalite* oxidizing catalyst and operated at 800°C in a tube furnace. Note: At this temperature, this catalyst must be purged with carrier gas at all times to prevent catalyst damage.

2. NMO Analyzer Oxidation Catalyst. ¼" OD×14" inconel tubing packed with 8 inches of hopcalite oxidizing catalyst and operated at 900°C in a tube furnace. (See note above.)

3. NMO Analyzer Reduction Catalyst. Reduction Catalyst Module; Byron Instruments, Raleigh, N.C.

4. Gas Chromatographic Separation Column. ⅛ inch OD stainless steel packed with 3 feet of 10 percent methyl silicone, Sp 2100 (or equivalent) on Supelcoport (or equivalent), 80/100 mesh, followed by 1.5 feet Porapak Q (or equivalent) 60/80 mesh. The inlet side is to the silicone. Condition the column for 24 hours at 200°C with 20 cc/min N_2 purge.

During analysis for the nonmethane organics the separation column is operated as follows: First, operate the column at −78°C (dry ice bath) to elute CO and CH_4. After the CH_4 peak operate the column at 0°C to elute CO_2. When the CO_2 is completely eluted, switch the carrier flow to backflush the column and simultaneously raise the column temperature to 100°C in order to elute all nonmethane organics (exact timings for column operation are determined from the calibration standard).

Note.—The dry ice operating condition may be deleted if separation of CO and CH_4 is unimportant.

Note.—Ethane and ethylene may or may not be measured using this column; whether or not ethane and ethylene are quantified will depend on the CO_2 concentration in the gas sample. When high levels of CO_2 are present, ethane and ethylene will elute under the tail of the CO_2 peak.

5. Carrier Gas. Zero grade nitrogen or helium or zero air.

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*MSA registered trademark.

6. Calculations

Note: All equations are written using absolute pressure; absolute pressures are determined by adding the measured barometric pressure to the measured gauge pressure.

6.1 Sample Volume. For each test run, calculate the gas volume sampled:

$$V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{tl}}{T_{tl}} \right)$$

6.2 Noncondensible Organics. For each sample tank, determine the concentration of nonmethane organics (ppm C):

$$C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\frac{P_t}{T_t} - \frac{P_{tl}}{T_{tl}}} \right] \left[\frac{1}{r} \sum_{j=1}^{r} C_{tm_j} - B_a \right]$$

6.3 Condensible Organics. For each condensate trap determine the concentration of organics (ppm C):

$$C_c = 0.386\ \frac{V_v}{V_s} \frac{P_f}{T_f} \left[\frac{1}{q} \sum_{k=1}^{q} C_{cm_k} - B_t \right]$$

6.4 Total Gaseous Nonmethane Organics (TGNMO). To determine the TGNMO concentration for each test run, use the following equation:

$$C = C_t + C_c$$

6.5 Total Gaseous Nonmethane Organics (TGNMO) Mass Concentration. To determine the TGNMO mass concentration as carbon for each test run, use the following equation:

$$M_c = 0.498\ C$$

6.6 Percent Recovery. To calculate the percent recovery for the liquid injections to the condensate recovery and conditioning system use the following equation:

$$\text{percent recovery} = 1.6\ \frac{M}{L} \frac{V_y}{p} \frac{P_f}{T_f} \frac{C_{cm}}{R}$$

6.7 Relative Standard Deviation.

$$RSD = \frac{100}{\bar{X}} \sqrt{\frac{\sum (x_i - \bar{X})^2}{n - 1}}$$

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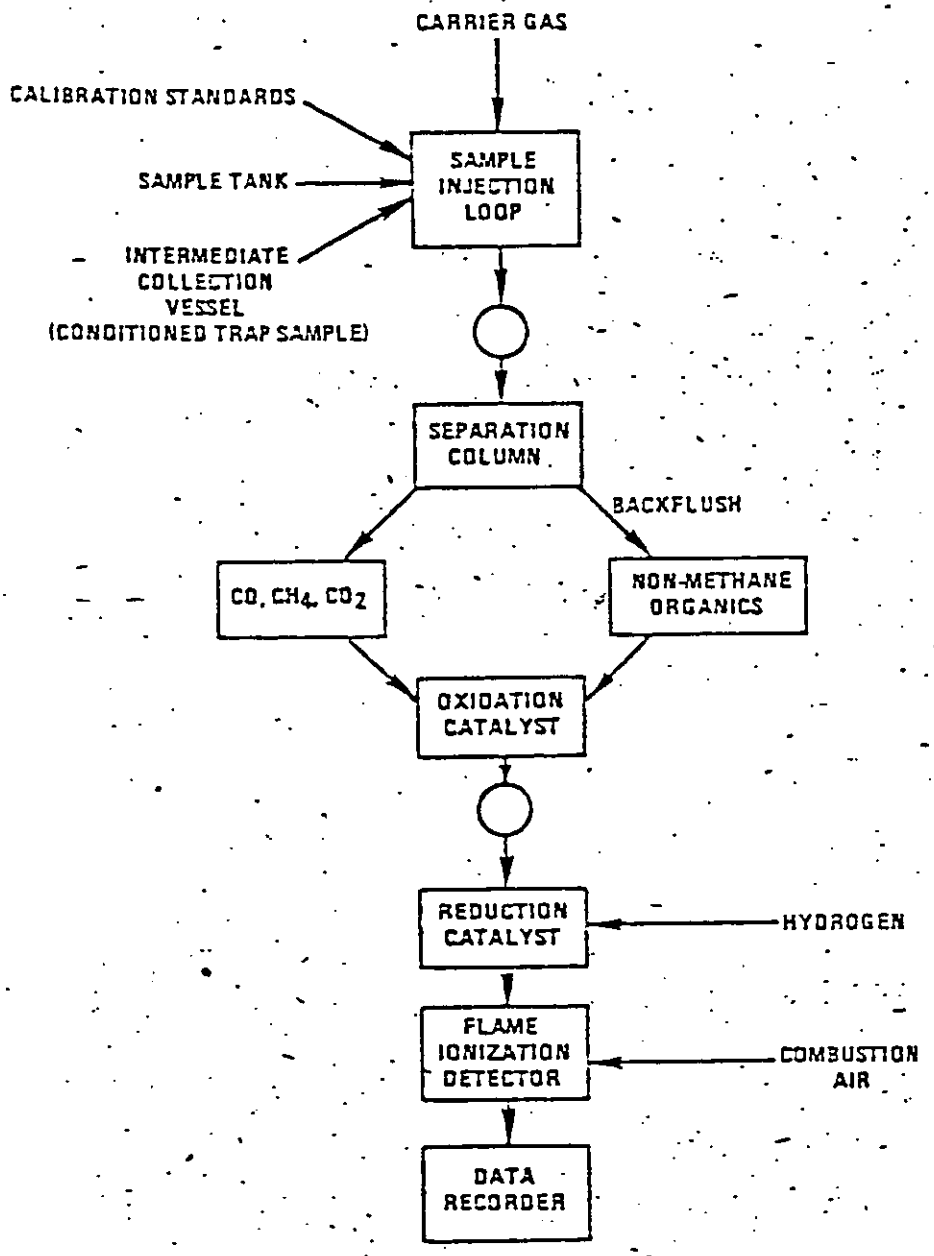

Figure 2. Simplified schematic of non-methane organic (NMO) analyzer.

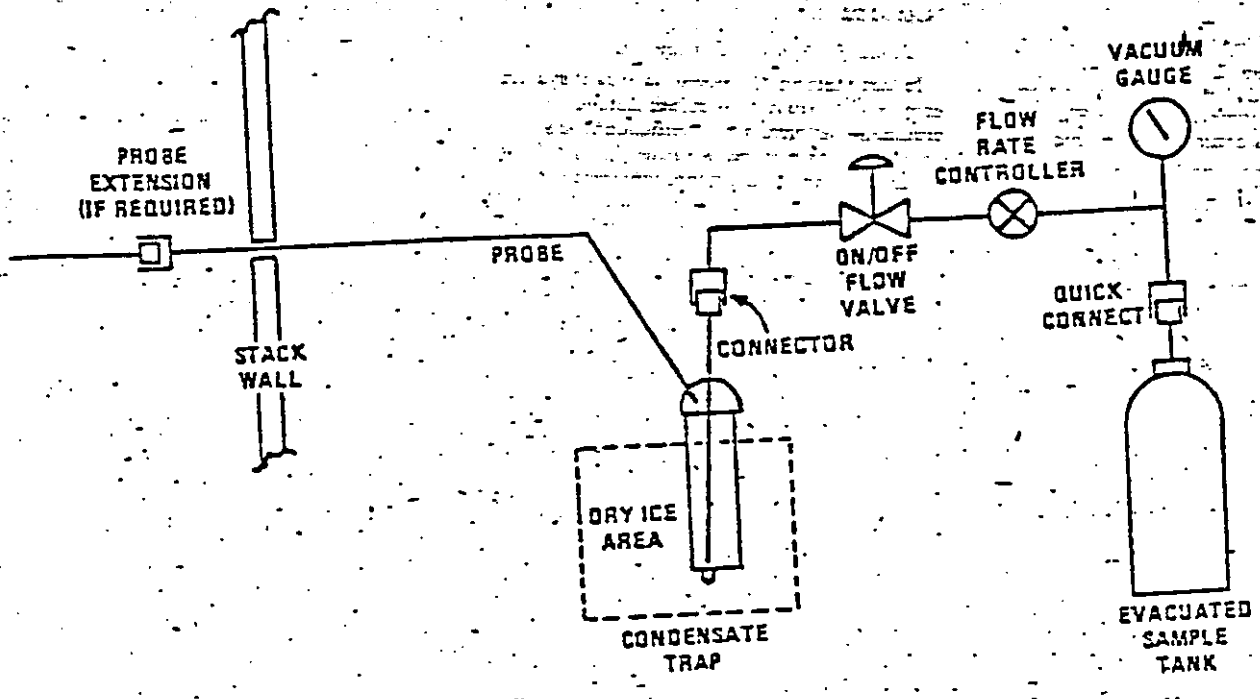

Figure 1. Sampling apparatus.

