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PLYWOOD/VENEER
EMISSION TEST REPORT
GEORGIA-PACIFIC PLYWOOD PLANT
SPRINGFIELD, OREGON
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PREFACE

The work described herein was conducted by personnel from TRC - Environmental Consultants, Inc., Research Triangle Institute (RTI), Del Green Associates (DGA); CH₂MHill, Engineers, Planners, Economists and Scientists; Pollution Control Science, Inc., (PCS); Georgia-Pacific (G-P) in Springfield, Oregon; the National Council of the Paper Industry for Air and Stream Improvement, Inc. (NCASI); and the United States Environmental Protection Agency (EPA) Emission Measurement Branch (EMB).

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., TRC work assignment manager, and John H. Powell, TRC field crew chief.

Robert L. Chessin of RTI monitored process operations and was assisted by Paul Willhite of DGA. RTI was responsible for preparing Section 3 and Appendix I of this report, both of which deal with process descriptions and operations. Mark S. Boedigheimer supervised Method 5X analyses performed by CH₂MHill. David Robinson supervised Method 25 analysis performed by PCS. Victor Dallons supervised NCASI sampling and analysis activities as well as providing helpful suggestions and comments in support of the test program. Mitch Steffensen and Pete Fetter of Georgia-Pacific, provided invaluable assistance and guidance to TRC, EPA and RTI in the performance of the test program. Clyde E. Riley, Office of Air Quality Planning and Standards (OAQPS), Emission Measurement Branch, EPA, served as task manager and was responsible for coordinating the test program.

Edwin J. Vincent, OAQPS, Chemical and Petroleum Branch, EPA, served as project lead engineer. He was also responsible for coordinating and directing the process operations monitoring.

TABLE OF CONTENTS

<u>SECTION</u>		<u>PAGE</u>
	PREFACE	ii
1.0	INTRODUCTION	1-1
1.1	Background	1-1
1.2	Summary of Process and Emissions	1-2
1.3	Applicability of EPA Reference Test Methods	1-3
1.3.1	EPA Method 5X (Provisional)	1-3
1.3.2	EPA Method 25	1-5
1.3.3	Comparability of Test Methods	1-6
1.4	Measurement Program Summary	1-7
1.4.1	Scrubber Inlet	1-7
1.4.2	Scrubber Outlet	1-7
1.4.3	Georgia-Pacific Scrubber System	1-8
1.4.4	Fugitive Emissions.	1-8
1.4.5	Ambient Air Measurements.	1-8
1.4.6	Clean-Up Evaluations	1-9
1.5	Report Sections	1-9
2.0	SUMMARY AND DISCUSSION OF RESULTS	2-1
2.1	Background and Definitions	2-1
2.1.1	Particulate Emissions	2-1
2.1.2	Condensable Emissions	2-2
2.1.3	Noncondensable Emissions	2-2
2.1.4	Total Organic Emissions	2-2
2.2	Method 5X - Particulate/Condensable	
	Organics Emission Tests	2-3
2.2.1	Scrubber Inlet.	2-6
2.2.2	Scrubber Outlet	2-8
2.3	Method 25 - Total Organic Tests	2-13
2.3.1	Scrubber Inlet.	2-16
2.3.2	Scrubber Outlet	2-16
2.4	Visible Emissions	2-21
2.5	Scrubber Operational Summary.	2-21
2.6	Summary of Fugitive Emissions	2-23
2.7	Ambient Air Measurements	2-23
2.8	Clean-Up Evaluation	2-27
2.9	Possible Test Interferences	2-27
3.0	PROCESS DESCRIPTION AND OPERATIONS	3-1
3.1	Process Equipment	3-1
3.2	Emission Control Equipment	3-1
3.3	Production and Control Equipment Monitoring	3-2
3.4	Process Operating Conditions During Test Program.	3-2
4.0	DESCRIPTION OF SAMPLING LOCATIONS	4-1
4.1	Scrubber Inlet.	4-1
4.2	Scrubber Outlet	4-1
4.3	Scrubber Operational Measurement Locations.	4-5
4.4	Fugitive Emissions.	4-5

TABLE OF CONTENTS (Continued)