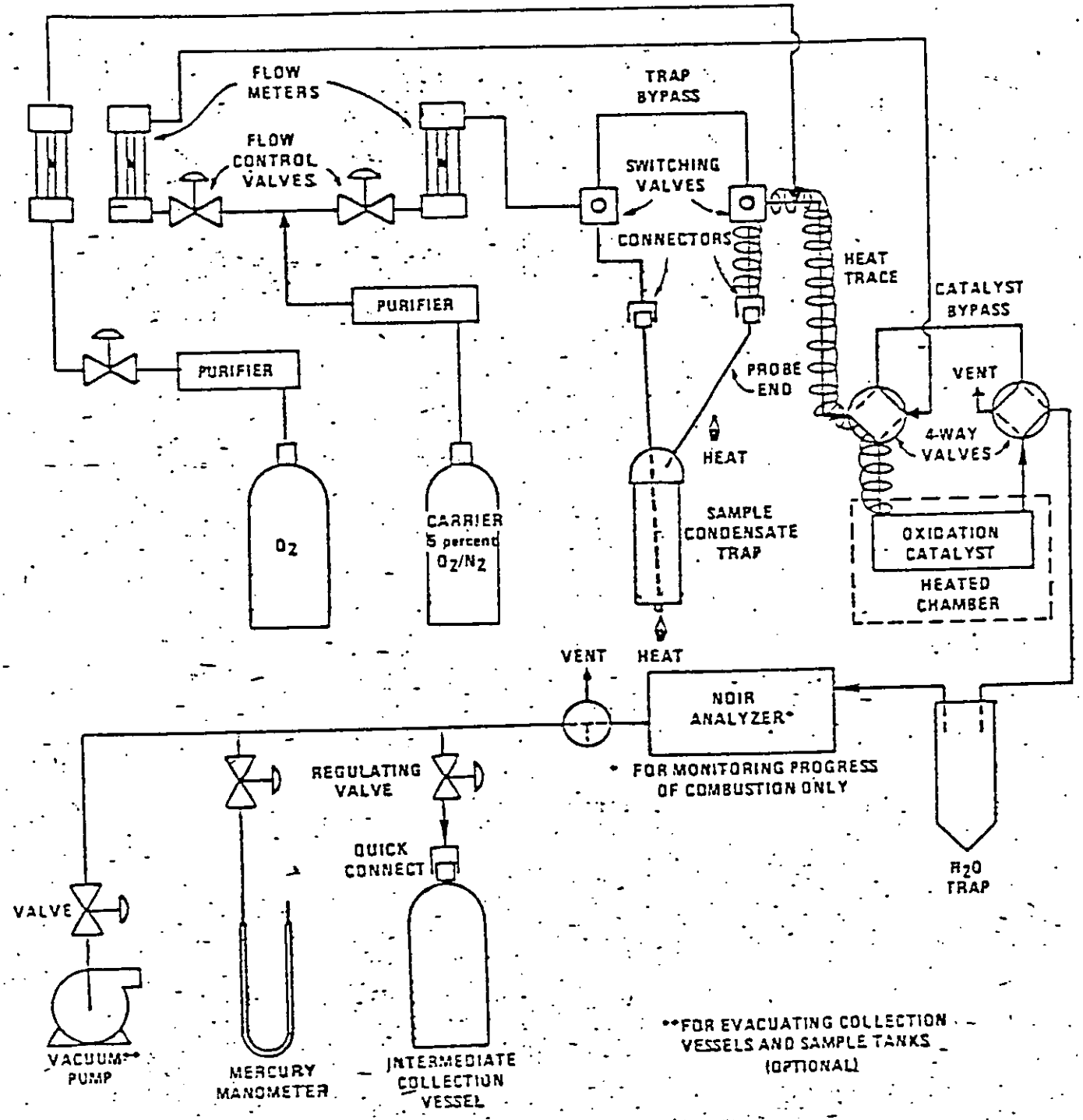

Figure 4. Condensate recovery and conditioning apparatus.

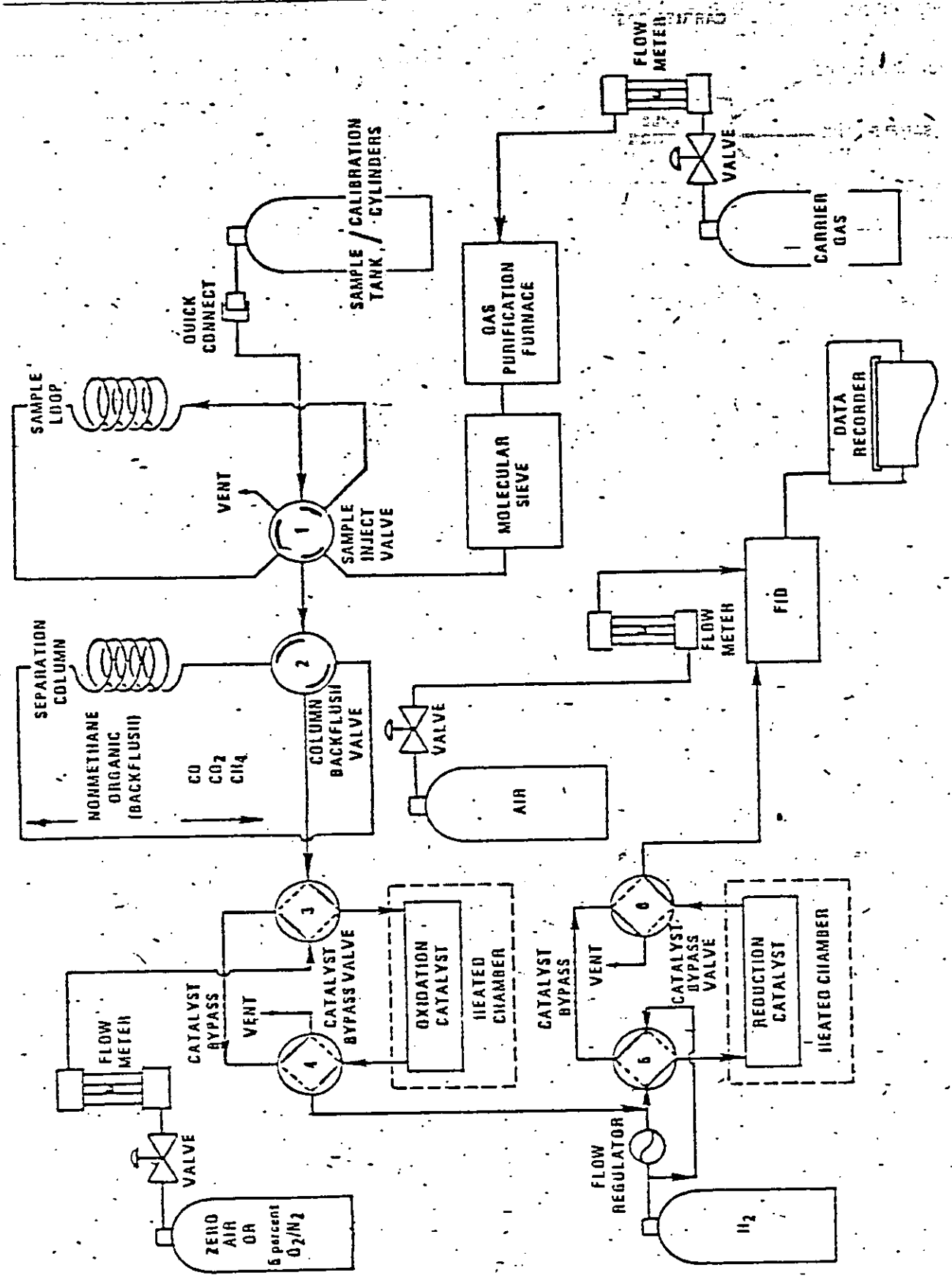

Figure 3. Nonmethane organic (NMO) analyzer.

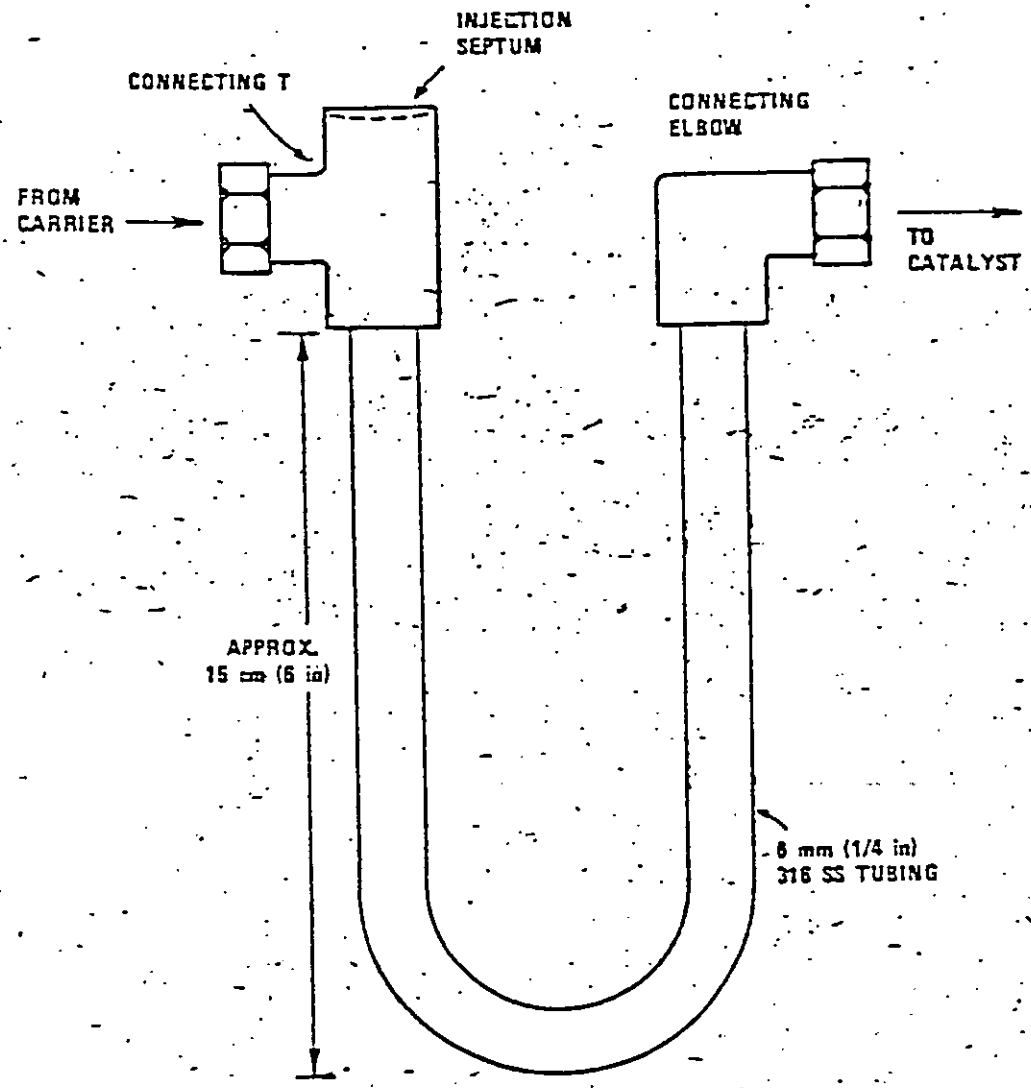

Figure 6. Liquid sample injection unit.

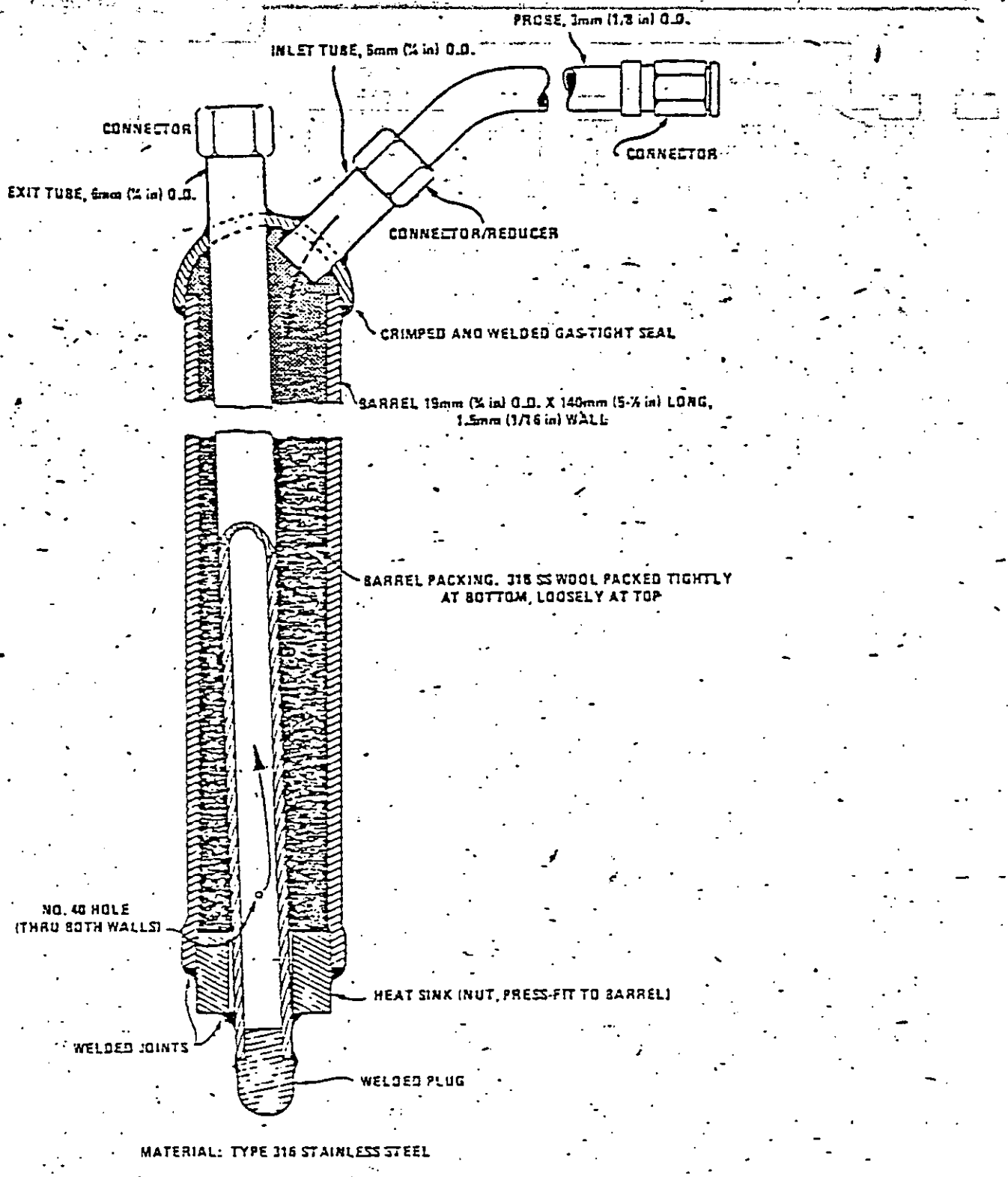

Figure 5. Condensate trap[2].

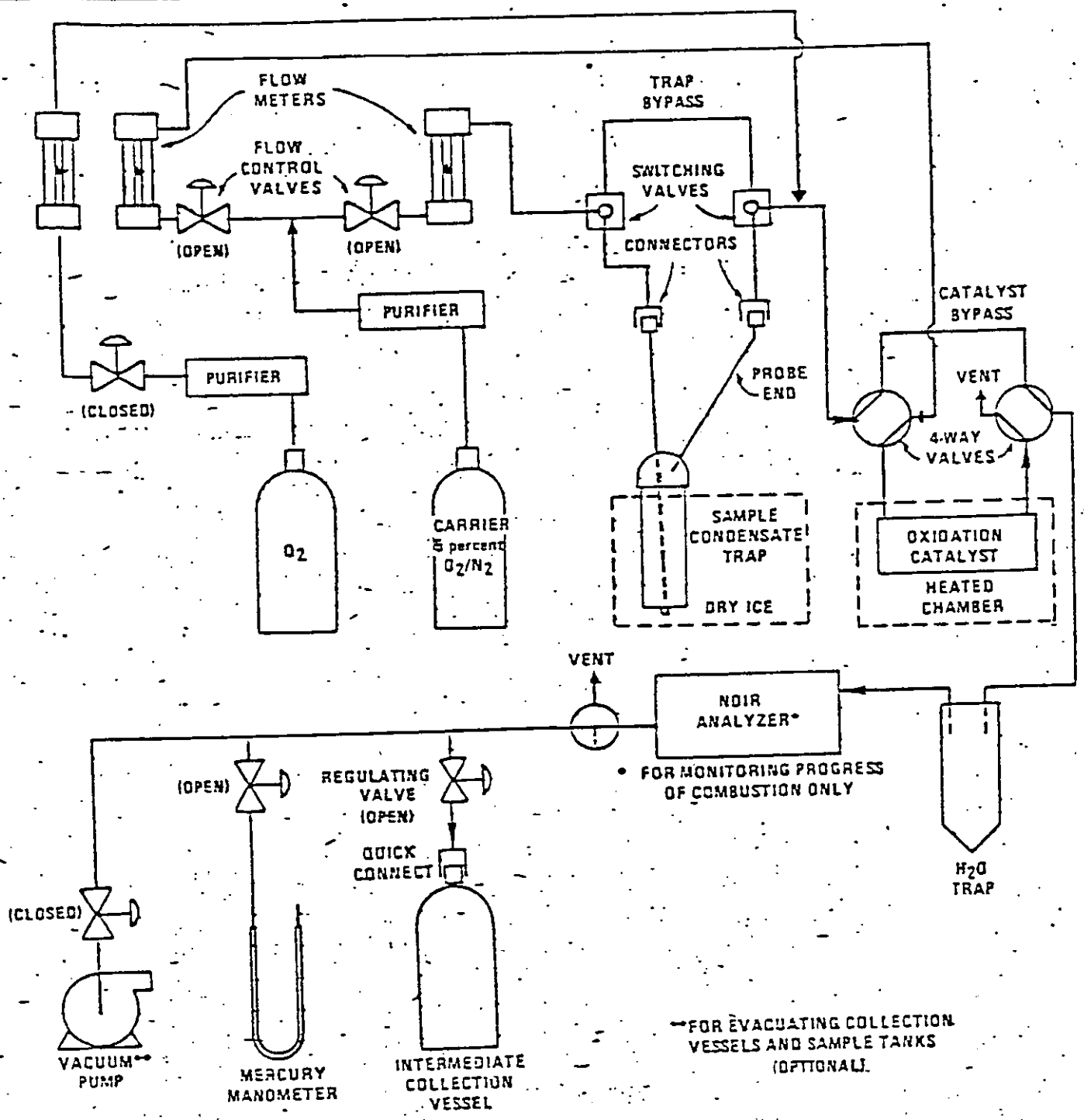

Figure 8. Condensate recovery and conditioning apparatus, carbon dioxide purge.

VOLATILE ORGANIC CARBON

FACILITY _____ SAMPLE LOCATION _____

LOCATION _____ OPERATOR _____

DATE _____ RUN NUMBER _____

TANK NUMBER _____ TRAP NUMBER _____ SAMPLE ID NUMBER _____

	TANK VACUUM, cm Hg		BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER)		(GAUGE)		
POST TEST (MANOMETER)		(GAUGE)		

LEAK RATE _____ cm Hg / 10 min

PRETEST _____

POST TEST _____

TIME - CLOCK/SAMPLE	GAUGE VACUUM, cm Hg	FLOWMETER SETTING	COMMENTS

Figure 7. Example Field Data Form.

STATE OF OREGON

DEPARTMENT OF ENVIRONMENTAL QUALITY

Source Sampling Method 7

Sampling Condensible Emissions From Stationary Sources

1. Principle and Applicability

   1.1 Principle: Particulate matter including condensible gases is withdrawn isokinetically from a flowing gas stream. The particulate matter is determined gravimetrically after extraction with organic solvents and evaporation.

   1.2 Applicability: This method is applicable to stationary sources whose primary emissions are condensible gases. It should be considered a modification of Source Sampling Method 5 and applied only when directed to do so by the Department.

2. Sampling Apparatus (Figure 7-1)

   2.1 The probe, sampling train, and metering system are the same as outlined in 3. Sampling Apparatus of Source Sampling Method 5 with the following exceptions:

      2.1.1 The heated filter and cyclone are optional, but should be used if significant quantities of solid particulate are present.

      2.1.2 An unheated glass fiber filter is placed between the third and fourth impingers.

3. Sample Recovery Apparatus

   3.1 The sample recovery apparatus is the same as outlined in 4. Sample Recovery Apparatus of Source Sampling Method 5.

4. Reagents

   4.1 The reagents are the same as outlined in 5. Reagents of Source Sampling Method 5.

5. Sampling Train Preparation

   5.1 The sampling train preparation is the same as outlined in 6. Sampling Train Preparation of Source Sampling Method 5 with the following exceptions:

      5.1.1 Insert numbered and weighed filters into each of the front (if used) and rear filter holders.

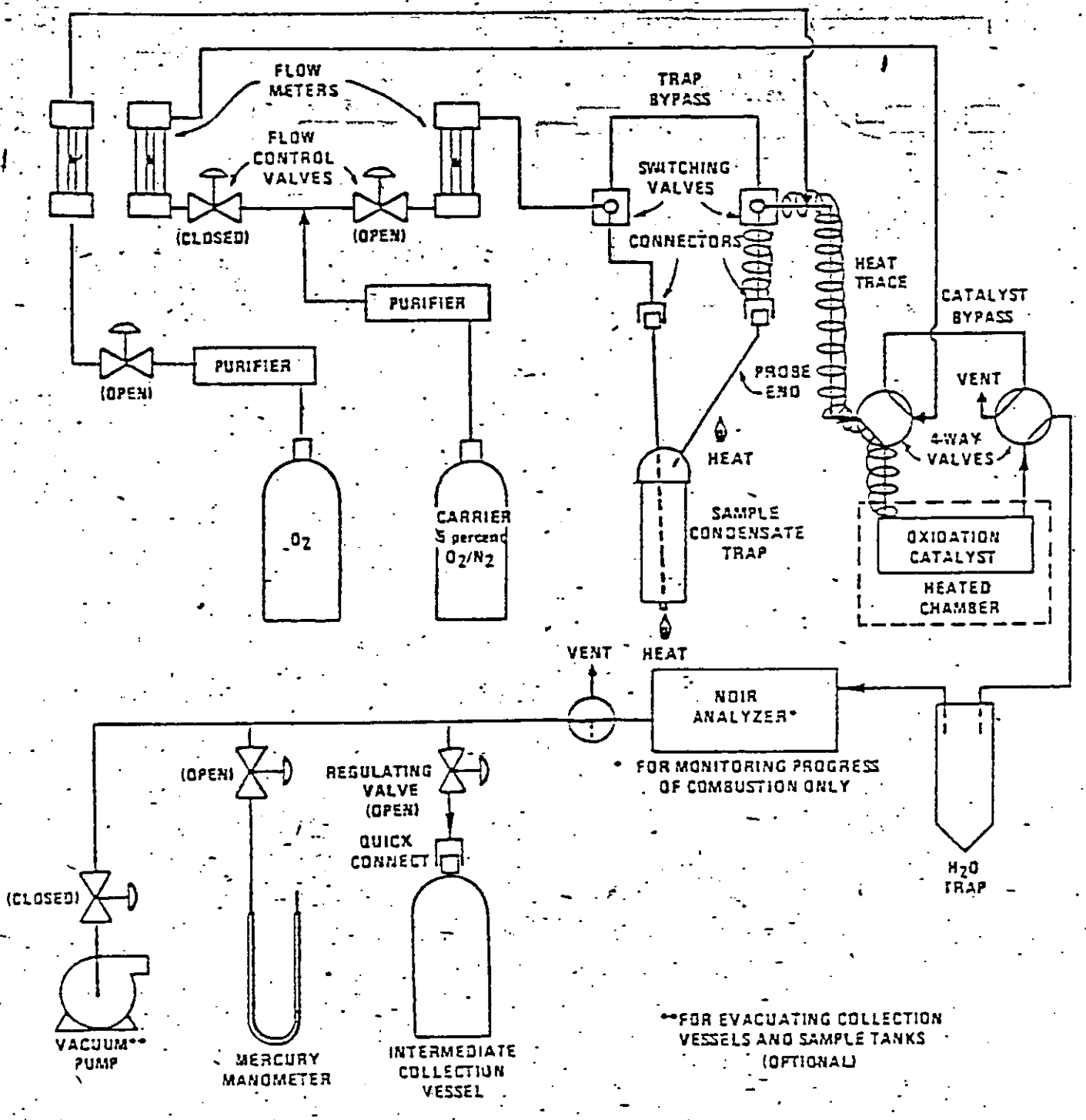

Figure 9. Condensate recovery and conditioning apparatus, collection of trap organics.