<u>SECTION</u>		<u>PAGE</u>
5.0	SAMPLING AND ANALYTICAL METHODS	5-1
5.1	EPA Reference Methods	5-1
5.2	Preliminary Measurements	5-2
5.3	Measurements for Particulate, Condensible and Noncondensable Emissions	5-2
5.3.1	EPA Method 5X (Provisional) - Particulate and Condensible Organic Compounds	5-2
5.3.2	EPA Reference Method 25 - Condensible and Noncondensable Organic Compounds	5-10
5.4	Preliminary Moisture Determination.	5-22
5.5	Preliminary Velocity Determination	5-22
5.6	Visible Emissions	5-23
5.7	Pressure Drop Measurements	5-23
5.8	Scrubber Solution Samples	5-23
5.9	Fugitive Emissions	5-24
5.10	Ambient Temperature and Relative Humidity	5-25
6.0	QUALITY ASSURANCE	6-1
6.1	Method 5X	6-1
6.2	Method 25	6-3
6.3	Method 9	6-3

LIST OF FIGURES

<u>SECTION</u>		<u>PAGE</u>
1-1	Veneer Dryer Exhaust and Scrubber System	1-4
4-1	Veneer Dryer Exhaust and Scrubber System Sampling Locations	4-2
4-2	Scrubber Inlet Sampling Port Configuration and Traverse Point Locations	4-3
4-3	Scrubber Outlet Sampling Port Configuration and Traverse Point Locations	4-4
5-1	Modified EPA Particulate and Condensible Organics Sampling Train	5-4
5-2	Method 25 Sampling Train	5-11
5-5	Method 25 Flow Control Assembly Adjustment	5-13
5-6	TRC Nonmethane Organic Analyzer	5-18
5-7	TRC Condensate Recovery and Conditioning Apparatus . .	5-21

LIST OF TABLES

2-1a	Summary of Method 5X Particulate and Condensible Organic Collection Efficiency for Georgia-Pacific Scrubber System (English Units)	2-4
2-1b	Summary of Method 5X Particulate and Condensible Organic Collection Efficiency for Georgia-Pacific Scrubber System (Metric Units).	2-5
2-2	Summary of Method 5X Particulate and Condensible Organic Measurements for Gases <u>Entering</u> the Georgia-Pacific Scrubber System	2-7
2-3	Summary of Method 5X Particulate and Condensible Organic Measurements for Gases <u>Exiting</u> the Georgia-Pacific Scrubber System	2-9
2-4	Comparison of Particulate and Condensible Measured Emissions with Calculated Emissions	2-10
2-5a	Summary of Method 25 Total Organic Collection Efficiency for Georgia-Pacific Scrubber System (English Units)	2-14
2-5b	Summary of Method 25 Total Organic Collection Efficiency for Georgia-Pacific Scrubber System (Metric Units).	2-15

LIST OF TABLES (Continued)

<u>SECTION</u>		<u>PAGE</u>
2-6	Summary Method 25 Individual Total Organic Measurements for Gases <u>Entering</u> the Georgia-Pacific Scrubber System	2-17
2-7	Summary Method 25 Individual Total Organic Measurements for Gases <u>Exiting</u> the Georgia-Pacific Scrubber System	2-18
2-8	Summary of Method 25 Individual Total Organic Trap, Tank Measurements for Gases <u>Entering</u> the Georgia-Pacific Scrubber System	2-19
2-9	Summary of Method 25 Individual Total Organic Trap, Tank Measurements for Gases <u>Exiting</u> the Georgia-Pacific Scrubber System	2-20
2-10	Georgia-Pacific Scrubber System Operational Data Summary	2-22
2-11a	Fugitive Emission Summary	2-24
2-11b	Fugitive Emission Summary	2-25
2-11c	Fugitive Emission Summary	2-26
2-12	Method 5X Clean-up Evaluation Results	2-28