[FR Doc. 80-30718 Filed 10-2-80; 8:45 am]
BILLING CODE 6560-01-C

8.3.4 Rinse all sample exposed glassware between the front filter (if used) or the first impinger (if the front filter is not used) and the fourth impinger (including glass filter frits) with acetone and place in a suitable marked container. If the moisture condensate in Section 8.3.3 was determined by use of a graduated container, it should also be rinsed with acetone and the rinse added to the impinger rinse container.

8.3.5 Determine the weight gain of the silica gel in the fourth impinger and record. Alternately transfer the silica gel quantatively to an air tight container to be weighed in the laboratory.

8.3.6 Collected samples should be analyzed within one week of collection in order to prevent any possibility of biological or chemical degradation.

9. Analysis

9.1 Desiccate the filter(s) at 70°F or less in the field container for 24 hours and weigh .

Note: In some cases, desiccation may give rise to a slow vaporization of the condensible material. Therefore it is not recommended that an attempt to weigh to constant weight be made.

9.2 Transfer the acetone rinse (Section 8.3.1) into a tared beaker or evaporating dish. Rinse the container with acetone (police to remove particulate) and add the rinse to the beaker. Evaporate the solvent at 70°F or less and laboratory pressure, desiccate 24 hours and weigh . See note in Section 9.1.

9.3 Transfer the acetone rinse from the impingers (Section 8.3.4)to a tared beaker or evaporating dish and treat as in Section 9.2.

9.4 Transfer the water (Section 8.3.3) to a separatory funnel. Rinse the container with distilled water and add to the separatory funnel. Add 25 ml of chloroform to the separatory funnel, stopper and vigorously shake 1 minute, let separate and transfer the chloroform (lower layer) into a tared beaker or evaporating dish. Repeat twice more. Repeat the abcve extraction using three 25 ml portions of diethyl ether in place of the chloroform. Transfer the ether (upper layer) to the same container as used to contain the chloroform.

Note: It is necessary to rinse the field container for water (if used) with solvent. This rinse may be made using the extracting reagents in which case it is added to the impinger extract container or with acetone in which case it is added to the container in Section 9.3.

6. Pretest Preparations and Lead Check.

6.1 The pretest preparations and leak check are the same as outlined in Sections 7 and 8 of Source Sampling Method 5.

7. Condensible Particulate Train Operations

7.1 The train operation is the same as outlined in Section 9 of Source Sampling Method 5. It is important to note that the gas temperature leaving the last impinger must not exceed 70°F as temperatures above this may cause loss of condensible material by revolatilization.

8. Condensible Particulate Train Cleanup

8.1 Cleanup should be performed in an area free of wind and airborne dust which may contaminate the sample or cause sample loss. If possible, the train should be cleaned in a laboratory.

8.2 After the probe and nozzle have cooled, remove the end seals and brush while rinsing with acetone into a suitable marked container.

Note: Exercise caution so that none of the rinse is lost and no extraneous material enters the rinse (such as from the pitot tubes or condensed material from the outside of the nozzle).

8.3 Should it be necessary to clean the train in the field, use the following procedure:

8.3.1 Thoroughly rinse all sample exposed surfaces prior to the front filter support, with acetone. Remove any adhering particles with the aid of a rubber policeman. Place the rinsings in the probe rinse bottle. If the front filter is not used, all sample exposed surfaces prior to the first impinger should be included in this rinse.

8.3.2 Remove the front (if used) and rear filters, place in a petri dish and seal. Since a heavy loading of condensible material on the rear filter may leave a residue in the filter container which would necessitate removal with solvent, glass petri dishes are preferred.

8.3.3 Measure and record the volume (or weight) increase of the first three impingers to the nearest 1 ml (or 1 g) and transfer their contents to a labeled container. Rinse the impingers and interconnects with distilled water and add to the container.

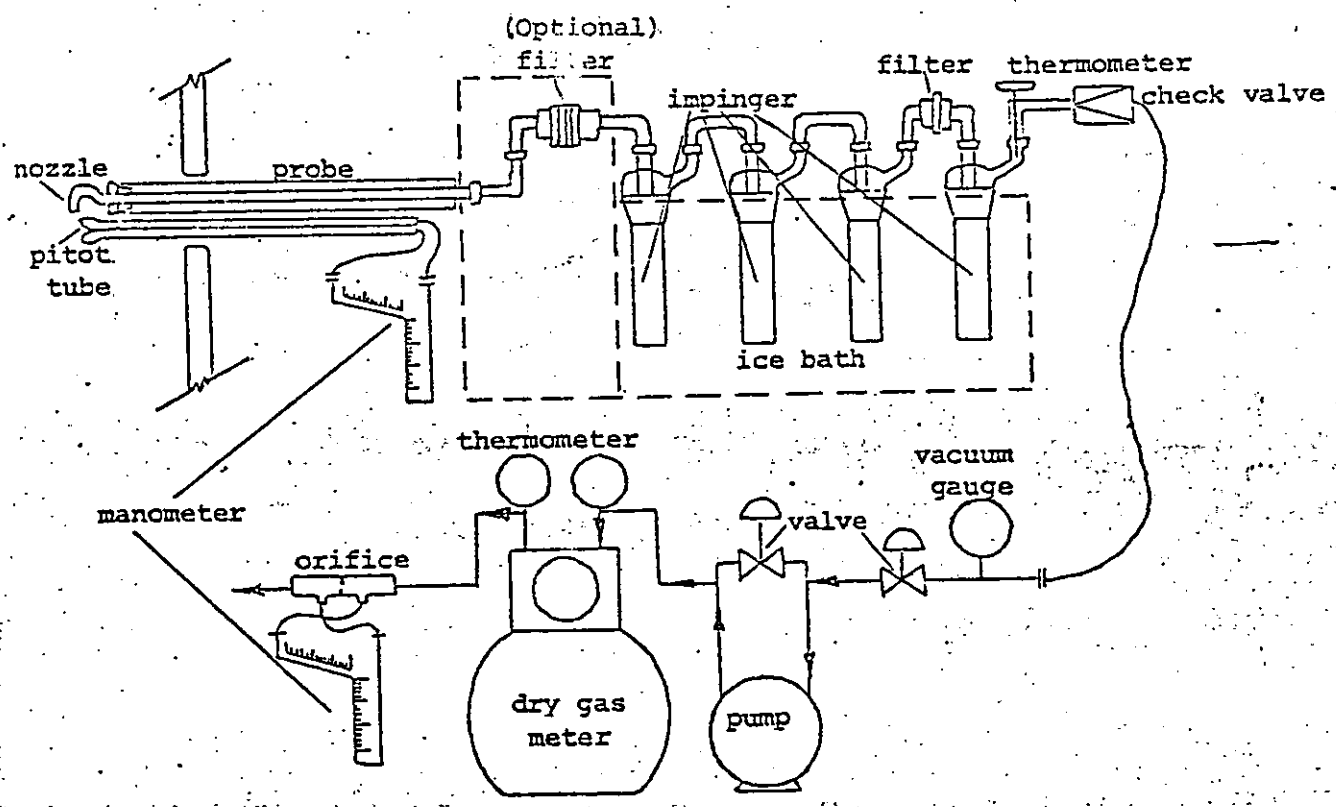
(Optional)
filter
filter
thermometer
check valve
impinger
nozzle
probe
pitot
tube
ice bath
thermometer
vacuum
gauge
manometer
valve
orifice
dry gas
meter
pump

Figure 7-1

9.5 Transfer the remaining water from the separatory funnel to a tared beaker or evaporating dish and evaporate at 105°C . Desiccate for 24 hours and weight.

9.6 Evaporate the combined impinger water extracts from Section 9.4 at 70°F or less and laboratory pressure, desiccate for 24 hours and weigh . See note in Section 9.1.

9.7 Evaporate portions of the solvents used in a manner similar to the sample evaporations to determine the solvent blanks.

9.8 Record all laboratory data in the Laboratory Data Reporting Sheet, Figure 5-9, Source Sampling Method 5.

10. Calculations

10.1 The calculations are the same as outlined in 14. Calculations of Source Sampling Method 5.

11. Minimum Acceptable Test Requirements

11.1 The minimum acceptable test requirements are the same as outlined in 15. Minimum Acceptable Test Requirements of Source Sampling Method 5.

12. Minimum Test Report Information

12.1 The test report should contain sufficient information about the source to accurately define its operation during the test. Also sufficient data and calculations shall be included to document the source test results.