TABLE OF CONTENTS

APPENDICES

A	SUMMARY OF TEST DATA
A.1	EPA Method 5X - Results
A.2	EPA Method 25 - Results
B	SAMPLE EQUATIONS AND CALCULATIONS
B.1	EPA Method 5X
B.2	EPA Method 25
C	FIELD DATA SHEETS
C.1	EPA Methods 1, 2 and 5X
C.1.1	Scrubber Inlet
C.1.2	Scrubber Outlet
C.2	EPA Method 25 - Scrubber Inlet
C.2.1	TRC Data
C.2.2	NCASI Data
C.3	EPA Method 25 - Scrubber Outlet
C.3.1	TRC Data
C.3.2	NCASI Data
C.4	Pressure Drop Measurements and Scrubber Solution Sample Collection
D	SAMPLING LOGS
D.1	Daily Summary Log
D.2	Sampling Task Log
D.3	Method 5X - Sample I.D. Log
D.4	Chain of Custody Forms For Method 5X and Method 25 - Samples
D.5	Crew Chief Field Operations Log
D.6	Field Laboratory Log
D.6.1	EPA Method 5X
D.6.2	EPA Method 25
D.7	Method 5X - Operators Field Log
E	CALIBRATION DATA
E.1	Summary of Equipment Used During Testing
E.2	Orifices, Dry Gas Meters and DGM Thermocouples
E.3	Pitot Tubes
E.4	Nozzles
E.5	EPA Method 25 - Flow Control Regulators
E.6	Calibration Gases
F	SAMPLING AND ANALYTICAL PROCEDURES
F.1	EPA Methods 1, 2, 4, 5 and 5X
F.2	EPA Method 25 as used by TRC
F.3	EPA Method 25 as used by NCASI
F.4	Scrubber Solution Analysis
F.5	EPA Method 22 - Fugitive Emissions
G	LABORATORY ANALYSIS DATA
G.1	EPA Method 5X - Data
G.1.1	Data Summary
G.1.2	Laboratory Data and Notebook

TABLE OF CONTENTS (CONTINUED)

APPENDICES (CONTINUED)

G.2	EPA Method 25 - Data
G.2.1	Data Summaries
G.2.2	TRC Laboratory Data and Notebook
G.2.3	NCASI Laboratory Data and Notebook
G.2.4	PCS Laboratory Data and Notebook
G.3	Scrubber Solution Data
H	CLEAN-UP EVALUATION RESULTS
I	PROCESS OPERATIONS
J	PROJECT PARTICIPANTS
K	SCOPE OF WORK
K.1	Work Assignment
K.2	Site Test Plan
K.3	Associated Correspondence

1.0 INTRODUCTION

1.1 Background

Section 111 of the Clean Air Act of 1970 charges the administrator of the United States Environmental Protection Agency with the responsibility of establishing Federal Standards of Performance for New Stationary Sources (SPNSS) that may significantly contribute to air pollution. When promulgated, these standards of performance for new stationary sources are to reflect the degree of emission limitation achievable through application of the best demonstrated emission control technology. Emission data collected from controlled sources in the plywood industry will provide a portion of the database used by EPA to develop SPNSS.

EPA's Office of Air Quality Planning and Standards selected the Georgia-Pacific (G-P) plywood plant in Springfield, Oregon, as a site for an emission test program because it is considered to employ process and emission technology representative of modern plywood manufacturing plants.

The test program was designed to determine the emission rate of particulate matter and condensible and noncondensable organic material emitted from the veneer drying operation. A second objective was to measure the collection efficiency of the Georgia-Pacific scrubber system for condensible and noncondensable organic emissions.

TRC - Environmental Consultants, Inc. was retained by the EPA Emissions Measurement Branch (EMB) to perform emission measurements at the G-P plywood plant in Springfield, Oregon. Testing was performed during the week of June 8, 1981 on the veneer dryer emissions and their pollution control, a G-P scrubber system. This report has been prepared in accordance with EPA Contract No. 68-02-3543 under the provisions of Work Assignment No. 1.

The Research Triangle Institute (RTI), the New Source Standard (NSS) contractor, was responsible for coordinating the overall test program with G-P personnel and for assuring that process and control equipment operating conditions were suitable for testing. All process data were monitored and recorded by RTI. Fugitive emissions from the veneer dryers, ambient air temperature and relative humidity were monitored and recorded by RTI.

Additional testing for total organic compounds was performed by the National Council of the Paper Industry for Air and Stream Improvement, Inc, (NCASI) simultaneously with the TRC test program. This testing was performed at the request of the American Plywood Association (APA) for research purposes and to provide an additional measure of quality assurance.