APPENDIX E

ANALYSIS DATA

E.1 Phase I
E.2 Phase II

APPENDIX E.1

PHASE I

TRC — THE RESEARCH CORPORATION OF NEW ENGLAND

Report of Chemical Analysis

Client: Georgia Pacific - EPA

Contract No: 1760-6-80-30

Reviewed by: M. Fox

Report to: Skip Blackwell

Laboratory No: 012-81-1

Date Received: 1/16/81

Date Reported: 1/28/81

Source	Test No.	Sample No.	mg Total Particulate	g Moisture	mg Organic	Condensibles mg Inorganic	mg Particulate Acetone Wash		mg residue Acetone Soxhlet extraction	Others
Train	1-1	Filt 2000	0.61	42.1	20.8		27.3			
		10152	96.62					281.83		
		1-1-PW	102.3							
		Thimble 1	42.32						34.2 mg (12.13%)	78.74 %
	1-2	2002	2.66	23.6	12.4		28.7			
		10153	51.82					317.68		
		1-2-PW	46.9							
		Thimble 1	27.07						23.9 mg (7.52%)	88.19 %
	2-1	2001	3.95	30.5	22.7		29.6			
		10171	238.27					317.72		
		2-1-PW	172.2							
		Thimble 3	48.39						36.0 mg (7.10%)	74.4 %
	2-2	2004	6.97	26.9	16.8		29.0			
		10172	111.25							
		2-2-PW	269.2					169.52		
		Thimble 4	52.36						40.1 mg (8.5%)	76.73 %
27mm Filters		1	-1.84						7.3 mg not Blank Corrected	
		2	-0.42						18.9	
		3	-0.02						15.6	
		5	-0.11						13.2	
		6	-1.82						5.8	
		10	-0.16						14.7	
		Blk-11							12.1	

Notes:

Analyzed: Dave Hamme

TRC — THE RESEARCH CORPORATION OF NEW ENGLAND

Request for Analysis of Stack Samples (EPA Methods)

Client: Georgia Pacific

Contract No.: 1460-EBO-30

Sent by: Ed Antle

Report to: Skip Brackbill

Laboratory No.:

Date Received: 1/19/81

Date Completed:

Report Needed by: 1/24/81

Estimated Time for Analysis:

Source	Test No.	Filter	Probe Wash	Gun Patch	Condensibles: Silica Gel	Condensibles: Water Wash	Condensibles: Acetone Wash	NO_x Sample No.	SO_x: 3% H_2O_2	SO_x: 80% IPA	Others (Specify)
		1									
		2									
		3									
		5									
		6									
		10									

TRC — THE RESEARCH CORPORATION OF NEW ENGLAND

Request for Analysis of Stack Samples (EPA Methods)

Client: Georgia Pacific / EPA

Contract No.: 1460-EBO-30

Sent by: EDWARD D Astle

Report to: Skip Brackbill

Laboratory No.: 012-81 (1)

Date Received: 1/16/81

Date Completed:

Report Needed by: 1/23/81

Estimated Time for Analysis:

Source	Test No.	Filter	Probe Wash	Thimble Gun-Patch	Condensibles: Silica Gel	Condensibles: Water Wash	Condensibles: Acetone Wash	NO_x Sample No.	SO_x: 3% H_2O_2	SO_x: 80% IPA	Others (Specify)
STACK #2	1-1	2000 2½"	1-1-PW)	2							
		10158 2½"	two		1-1	2 bottles	1 bottle				
	1-2	2002 2½"	1-2-PW)	1	1-2	2 bottles	1 bottle				
		10153 2½"	two								
STACK #3	2-1	2001	2-1-PW)	3	2-1	3 bottles	1 bottle				
		10171	two								
	2-2	~~10171~~ 2004	2-2-PW)	4	2-2	3 bottles	1 bottle				
		10172	two								
*	Acetone Blank										
*	H_2O Blank										

TITLE Georgia Pacific / EPA

Project No. [illegible] 2

Book No.

From Page No.

1-19-81

Stack # 3

Test No. 2-1

Filter	2½"	2001	clear white, some particulate around ripped section (1
	4½"	10171	medium yellow; dark yellow small blotches throughou
Thimble	3		Some dark particulate on outside; brown areas near top; ri section included inside; some particulate inside.
Probe Wash	2-1		yellowish - transparent
Silica Gel	21		spent - mostly pink & white
Condensibles	2-1		cloudy white - translucent
Acetone Wash	2-1		clear - transparent

Test No. 2-2

Filter	2½"	2004	clear white, filter ripped
	4½"	10172	medium yellow, dark yellow small blotches thro
Thimble	4		Some dark particulate on outside; brown throughout; with dark spots near edge on top.
Probe Wash	2-2		yellowish - transparent
Silica Gel	22		spent - much pink
Condensibles	2-2		cloudy white - translucent
Acetone Wash	2-2		clear - transparent

Witnessed & Understood by me,

Date

Invented by

Date

Recorded by

TITLE Georgia Pacific / EPA

1-19-81

Probe Wash, Filter, Condensibles

Ke #2

Test No. 1-1 ~~Test No. 1-2~~

Filter	2½"	2000	clear white, filter ripped
	4½"	10152	light yellow
Thimble		2	yellow stains on outside; black particulate on outside; brown color on inside with black particulate.
Probe Wash		1-1	yellowish with particulate on bottom; transparent
Silica Gel		1-1	spent - mostly pink
Condensibles		1-1	slightly cloudy - still transparent. (white)
Acetone Wash		1-1	clear - transparent

Test No. 1-2

Filter	2½"	2002	clear white, filter intact
	4½"	10153	light-medium yellow with ~~tint~~ ~~tinting~~ blotches throughout.
Thimble		1	few yellow stains, one spot of particulate on outside. Tip ripped with contents inside; brown stains inside with some particulate
Probe Wash		1-2	yellow - transparent
Silica Gel		1-2	spent - much pink
Condensibles		1-2	impinger catch - translucent (white). Impinger Wash - cloudy white - opaque
Acetone Wash		1-2	clear transparent

To Page No.

METHOD 25 CALCULATIONS

RUN NO. 1-B

P_t =	256.5	P_f =	1079	$\bar{C}_{fm}$ =	2.7
T_t =	275	T_f =	297.5	$\bar{C}_{cm}$ =	1193
P_{ti} =	90.9	P_{tf} =	1079	V =	.00483
T_{ti} =	268	T_{tf} =	297.5	V_v =	.00483

1. Sample volume $V_s = 0.386\ v \left(\frac{P_t}{T_t} - \frac{P_{fi}}{T_{ti}} \right)$

V_s = .386 v (.59) = .0011

2. Noncondensible Organics $C_t = \left[\frac{P_{tf}}{T_{tf}} \Big/ \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right) \right] \left[\overline{C_{tm}} \right]$

C_t = 6.15 (2.7) = 17.8 ppm C_1

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\overline{C_{cm}} \right]$

15.9

C_c = 7334. ppm C_1

7317

C_c = 7351. ppm C_1 7317

METHOD 25 CALCULATIONS

RUN NO. 1

P_t = 210

T_t = 375

P_{ti} = 26

T_{ti} = 212

P_f = 1074

T_f = 292.5

P_{tf} = 105

T_{tf} = 292.5

$\bar{C}_{tm}$ = 9193 ppm C

$\bar{C}_{cm}$ = 1273 ppm C

V = .60485

V_v = .004855

1. Sample volume $V_s = 0.386\ v \left(\frac{P_t}{T_t} - \frac{P_{fi}}{T_{ti}} \right)$

V_s = .386 V ( ) = .001

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right] \left[\overline{C_{tm}} \right]$

C_t =

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\overline{C_{cm}} \right]$

C_c = .386 17.5)

$C_c + C_t$ = 9194 ppm C

METHOD 25 CALCULATIONS

RUN NO. 2-B

P_t = 185.7 P_f = 1102. $\bar{C}_{fm}$ = 88

T_t = 152 T_f = 247.5 $\bar{C}_{cm}$ = 468

P_{ti} = 1.47 P_{tf} = 101.6 V = .00755 .23

T_{ti} = 275 T_{tf} = 277.5 V_v = .00485 .11

1. Sample volume $V_s = 0.386\ v \left(\frac{P_t}{T_t} - \frac{P_{fi}}{T_{ti}} \right)$

V_s = .386 V (.02) = .0012 1.15 1.15

2. Noncondensible Organics $C_t = \left[\frac{P_{tf}}{T_{tf}} \right] \left[\frac{}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right] \left[\overline{C_{tm}} \right]$

C_t = 5.78 ($\bar{C}_m$) = 5409. ppm C. 5.12

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\overline{C_{cm}} \right]$

5.0

C_c = 2704. ppm C. 2.51

C_c = 3-2.14. ppm C

METHOD 25 CALCULATIONS RUN NO. _____

P_t = 141.7 P_f = 1056. $\bar{C}_{fm}$ = 71

T_t = 282 T_f = 297.5 $\bar{C}_{cm}$ = 569

P_{ti} = 9.62 P_{tf} = 1035. V = .00486 22

T_{ti} = 275 T_{tf} = 297.5 V_v = .004555 10

1. Sample volume $V_s = 0.386\ v \left(\frac{P_t}{T_t} - \frac{P_{fi}}{T_{ti}} \right)$

V_s = [illegible] .00455 8.75 0.38

2. Noncondensible Organics $C_t = \left[\frac{P_{tf}}{T_{tf}} \right] \left[\overline{C_{tm}} \right] \left[\overline{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right]$

C_t = 7.45 [illegible] 529. ppm C

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\overline{C_{cm}} \right]$

19.6

C_c = 4301. ppm C

$C_t + C_c$ = [illegible]

METHOD 25 CALCULATIONS RUN NO. 4

P_t =	147.6	P_f =	1216	$\bar{C}_{fm}$ =	[illegible]
T_t =	280	T_f =	292	$\bar{C}_{cm}$ =	16 C
P_{ti} =	24.13	P_{tf} =	1295	V =	.00486 16
T_{ti} =	274	T_{tf} =	297	V_v =	.004555 17

1. Sample volume $V_s = 0.386\ v\left(\frac{P_t}{T_t} - \frac{P_{fi}}{T_{ti}}\right)$

$V_s = .386\ V(.44) = .00082$

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} \quad \frac{P_{ti}}{T_{ti}}\right)}\right] \left[\overline{C_{tm}}\right]$

$C_t = 9.91.(\bar{C}_m) = 1050.$ ppm C, 16.3

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f}\right] \left[\overline{C_{cm}}\right]$

24.2

$C_c =$ 1497. ppm C, 14.7

$C_c = C - C_t = 2547$ ppm C, 25.4

METHOD 25 CALCULATIONS

RUN NO. 3

P_t =	346.2	P_f =	1232.	$\bar{C}_{fm}$ =	6.9
T_t =	290	T_f =	297	$\bar{C}_{cm}$ =	555
P_{ti} =	1.8	P_{tf} =	1282.	V =	.004865 13
T_{ti} =	290	T_{tf} =	297	V_v =	.00455 6

1. Sample volume $V_s = 0.386\ v\left(\frac{P_t}{T_t} - \frac{P_{fi}}{T_{ti}}\right)$

V_s = .386 V (1.10) = .0022

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} \quad \frac{P_{ti}}{T_{ti}}\right)}\right] \left[\overline{C_{tm}}\right]$

C_t = 3.73 [illegible] = 657. ppm C

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f}\right] \left[\overline{C_{cm}}\right]$

9.14

C_c = 1959. ppm C

$C_c + C_t$ = 2216. ppm C

METHOD 25 CALCULATIONS

RUN NO. 6A

P_t = 403.4
T_t = 287

P_{ti} = 20.4
T_{ti} = 256

$P_{f_{fm}}$ = 1201 · P_{f_m} 1237
T_f = 297

P_{tf} = 1039.
T_{tf} = 297

$\bar{C}_{fm}$ = 931
(1 Hr o Tcd) $\bar{C}_{cm}$ = 105 19
$\bar{C}_{cm}$ = 9

V = .014855 4
V_w = .00486 10
V_{w_2} = .00455 7

1. Sample volume $V_s = 0.386\ v\left(\frac{P_t}{T_t} - \frac{P_{fi}}{T_{ti}}\right)$

V_s = .386 V(1.3 = .0024

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)}\right]\left[\overline{C_{tm}}\right]$

C_t = 2.69 (C-) 2504. ppm C

3. Condensible Organics $C_c = 0.386\left[\frac{V_v\ P_f}{V_s\ T_f}\right]\left[\overline{C_{cm}}\right]$

C_c = 524. ppm

C_{c_2} = 1068. ppm

$C = C_t + C_c$ = 3197. ppm C

METHOD 25 CALCULATIONS RUN NO. 5

P_t = [illegible]
T_t = 283

$P_{f,i}$ = 1260 ; P_{f_2} = 1153
T_f = 277

$\bar{C}_{tm}$ = 1513
$\bar{C}_{cm_1}$ = 355
$\bar{C}_{cm_2}$ = 76

P_{ti} = 33.02
T_{ti} = [illegible]