1.2 Summary of Process and Emissions

The G-P Springfield plant is a combination veneer and lay-up facility, and is considered to employ process and emission control technology representative of modern plywood manufacturing plants. The plywood production rate for the drying operation is approximately 800,000 square feet (3/8-inch basis) per 24-hour day.

The veneer drying operation begins after the veneer has been peeled from the log at the lathe operation and is transferred to the drying operation. Here, the veneer is continuously hand-fed onto the dryer feed conveyor and into the dryer. The purpose of the 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, organic compounds are driven out of the veneer. These organic compounds are the emissions of interest.

The G-P Springfield plant has four veneer dryers. Each is a steam heated, multideck unit, with the number of drying zones varying. Each dryer has two exhausts from the heated zones, except dryer 4, which has three exhausts. The nine exhausts are ducted to a common manifold which carries the dryer emissions to the G-P scrubber system. A schematic drawing of the veneer dryer exhaust system is presented in Figure 1-1.

1.3 Applicability of EPA Reference Test Methods

EPA is required to publish a national reference test method for each regulated source category and pollutant for which a New Source Performance Standard (NSPS) is established. Reference test methods are usually specified by a State regulatory agency during the State Implementation Planning process and may be different from national reference test methods.

The purpose of establishing a national reference test method is to ensure that emission data collected from a specific source is representative of that source and comparable to data collected at other designated sources. The primary purpose of this test program was to collect emission data using standardized test methods which allow the data to be evaluated to develop a national SPNSS. Two different test methods were selected by EPA to measure emissions from plywood veneer drying operations. These methods are briefly described in the following subsections and are described in detail in Section 5.

1.3.1 EPA Method 5X (Provisional)

Provisional Method 5X is similar to the Oregon Department of Environmental Quality (ODEQ) Method 7 used to measure condensible organic emissions. EPA Method 5X measures particulate matter and condensible organic matter. "Particulate matter" is defined as any finely divided solid or liquid material,

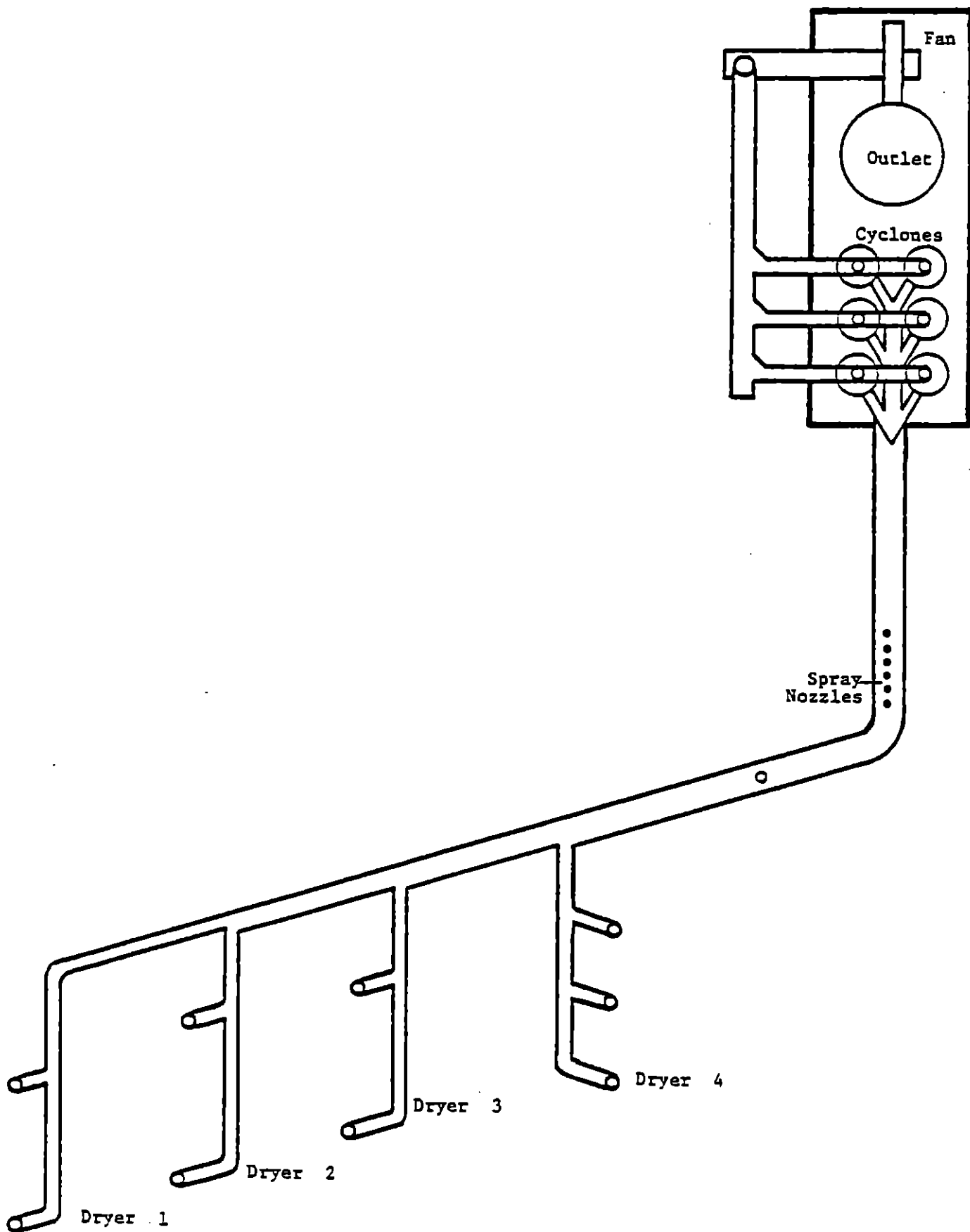


Figure 1-1. Veneer Dryer Exhaust and Scrubber System
 Georgia-Pacific Plywood Plant
 Springfield, Oregon

other than uncombined water, that condenses at or above the filtration temperature range of $350 \pm 25^{\circ}\text{F}$ ($177 \pm 14^{\circ}\text{C}$), and is collected by the probe and filter (front half of the sampling train). "Condensible organic matter" is defined as any material remaining after extraction, filtration and ambient evaporation of the ether-chloroform extract of the impinger portion of the sampling train. Particulate matter and condensible organic matter are quantified gravimetrically and results are expressed as the mass of collected material.

The purpose of the 350°F filtration temperature is to precondition the Method 25 slipstream sample being withdrawn from the Method 5X sample stream. This temperature was selected on the basis of average veneer dryer operating temperatures throughout the industry. This temperature condition excludes from the Method 25 samples only matter that can condense at or above 350°F . It does not affect Method 5X results because the remaining sample is caught in the condenser portion of the train.

1.3.2 EPA Method 25

EPA Reference Method 25, as promulgated in the October 3, 1980 Federal Register (volume 145, no. 194, 65959 ff.), applies to the measurement of organic compounds as total gaseous nonmethane organics (TGNMO). Emissions are expressed as equivalent carbon (C_1) mass. Method 25 sample fractions are separated by a gas chromatographic column, oxidized to carbon dioxide (CO_2), and reduced to methane (CH_4) prior to analysis by flame ionization detector (FID). Since all the sample organic compounds are reduced to CH_4 , the problems associated with the variable FID response characteristic for different organic compound structures is eliminated. This allows comparison of emission data on a uniform C_1 basis. Method 25 is discussed in greater detail in Section 5 of this report.

Major procedural modifications made to Method 25 were required to measure accurately emissions from plywood veneer drying facilities. These modifications are discussed in Section 5. An additional condensate trap immersed in water ice was placed in the sampling train ahead of the standard dry ice immersed condensate trap. The purpose of the additional trap is to condense moisture that would freeze in the dry ice immersed trap and cause a premature sample flow stoppage. In this manner gas stream moisture content, which may range from 30 to 60 percent by volume, may effectively be reduced to 3 percent or less before entering the dry ice immersed trap.

The use of the Method 5X sampling train as a sample preconditioner also represents a major modification. In addition to the 350°F sample stream temperature, isokinetic sample extraction from the source using Method 5X was also deemed necessary to obtain a representative Method 25 sample. This is particularly the case when moisture-saturated gas streams, such as those following wet scrubbing devices, are being sampled. Entrained water droplets may contain organic materials that would not be collected using the normal Method 25 constant sampling rate procedure.