P_{tf} = 1262
T_{tf} = [illegible]

V = .00483 5
V_{v_1} = .004855 18
V_{v_2} = .00485 8

1. Sample volume $V_s = 0.386\ v\left(\frac{P_t}{T_t} - \frac{P_{fi}}{T_{ti}}\right)$

V_s = .386 V(.9-) = .0018 1.74 1.74

2. Noncondensible Organics $C_t = \left[\frac{P_{tf}}{T_{tf}}\right] \left[\frac{}{\left(\frac{P_t}{T_t} \quad \frac{P_{ti}}{T_{ti}}\right)}\right] \left[\overline{C_{tm}}\right]$

C_t = 4.52 [illegible] = 2274. ppm C, [illegible]

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f}\right] \left[\overline{C_{cm}}\right]$

C_{c_1} = 1573. ppm
C_{c_2} = 307. ppm

$C_t + C_{c_1} + C_{c_2}$ = 4154. ppm C, Ans

APPENDIX E.2

PHASE II

METHOD 25 CALCULATIONS

RUN NO. 6B

P_t = 415.8
T_t = 287

P_f = 1288
T_f = 292

$\bar{C}_{fm}$ = 712
$\bar{C}_{cm}$ = .542

P_{ti} = 19.6
T_{ti} = 286

P_{tf} = 1308
T_{tf} = 297

V = .00483 20
V_v = .10486 .5

1. Sample volume $V_s = 0.386\ v\left(\frac{P_t}{T_t} - \frac{P_{fi}}{T_{ti}}\right)$

V_s = .386 V (1.[illegible]) = .0026

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} \quad \frac{P_{ti}}{T_{ti}}\right)}\right] \left[\overline{C_{tm}}\right]$

C_t = 3.19 (E-m)

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f}\right] \left[\overline{C_{cm}}\right]$

C_c = .0946

4621

TRC — THE RESEARCH CORPORATION OF NEW ENGLAND

Report of Chemical Analysis

Client: EPA

Contract No: 1460-E80-30

Reviewed by: M. Fox

Report to: S. Brackbill

Laboratory No: 045-81(3)

Date Received: 3-9-81

Date Reported: 3-23-81

Source	Test No.	Sample No.	mg Total Particulate	g Moisture	Condensibles mg Organic	Condensibles mg Inorganic	mg Particulate Acetone Wash	Total ug NO_x as NO_2	SO_2 $(V_t-V_{tb})(N)(V_{soln}/V_a)$	Others
Scrubber	S07-1	10213 (4")	0.38	6.3	7.73	2.46	13.89			
Probe		2114 (2½")	1.10							
		29 (Thimble)	77.42							
		S07-1-PW	14.37							
		S07-1-N	10.61							
		Total	103.88							
	S07-2	111 (4")	6.37	8.7	7.59	2.85	33.34			
		2111 (2½")	5.12							
		32 (Thimble)	107.33							
		S07-2-PW	6.61							
		S07-2-N	44.43							
		Total	169.86							
	S07-3	110 (4")	n.d.	13.9	8.35	6.09	30.85			
		2113 (2½")	0.4							
		30 Thimble	125.79							
		S07-3-PW	7.93							
		S07-3-N	0.36							
		Total	134.48							

Notes:

Analyzed: M E Sanders

Form CL-002

METHOD 25 CALCULATIONS

RUN NO. 1-1-A

P_t = 695
T_t = 286

P_{ti} = 35.8
T_{ti} = 256

P_f = 1232. P_{f_2} = 1023
T_f = 300

P_{tf} = 1191
T_{tf} = 300

$\bar{C}_{tm}$ = 427
$\bar{C}_{cm_1}$ = 587
$C_{c_{m_2}}$ = 397
V = .00483
V_{v_1} = .00485
V_{v_2} = .004855

Tank No.
1
7
18

Trap No. 29 11, 0
100 CC_2

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$

V_s = .00364

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right] \left[\bar{C}_{tm} \right]$

C_t = 847

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\bar{C}_{cm} \right]$

CO_2 C_{c_1} = 1240.

H_2O C_{c_2} = 697.

4. Total Organics $C_t + C_c$ = 2804.

TRC — THE RESEARCH CORPORATION OF NEW ENGLAND

Request for Analysis of 5 Samples (EPA Methods)

Client: EPA / Georgia Pacific

Contract No.: 1460-E88

Sent by: J. Powell

Report to:

Laboratory No.: 045-81(3)

Date Received: 3/9/81

Date Completed:

Report Needed by: 30 March

Estimated Time for Analysis:

Source	Test No.	Filter	Probe Wash	Nozzle Rinse ~~Gun Patch~~	Silica Gel	Condensibles: Water Wash	Condensibles: Acetone Wash	NO_x Sample No.	SO_x: 3% H_2O_2	SO_x: 80% IPA	Others (Specify)
Scrubber Outlet	S07-1	10213 (4")	S07-1-PW	S07-1-N	S07-1-SG	S07-1-IW	S07-1-IA	combine volume			
		2114 (2½")				S07-1-SLW	S07-1-SLA	in beaker			
		29 (Thimble)									
	S07-2	111 (4")	S07-2-PW	S07-2-N	S07-2-SG	S07-2-IW	S07-2-IA	1 beaker			
		2111 (2½")				S07-2-SLW	S07-2-SLA	1 volume			
		32 (Thimble)									
	S07-3	110 (4")	S07-3-PW	S07-3-N	S07-3-SG	S07-3-IW	S07-3-IA	1 beaker			
		2113 (2½")				S07-3-SLW	S07-3-SLA	1 volume			
		30 (Thimble)									
						Blank-W	Blank-A				

Notes: Split Sample Yes No

METHOD 25 CALCULATIONS

RUN NO. 2-1-A

P_t = 525.8
T_t = 286

P_{f_a} = 1194 P_{f_b} = 1219
T_f = 300

P_{ti} = 35.8
T_{ti} = 286

P_{tf} = 1194
T_{tf} = 300

$\bar{C}_{tm}$ = 2470
$\bar{C}_{cm_a}$ = 214
$\bar{C}_{cm_b}$ = 1322
V = .004855
V_{v_a} = .004855
V_{v_b} = .004855

Tank No.
11
4
18

Trap No. 31 11.9 a
235 11.0 b

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$

V_s = .00347

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right] \left[\bar{C}_{tm} \right]$

C_t = 5305.

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\bar{C}_{cm} \right]$

C_c = 4600.

C_{c_b} = 2901

4. Total Organics $C_t + C_c$ = 12806 $C_{t_b} + C_{c_b}$

METHOD 25 CALCULATIONS

RUN NO. 1-1-B

P_t = 572
T_t = 586

P_{f_1} = 1167.15 = 1267
T_f = 300

$\bar{C}_{tm}$ = 4.59
$\bar{C}_{cm_1}$ = .793
C_{cm_2} = .374

Tank No.

P_{ti} = 28
T_{ti} = 286

P_{tf} = 1325
T_{tf} = 300

V = .00456 — 16
V_{v_1} = .00456 — 53
V_{v_2} = .00456 — 6

Trap No. .112 CO_2
10 H_2O

1. Sample volume $V_s = 0.386\ V\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)$

V_s = .00357

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)}\right]\left[\bar{C}_{tm}\right]$

C_t = 5536

3. Condensible Organics $C_c = 0.386\left[\frac{V_v\ P_f}{V_s\ T_f}\right]\left[\bar{C}_{cm}\right]$

C_{c_1} = 1621

C_{c_2} = 828

4. Total Organics $C_t + C_c$ = 7985 ppm

METHOD 25 CALCULATIONS

RUN NO. 3-1-A

P_t = 579
T_t = 286

P_{f_1} = 975 [illegible]
T_f = 300°K

$\bar{C}_{tm}$ = 820
$\bar{C}_{cm_1}$ = 1287.
C_{cm_2} = [illegible]

P_{ti} = .63
T_{ti} = 286

P_{tf} = 993
T_{tf} = 300°K

V = .004865 — Tank No. 13
V_{v_1} = .00486 — 19 cu
V_{v_2} = .004855 — 18 "

Trap No. #2 - H_2O
#1 - CO_2

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$

V_s = .00539

2. Noncondensible Organics $C_t = \left[\frac{P_{tf}}{T_{tf}} \right] \left[\frac{\bar{C}_{tm}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right]$

C_t = 1504.

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\bar{C}_{cm} \right]$

C_{c_1} = 1239.
C_{c_2} = [illegible]

4. Total Organics $C_t + C_c$ = 2743. ppm

METHOD 25 CALCULATIONS RUN NO. 2-1-B

P_t = 567 P_f = 1031 P_{f_2} = 1059 $\bar{C}_{tm}$ = 167

T_t = 286 T_f = 300 $\bar{C}_{cm}$ = 2459

C_{cm_2} = 1466

P_{ti} = 51 P_{tf} = 1411 V = .00485 Tank No. 22

T_{ti} = 286 T_{tf} = 300 V_{v_1} = .00453 20

V_{v_2} = .00456 19

Trap No. 115 CO_2

24 H_2O

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$

V_s = .0034

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right] \left[\bar{C}_{tm} \right]$

C_t = 435 ppm as C_1

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\bar{C}_{cm} \right]$

C_{c_1} = 4634. ppm

C_{c_2} = 2855 ppm

4. Total Organics $C_t + C_c$ = 7924. ppm

METHOD 25 CALCULATIONS

RUN NO. Dry Cal. = 1
1-2 PM

P_t = 528.
T_t = 283

P_{ti} = 51.8
T_{ti} = 756

P_{f_i} = 1372 P_f = 1395
T_f = 300

P_{tf} = 1372 Bi=760
T_{tf} = 300

$\bar{C}_{tm}$ = 1192
$\bar{C}_{cm}$ = 588
C_{cm} = 2.83
V = .00485
V_{v_1} = .004825
V_{v_2} = .004855

Tank No.
57
13
18

Trap No. 23 Blue
211 Gray 6

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$

V_s = .00315

2. Noncondensible Organics $C_t = \left[\frac{P_{tf}}{T_{tf}} \right] \left[\frac{\bar{C}_{tm}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right]$

C_t = 3236.

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\bar{C}_{cm} \right]$

C_{c_a} = 1603.
C_{c_b} = 783.

4. Total Organics $C_t + C_c$ = 5622.3 ppm $C_{1\ mean}$

METHOD 25 CALCULATIONS

RUN NO. 3-1-B

P_t = 599.	P_{f_1} = 1143	$\bar{C}_{tm}$ = 12428		
T_t = 256.	T_f = 300	$\bar{C}_{cm_1}$ = 1142.		
		C_{cm_2} = Lost	Tank No.	
P_{ti} = 58	P_{tf} = 11049	V = .9045 cf	58	
T_{ti} = 256	T_{tf} = 300	V_v = .2483	20	
		V_{v_2} = Lost	7	

Trap No. 210 502
15 ml H2O

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$

V_s = .00354

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right] \left[\bar{C}_{tm} \right]$

C_t = 4458.

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\bar{C}_{cm} \right]$

C_c = 2292.