1.3.3 Comparability of Test Methods

Methods 5X and 25 are not related and measured results can not be compared under any circumstances. Condensation temperatures differ by more than 100°F between the two methods, and consequently different condensible compounds are collected by each method. In addition, it has been demonstrated that Method 5X has limited collection capabilities for organic compounds with high-vapor pressures. A loss of organic material is experienced even during normal Method 5X sample recovery and analysis operations.

1.4 Measurement Program Summary

The measurement program was conducted at the G-P Springfield facility during the week of June 8, 1981. The emission tests were designed to measure the veneer dryer organic emissions and to determine the collection efficiency of the G-P scrubber system for those emissions. Tests were performed at the veneer dryer exhaust duct (scrubber inlet) and at the outlet of the scrubber system.

All emission testing was performed by TRC and NCASI personnel. RTI personnel monitored process operating conditions, while DGA personnel monitored fugitive emissions, ambient temperature and relative humidity. Scrubber operational data and solution samples were collected by TRC personnel.

1.4.1 Scrubber Inlet

Preliminary Measurements

Preliminary testing was performed on June 8 to determine volumetric flow rate and stack gas moisture content.

Method 5X - Particulate and Condensible Organics Tests

Three Method 5X tests were performed, one each on June 9, 10, and 11, concurrently with tests performed at the scrubber outlet.

Method 25 - Total Organic Tests

Eighteen Method 25 samples were taken at this location concurrently with the Method 5X tests performed. Six Method 25 samples were taken concurrently with each Method 5X test.

1.4.2 Scrubber Outlet

Preliminary Measurements

Preliminary tests were performed on June 8 to determine volumetric flow rate and stack gas moisture content.

Method 5X - Particulate and Condensible Organics Tests

Three Method 5X tests were performed at this location, one each on June 9, 10, and 11 concurrently with tests performed at the scrubber inlet.

Method 25 - Total Organic Tests

Eighteen Method 25 samples were taken at this location concurrently with the Method 5X samples (six per test run), and simultaneously with Method 25 samples taken at the scrubber inlet.

Method 9 - Visible Emissions

Scrubber outlet visible emissions were not monitored as planned because of overcast sky background conditions. The scrubber outlet plume was bluish-white and was therefore indistinguishable from the overcast sky. Overcast skies were present on June 8, 9 and 10. During the last test day, June 11, the sky began to clear and only scattered clouds were present in the afternoon. However, the final test sequence was nearly completed by this time. Consequently, no visible emission observations were recorded.

Although the scrubber outlet stack had an attached steam plume, the Method 9 observations were not cancelled because of this condition. The method provides for attached steam plumes by requiring that observations be made at the point where the condensed water vapor is no longer visible.

1.4.3 Georgia-Pacific Scrubber System

Static pressure upstream and downstream of the system induced draft fan was measured with U-tube water manometers and recorded at 30-minute intervals. These measurements were used to calculate pressure drop (ΔP) across the scrubber system.

Scrubber solution samples were taken every 30 minutes during the scrubber outlet Method 5X test period. One-hundred-ml samples were collected from the scrubber recirculation tank every 30 minutes during each test. The individual samples collected during each test were composited for analysis.

1.4.4 Fugitive Emissions

Fugitive emissions from the veneer dryers were monitored by DGA during each Method 5X test.

1.4.5 Ambient Air Measurements

Ambient air temperature and relative humidity were monitored and recorded by DGA at the beginning and end of each Method 5X test.

1.4.6 Clean-Up Evaluations

Prior to any emission testing, two Method 5X sampling trains were prepared and charged, ready to perform a test. The unexposed trains were then cleaned according to the method and samples recovered. The samples were analyzed to establish background and/or contamination levels from the sample collection equipment.

1.5 Report Sections

The remaining sections of this report present the Summary and Discussion of Results (Section 2), Process Description and Operations (Section 3), Description of Sampling Locations (Section 4), Sampling and Analytical Procedures (Section 5), and Quality Assurance (Section 6). Descriptions of methods and procedures, field and laboratory data, and calculations are presented in various appendices as noted in the Table of Contents.

2.0 SUMMARY AND DISCUSSION OF RESULTS

A summary of all emission measurements and collected data is presented in this section. Section 2.1 provides a brief background discussion and definitions of measured parameters. Section 2.2 presents Method 5X particulate/condensable organics results with a complete breakdown and discussion of parameters at both sampling sites. Method 25 total organic emission results are described in detail in Section 2.3, which includes a discussion of emissions at both sampling sites as well as a breakdown of major analytical data. Section 2.4 discusses visible emissions observations. A summary of scrubber operational data is presented in Section 2.5. Fugitive emissions are discussed in Section 2.6. A summary of ambient air measurements is presented in Section 2.7. A full discussion of the Method 5X clean-up evaluation and results may be found in Section 2.8.

2.1 Background and Definitions

The test program was designed to measure particulate matter, condensable and noncondensable organic material emitted from veneer dryers, and to determine the collection efficiency of the G-P scrubber system as a control for those emissions.

2.1.1 Particulate Emissions

Particulate emissions are defined as any finely divided solid or liquid matter, other than uncombined water, that condenses at or above $350 \pm 25^{\circ}\text{F}$ ($177 \pm 14^{\circ}\text{C}$) and is collected in the probe and filter (front half) of the Method 5X sampling train.

2.1.2 Condensible Emissions

Condensible emissions are defined differently in Methods 5X and 25. Although called by the same name, these two sample fractions differ significantly in content and composition and may not under any circumstances be compared.

Method 5X condensibles are collected in glass impingers containing deionized distilled water and immersed in a water ice bath, and on a back-up filter following those impingers. Any material remaining after extraction, filtration and ambient evaporation of the impinger solution, plus any material collected on the desiccated back-up filter, is defined as condensible organic matter. Quantification of this matter is done gravimetrically.

Method 25 condensibles are collected in two stainless-steel traps, one immersed in water ice followed by another packed in dry ice. Material collected in the traps is oxidized, reduced and analyzed by flame ionization. Results are expressed as a concentration of carbon (C_1).

2.1.3 Noncondensable Emissions

Noncondensable emissions are measured by Method 25 only and are those that pass through both ice traps to the evacuated sample tank at the end of the Method 25 train. These samples are oxidized, reduced and analyzed by FID. Results are expressed as concentrations of carbon (C_1).

2.1.4 Total Organic Emissions

Total organic emissions are those collected by the complete Method 25 sampling train drawing a preconditioned sample slipstream from a Method 5X train. These emissions include condensible and noncondensable emissions as defined above.

2.2 Method 5X - Particulate/Condensible Organics Emission Tests

A summary of Method 5X data collected at the scrubber inlet and outlet is presented in Tables 2-1a (English units) and 2-1b (metric units). These tables include relevant emission data: stack gas temperature, moisture content and volumetric flow rate; veneer dryer production rate; and a summary of the total measured particulate/condensible emissions by concentration, mass emission rate, and emission rate per unit production.

Emission data are presented for the three test series. Testing was performed concurrently at the scrubber inlet and outlet. Emissions at the scrubber inlet averaged 18.3 lbs/hr (8.29 kg/hr) or 0.53 lbs/1000 ft² veneer on a 3/8-inch basis (2.56 kg/1000 m² on 9.5 mm basis) for the three tests. Emissions from the scrubber outlet averaged 14.9 lbs/hr (6.77 kg/hr) or 0.43 lbs/1000 ft² veneer (2.10 kg/1000 m²) for the three tests. The concentrations of the emissions from the two sources, however, differed markedly. The average scrubber inlet concentration was 0.164 gr/DSCF (0.376 g/NM³), while the scrubber outlet averaged only 0.103 gr/DSCF (0.236 g/NM³) for the three tests.

The removal efficiency of the G-P scrubber system for particulate/condensible organics averaged 16.4 percent for the three tests. Efficiencies ranged from 29 percent during test 1 to 6 percent during test 3.

Detailed summaries of this test data are presented in Sections 2.2.1 and 2.2.2 and in Appendix A. Sample equations and calculations are presented in Appendix B. Field data sheets appear in Appendix C. Sampling logs and summaries are shown in Appendix D. Calibration data for the Method 5X sampling train are found in Appendix F. Laboratory analysis data are presented in Appendix G.