4. Total Organics $C_t + C_c$ = 6750. ppm

METHOD 25 CALCULATIONS

RUN NO. 5I-25-1A

P_t = 531.8
T_t = 296

P_{f_a} = 1185 P_{f_b} = 1185
T_f = 300

$\bar{C}_{tm}$ = 40.2
$\bar{C}_{cm_a}$ = ~~165~~ 198
C_{cm_b} = 579

Tank No.
V = .00485 — 23
V_{v_a} = .004855 — 4
V_{v_b} = .004855 — 21

P_{ti} = 19.8
T_{ti} = 289

P_{tf} = 1185
T_{tf} = 300

Trap No. 27 — 11.9 g
220 — 1070 g

β_p = 753 mm Hg

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$

V_s = .0032f

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right] \left[\bar{C}_{tm} \right]$

C_t = 91.9

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\bar{C}_{cm} \right]$

C_{c_a} = ~~327~~ 452.

C_{c_b} = 1323.

4. Total Organics $C_t + C_c$ = ~~1787~~ 1867 ppmv C

METHOD 25 CALCULATIONS

RUN NO. 2-2-B

P_t = .70
T_t = 286

P_{ti} = 1.2
T_{ti} = 286

P_f = 1.37 P_{f_2} = 1.308
T_f = 300

P_{tf} = 1231
T_{tf} = 300

$\bar{C}_{tm}$ = 1788.
$\bar{C}_{cm}$ = 431.
C_{cm_2} = 481.

		Tank No.
V =	.004855	61
V_v =	.00485	7
V_{v_2} =	.00486	53

Trap No. 205 CO_2
8 H_2O

1. Sample volume $V_s = 0.386\ V\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)$

V_s = .00352

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)}\right]\left[\bar{C}_{tm}\right]$

C_t = 1821

3. Condensible Organics $C_c = 0.386\left[\frac{V_v\ P_f}{V_s\ T_f}\right]\left[\bar{C}_{cm}\right]$

C_c = 921.
C_{c_2} = 1155

4. Total Organics $C_t + C_c$ = 3927. ppm

METHOD 25 CALCULATIONS

RUN NO. 50-25-1A

P_t = 31.54 in Hg
T_t = 296 °R

P_{f_1} = 1189 P_{f_2} = 1185
T_f = 300 °R

$\bar{C}_{tm}$ = 38.
$\bar{C}_{cm_1}$ = 248.
$\bar{C}_{cm_2}$ = ~~539~~ 552

		Tank No.
V =	.00455	17
V_{v_1} =	.00455	14
V_{v_2} =	.00486	15

P_{ti} = 23.84 in Hg
T_{ti} = 291 °R

P_{tf} = 1189
T_{tf} = 300 °R

Trap No. 26 [illegible]
201 [illegible]

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)$

V_s = .00321

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)}\right] \left[\bar{C}_{tm}\right]$

C_t = 87.8

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f}\right] \left[\bar{C}_{cm}\right]$

C_{c_1} = 573.

C_{c_2} = ~~1215~~ 1278.

4. Total Organics $C_t + C_c$ = ~~1409~~ 1939 ppm C_1

METHOD 25 CALCULATIONS

RUN NO. 5I-25-1B

P_t = 550.
T_t = 296

P_{f_c} = 1185 P_{f_v} = 1185
T_f = 300

$\bar{C}_{tm}$ = 41.6
$\bar{C}_{cm_a}$ = 436.
C_{cm_t} = 534.

		Tank No.
P_{ti} =	29,84	
T_{ti} =	289	
V =	.004845	12
V_{v_c} =	.004855	9
V_{v_s} =	.00487	60

P_{tf} =	1185	
T_{tf} =	300	

Trap No. 3 (1.0)
228 (1.7)

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$

V_s = .00328

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right] \left[\bar{C}_{tm} \right]$

C_t = 93.6

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\bar{C}_{cm} \right]$

C_{c_c} = 184.

C_{c_s} = 120.

4. Total Organics $C_t + C_c$ = 228 ppm C.

METHOD 25 CALCULATIONS

RUN NO. 5I-25-2A

P_t = 493.51 in Hg
T_t = 295 °K

P_{f_a} = 1199.5 P_{f_b} = 1199.5 in Hg
T_f = 300 °K

$\bar{C}_{tm}$ = 62.2
$\bar{C}_{cm}$ = 401.3
C_{cm} = 364.

	Tank No.
V = .004555	4
V_{V_a} = .004555	9
V_{V_b} = .00486	15

P_{ti} = 34.54 in Hg
T_{ti} = 295 °K

P_{tf} = 1199.5 in Hg
T_{tf} = 300 °K

Trap No. 214 12.0 a
111 12.0 b

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$

V_s = .00292

2. Noncondensible Organics $C_t = \left[\frac{P_{tf}}{T_{tf}} \right] \left[\overline{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right] \left[\bar{C}_{tm} \right]$

C_t = 160.

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\bar{C}_{cm} \right]$

C_{c_a} = 1037.

C_{c_b} = 935.

4. Total Organics $C_t + C_c$ = 11470. ppm = C_{tc}

METHOD 25 CALCULATIONS

RUN NO. 50-25-13

P_t = 644

T_t = 296

P_{ti} = 27.8

T_{ti} = 291

P_f = 1191 [illegible]

T_f = 300

P_{tf} = 104

T_{tf} = 300

$\bar{C}_{tm}$ = 14.5

$\bar{C}_{cm}$ = 32.3

$\bar{C}$ = [illegible]

V = .03183

V_v = .00485

[illegible] = .00486

Tank No. 24, 14, 15

Trap No. 6 H_2O

[illegible]

1. Sample volume $V_s = 0.386\,V\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)$

V_s = .02369

2. Noncondensible Organics $C_t = \left[\dfrac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)}\right]\left[\bar{C}_{tm}\right]$

C_t = 117

3. Condensible Organics $C_c = 0.386\left[\frac{V_v\,P_f}{V_s\,T_f}\right]\left[\bar{C}_{cm}\right]$

C_{c_a} = 751

C_{c_b} = 4517

4. Total Organics $C_t + C_c$ = [illegible]

METHOD 25 CALCULATIONS

RUN NO. 50-25-2A

P_t = 426.3
T_t = 295

P_{f_a} = 1198 P_{f_b} = 1234.
T_f = 310

$\bar{C}_{tm}$ = 182.
$\bar{C}_{cm_a}$ = 794
$\bar{C}_{cm_b}$ = 794

	Tank No.
V = .004855	9
V_{Va} = .004855	21
V_{Vb} = .00487	60

P_{ti} = -45.7
T_{ti} = 295

P_{tf} = 1198.
T_{tf} = 300

Trap No. 226 H_2O a
110 NMO b

1. Sample volume $V_s = 0.386\ V\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)$

V_s = .002998

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)}\right] \left[\bar{C}_{tm}\right]$

C_t = 454.

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f}\right] \left[\bar{C}_{cm}\right]$

C_{c_a} = 1857

C_{c_b} = 2048

4. Total Organics $C_t + C_c$ = 4359. 4410. ppm @ C_1

METHOD 25 CALCULATIONS

RUN NO. 5I-25-2B

P_t = 574.8
T_t = 295

P_{f_a} = 1199.5 P_{f_b} = 1199.5
T_f = 300

$\bar{C}_{tm}$ =
$\bar{C}_{cm_a}$ = 720
$\bar{C}_{cm_b}$ = 11.25

P_{ti} = 28.84
T_{ti} = 295

P_{tf} = 1199.5
T_{tf} = 300

V_{m_a} = .00485 Tank No. 14
V_{v_a} = .00487 60
V_{v_b} = .004855 31

Trap No. 219 a
202 b

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$

V_s = .00546

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right] \left[\bar{C}_{tm} \right]$

C_t = 106.5

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\bar{C}_{cm} \right]$

C_{c_a} = 1504.

C_{c_b} = 3517.

4. Total Organics $C_t + C_c$ = 5187.

METHOD 25 CALCULATIONS

RUN NO. 5T-25-3A

P_t = 511
T_t = 285

P_{ti} = .11
T_{ti} = 283

P_f = 1346 1191
T_f = 300

P_{tf} = 1191
T_{tf} = 300

$\bar{C}_{tm}$ = 35.3
$\bar{C}_{cm_3}$ = 957
$\bar{C}_{cm_4}$ = 1477

		Tank No.
V =	.00484	51
V_{v_3} =	.004855	4
V_{v_4} =	.004855	9

Trap No. 222 H_2O a
215 H_2O b

1. Sample volume $V_s = 0.386\ V\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)$

V_s = .00328

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)}\right] \left[\bar{C}_{tm}\right]$

C_t = 79.9

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f}\right] \left[\bar{C}_{cm}\right]$

C_{c_3} = ~~2375~~ 2453.

C_{c_4} = 3352

4. Total Organics $C_t + C_c$ = 5885 ppm C_1

METHOD 25 CALCULATIONS

RUN NO 50-25-2B

P_t = 514.84 in Hg

T_t = 295 °K

P_{f_a} = 1189 P_{f_b} = 1196 in Hg

T_f = 300 °K

$\bar{C}_{tm}$ = 276

$\bar{C}_{cm}$ = 472

$\bar{C}_{cm_b}$ = 176

		Tank No.
P_{ti} =	28.84 in Hg	
T_{ti} =	295 °K	
P_{tf} =	1198 in Hg	
T_{tf} =	300 °K	
V =	.00456	15
V_{V_a} =	.00487	60
V_{V_b} =	.004855	21

Trap No. 204 H_2O a

212 NMO b

1. Sample volume $V_s = 0.386\ V\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)$

V_s = .00309

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)}\right]\left[\bar{C}_{tm}\right]$

C_t = 669

3. Condensible Organics $C_c = 0.386\left[\frac{V_v\ P_f}{V_s\ T_f}\right]\left[\bar{C}_{cm}\right]$

C_{c_a} = 1138.

C_{c_b} = 426

4. Total Organics $C_t + C_c$ = 2233 ppm = C

METHOD 25 CALCULATIONS

RUN NO. [illegible] 3/L

P_t = 555
T_t = [illegible]

P_{f_1} = 1191 P_{f_2} = 1191
T_f = [illegible]

$\bar{C}_{tm}$ = 654.
$\bar{C}_{cm_a}$ = 551
$\bar{C}_{cm_b}$ = 373

P_{ti} = .13
T_{ti} = [illegible]

P_{tf} = 1901
T_{tf} = 300

Tank No.

V = [illegible] — 3 VOC
V_{v_a} = .00443 — 24
V_{v_b} = .00455 — 14

Trap No. 206 [illegible]
113 [illegible]

1. Sample volume $V_s = 0.386\ V\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)$

V_s = .00354

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)}\right] \left[\bar{C}_{tm}\right]$

C_t = 1377.

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f}\right] \left[\bar{C}_{cm}\right]$

C_{c_a} = 1152.

C_{c_b} = 783

4. Total Organics $C_t + C_c$ = 3312 [illegible]

METHOD 25 CALCULATIONS

RUN NO. ST-25-3B3

P_t = 607
T_t = 285

P_{ti} = 11
T_{ti} = 283

P_{f_a} = 1191 Pb = 1191
T_f = 300

P_{tf} = 1191
T_{tf} = 300

$\bar{C}_{tm}$ = 133
$\bar{C}_{cm_a}$ = 353
$\bar{C}_{cm_b}$ = 908

Tank No. 63
V = [illegible]
V_{v_a} = [illegible]
V_{v_b} = [illegible] 12

Trap No. [illegible] 1.0
[illegible] 1191

1. Sample volume $V_s = 0.386\ V \left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)$

V_s = .02393

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right)} \right] \left[\bar{C}_{tm} \right]$

C_t = 62.6

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f} \right] \left[\bar{C}_{cm} \right]$

C_{c_a} = 670.

C_{c_b} = 1715.

4. Total Organics $C_t + C_c$ = 2448. ppm C,

APPENDIX F

SCOPE OF WORK

METHOD 25 CALCULATIONS RUN NO. 50-25-3B

P_t = 545
T_t = 285
P_{ti} = 115
T_{ti} = 283

P_{f_c} = 1191 1190 1191
T_f = 300

P_{tf} = 1272.
T_{tf} = 300

$\bar{C}_{tm}$ = 11098.
$\bar{C}_{cm}$ = 7033
C_{cm_i} = 377
V = .004585
V_{v_c} = .004585
V_{v_i} = .004585

Tank No. 10, 23, 21

Trap No. 217
20

1. Sample volume $V_s = 0.386\ V\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)$

V_s = .00341

2. Noncondensible Organics $C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left(\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}}\right)}\right] \left[\bar{C}_{tm}\right]$

C_t = 2405.

3. Condensible Organics $C_c = 0.386 \left[\frac{V_v\ P_f}{V_s\ T_f}\right] \left[\bar{C}_{cm}\right]$

C_{c_b} = 200.
C_{c_a} = 10073

4. Total Organics $C_t + C_c$ = 12748. ppm C,

WORK ASSIGNMENT

ENVIRONMENTAL PROTECTION AGENCY

Research Triangle Park, N.C. 27711

EPA CONTRACT NO. 68-02-3543 (1400 - C30)

CONTRACTOR: TRC Environmental Consultan

ASSIGNMENT NO. 1

ASSIGNMENT CHANGE NO.

TITLE: Method Development and Testing for Plywood/Veneer Industry

DATE: 14 AUG 1980

DESCRIPTION

The Contractor shall perform the following work areas for the plywood/veneer industry in accordance with the basic contract scope of work.

- Method Field Evaluation
- Standard Development Field Tests Non-Reference Methods
- Testing Documentation

The Task Manager is Gary McAlister, Mail Drop 13, EMB, ESED, OAQPS, Research Triangle Park, North Carolina 27711.

All reports shall be submitted directly to the Task Manager.

ESTIMATE OF	GOVERNMENT ESTIMATE	CONTRACTOR ESTIMATE
LABOR HOURS	2000 hours	
DURATION OF WORK	6 months	
COMPLETION DATE	February 11, 1981	

REQUESTER'S SIGNATURE	ORG CODE	TELEPHONE	DATE
Gary McAlister	ESED/EMB	(919) 541-5243	8/6/80

APPROVALS (as applicable)	SIGNATURE	DATE
BRANCH CHIEF	for G. Walsh	8/6/80
DIVISION CHIEF		8/6/80
PROJECT MANAGER		8/6
CONTRACTING OFFICER		8/14/80

CONTRACTOR'S REPRESENTATIVE ACKNOWLEDGMENT

SIGNATURE	TITLE	DATE

EPA FORM 1900-8 (REV. 12-70)

RECEIVED
MAR 2- 1981
TRC-THE RESEARCH CORP. OF NEW ENGLAND

WORK ASSIGNMENT

ENVIRONMENTAL PROTECTION AGENCY

Research Triangle Park, N.C. 27711

EPA CONTRACT NO: 68-02-3543

CONTRACTOR: TRC Env. Consultants

ASSIGNMENT NO: 1

ASSIGNMENT CHANGE NO: 2

TITLE: Method Development and Testing for Plywood/Veneer Industry (80/2)

DATE: FEB 25 1981

DESCRIPTION

Increase level-of-effort by 2000 hours (total of 4000). This increase is required for a second method field evaluation test and initial testing for standard development.

ESTIMATE OF	GOVERNMENT ESTIMATE	CONTRACTOR ESTIMATE
LABOR HOURS	Increase 2000 (total 4000)	
DURATION OF WORK	No change	
COMPLETION DATE	No change	

REQUESTER'S SIGNATURE	ORG CODE	TELEPHONE	DATE
for Gary McAlister	ESED/EMB	541-2237	2/17/81

APPROVALS (as applicable)	SIGNATURE	DATE
BRANCH CHIEF		2/19/81
DIVISION CHIEF	Robert T. Walsh	2-19-81
PROJECT MANAGER	Robert T. Walsh	2-19-81
CONTRACTING OFFICER		2/25/81

CONTRACTOR'S REPRESENTATIVE ACKNOWLEDGMENT

SIGNATURE	TITLE	DATE

EPA ATP 1299

WORK ASSIGNMENT

ENVIRONMENTAL PROTECTION AGENCY

Research Triangle Park, N.C. 27711

68-02-3043

CONTRACTOR: TRC Env. Consultants

ASSIGNMENT NO: 1

ASSIGNMENT CHANGE NO: 1

DATE: 6 FEB 1981

- Method Development and Testing for Plywood/Veneer Industry (80/2)

DESCRIPTION

Extend period of performance by 6 months.

ESTIMATE OF	GOVERNMENT ESTIMATE	CONTRACTOR ESTIMATE
LABOR HOURS	No Change	
DURATION OF WORK	12 months	
COMPLETION DATE	August 14, 1981	

REQUESTER'S SIGNATURE	ORG CODE	TELEPHONE	DATE
for /s/ Gary McAlister	ESED/EMB	541-2237	1/29/81

APPROVALS (as applicable)	SIGNATURE	DATE
BRANCH CHIEF	[signature]	2/2/81
DIVISION CHIEF	[signature]	2-3-81
PROJECT MANAGER	[signature] for T. Tibbs	2/2/81
CONTRACTING OFFICER	[signature]	2-6-81

CONTRACTOR'S REPRESENTATIVE ACKNOWLEDGMENT

SIGNATURE	TITLE	DATE

EPA (REV. 12-80)

REC'D
11/3/80

EMISSION MEASUREMENT BRANCH

TECHNICAL DIRECTIVE NO. 2

Task Title METHOD DEVELOPMENT AND TESTING FOR PLYWOOD/VENEER INDUSTRY Date OCTOBER 27, 1980

Contractor TRC ENVIRONMENTAL CONSULTANTS

Contract Number 68-02-2820 Work Assignment Number 1

Task Manager GARY McALISTER

Verbal Directions Given to SKIP BRACKBILL

Directive:

1. AMEND the work plan to conform with the change in the purpose of emissions testing outlined in the memo from Mike McCarthy to Ed. Vincent, October 17, 1980. The method development plan now has two goals:
   a. Comparison of test results from simultaneous tests using EPA Method-25 and Oregon DEQ Method 7 (instack filter before the impingers) followed by EPA METHOD 25.
   b. Estimation of the precision of Method 25 from paired train tests of veneer dryers.

   The revised work plan should outline in detail the test program to accomplish these goals.

2. The letter from Mike McCarthy to Ed Vincent (September 30, 198) describing the recommended test sites is for your information in planning the testing program. Detailed test requests will be forwarded to you as soon as they are received.

cc: Contractor Project Manager
PETER KALIKA

Contractor Task Leader
EUGENE BRACKBILL

Gary McAlister
Task Manager, EMB

Roger Shigehara
Section Chief, EMB

EMISSION MEASUREMENT BRANCH

TECHNICAL DIRECTIVE NO. 1

Task Title METHOD DEVELOPMENT AND TESTING FOR PLYWOOD/VENEER INDUSTRY Date 10/16/80

Contractor TRC ENVIRONMENTAL CONSULTANTS

Contract Number 68-02-2820 Work Assignment Number 1

Task Manager GARY McALISTER

Verbal Directions Given to SKIP BRACKBILL

Directive:

ANALYZE 6 METHOD 25 AUDIT SAMPLES (TANKS and TRAPS Prepared by Midwest Research Institute, AS well as 3 Audit Cylinder Gases. This is in preparation for a Method 25 Field test.

cc: Contractor Project Manager
Peter W. Kalika

Contractor Task Leader
Eugene A. BrackBill

Gary McAlister
Task Manager, EMB

Roger Shigehara
Section Chief, EMB

Source Test Requests Directions

The four individual requests shall present detailed information for each emission or process stream proposed for sampling. Measurement parameters shall include all data or variables judged vital for interpretation of the collected data (see attached examples).

Please submit five copies of the proposed Source Test Requests for review by February 6, 1981.

EMISSION MEASUREMENT BRANCH

TECHNICAL DIRECTIVE NO. 3

Task Title METHOD DEVELOPMENT AND TESTING FOR THE PLYWOOD/VENEER INDUSTRY Date 12/2/80

Project Number 80/02

Contractor TRC ENVIRONMENTAL CONSULTANTS INC.

Contract Number 68-02-3543 Work Assignment Number 1

Task Manager GARY MCALISTER

Verbal Directions Given to PETER KALIKA

Directive:

--- GEORGIA PACIFIC has requested that we delay our Method development test scheduled for December 15-19 until January. We have agreed to their request. You should reskhedule the method development test for the month of January.

cc: Contractor Project Manager
PETER KALIKA

Contractor Task Leader
EUGENE BRACKBILL

Gary McAlister
Task Manager, EMB

Section Chief, EMB

EMISSION MEASUREMENT BRANCH

TECHNICAL DIRECTIVE NO. 5

Date 1-13-81

Task Title Method Development and Testing For Plywood Veneer Industry ESED Project No. 80102

Contractor IRC Environmental Consult.

Contract Number 68-02-3543 Work Assignment No. 1

Task Manager Gary McAlister

Verbal Directions Given to M. Skip Brackbill

Directive: A review of your Project Work Plan entitled "Evaluation of Test Methods for the Plywood Industry ~~Dated~~ Revision A: Dated October 29, 1980 has been completed. The Project Work Plan is approved as submitted.

The attached comments are presented for your information and guidance.

cc: Peter Kelsko
Contractor Project Manager

C.E. Riley for Gary McAlister
Task Manager, EMB

Eugene Brackbill
Contractor Task Leader

Clinton E. Kelly
Section Chief, EMB

File - PLY General Tech Dir.

EMISSION MEASUREMENT BRANCH

TECHNICAL DIRECTIVE NO. 4

Date 1-21-81

Task Title Method Development and Testing For the Plywood/Veneer Ind. ESED Project No. 8012

Contractor TRC Environmental Consultants

Contract Number 68-02-3513 Work Assignment No. 1

Task Manager Gary McAlister

Verbal Directions Given to Mr. Eugene Brackbill

Directive:

1. A review of your method development pretest report entitled "Evaluation of Test Methods For the Plywood Industry -- Pretest Survey Report and Initial Test Plan" dated November 25, 1980 Revision A December 22, 1980 has been completed. The method development pretest report is approved as submitted.

2. Contractor shall prepare proposed Source Test Requests for Test Programs at the following plants:
   a. Louisana Pacific; Tillamook, Oregon
   b. Georgia Pacific; Eugene, Oregon
   c. Champion International, Lebanon Plant; Lebanon Oregon.
   d. Boise-Cascade; Albany, Oregon

cc: Bete Kalika
Contractor Project Manager

Clyde E. Riley for Gary McAlister
Task Manager, EMB

Eugene Brackbill
Contractor Task Leader

John McArthur for Roger Shigehiro
Section Chief, EMB

File - PIV Task Dirs.