TABLE 2-1a (English Units)

SUMMARY OF METHOD 5X PARTICULATE AND CONDENSIBLE ORGANIC
COLLECTION EFFICIENCY FOR GEORGIA-PACIFIC SCRUBBER SYSTEM

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run Number Date	Run 1 6-9-81		Run 2 6-10-81		Run 3 6-11-81		Average
Emission Description:	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled
Volume Gas Sampled (DSCF) ^a	45.3	38.3	42.1	37.3	42.4	37.4	43.3
Stack Gas Flow Rate (DSCFM) ^b	12400	15200	12000	17500	12600	16100	12300
Stack Temperature (°F)	303	166	314	166	309	168	309
Percent Moisture of Volume ^c	31.9	38.3 (37.4) ^e	34.0	37.5 (37.4) ^e	31.8	39.6 (39.3) ^e	32.6
Percent Isokinesis	116.5	120.4	111.4	102.1	99.2	111.3	109.0
Scrubber Pressure Drop (inches H ₂ O)	14.2		15.0		13.9		14.4
Production Rate (1000 ft ³ /hr) ^d	35.7		34.4		34.1		34.7
<u>Particulate-Condensible Results</u>							
Total Catch							
gr/DSCF	0.198	0.115	0.169	0.107	0.124	0.086	0.164
lbs/hour	21.0 ^f	16.3 ^f	18.5 ^f	15.9	13.4	12.6 ^f	18.3
lbs/1000 ft ³	0.644	0.456	0.538	0.462	0.393	0.370	0.525
Scrubber System Collection Efficiency (%)	29.3		14.1		5.97		16.4

^a Standard conditions: 29.92 inches Hg at 68°F.^b Outlet volumetric flows (DSCFM) suspected to be slightly biased high due to possible wind interference.^c Outlet moisture results calculated with psychometric equation. (See Section 5.)^d 1000 square feet veneer per hour on 3/8 inch basis; includes trim factor; does not account for redry material.^e Theoretical moisture content at saturation () ; all results based on this.^f Results are average of concentration and area ratio methods due to high isokinetic values. (See Table 2-4.)

TABLE 2-1b (Metric Units)

SUMMARY OF METHOD 5X PARTICULATE AND CONDENSIBLE ORGANIC
COLLECTION EFFICIENCY FOR GEORGIA-PACIFIC SCRUBBER SYSTEM

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run Number	Run 1 6-9-81		Run 2 6-10-81		Run 3 6-11-81		Average	
Emission Description:	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
Volume Gas Sampled (NM ³) ^a	1.28	1.08	1.19	1.06	1.20	1.06	1.23	1.07
Stack Gas Flow Rate (NM ³ /Min) ^b	351	430	340	495	357	456	348	461
Stack Temperature (°C)	151	74.4	157	74.4	154	75.6	154	75.0
Percent Moisture of Volume ^c	31.9	38.3 (37.4) ^e	34.0	37.5 (37.4) ^e	31.8	39.6 (39.3) ^e	32.6	38.5 (38.0) ^e
Percent Isokinetics	116.5	120.4	111.4	102.1	99.2	111.3	109.0	111.3
Scrubber Pressure Drop (mm H ₂ O)		55.9		59.1		54.7		56.7
Production Rate (1000 m ³ /hr) ^d		3.32		3.20		3.17		3.22
<u>Particulate-Condensible Results</u>								
<u>Total Catch</u>								
g/NM ³	0.454	0.263	0.387	0.245	0.284	0.197	0.376	0.236
kg/hour	10.4 ^f	7.39 ^f	8.39 ^f	7.21	6.08	5.72 ^f	8.29	6.77
kg/1000 ft ³	3.14	2.23	2.62	2.26	1.92	1.80	2.56	2.10
Scrubber System Collection Efficiency %		28.9		14.1		5.92		16.3

^a Standard conditions: 760 mm Hg at 20°C.^b Outlet volumetric flows (NM³/min) suspected to be slightly biased high due to possible wind interference.^c Outlet moisture calculated with psychometric equation. (See Section 5.)^d 1000 square meters veneer per hour on 9.5 millimeter basis; included trim factor; does not account for redry material.^e Theoretical moisture content at saturation () ; all results based on this.^f Results are average of concentration and area ratio methods due to high isokinetic values. (See Table 2-4.)

2.2.1 Scrubber Inlet

A summary of Method 5X data collected at the scrubber inlet is presented in Table 2-2. Data presented include sample volume; stack gas flow rate, temperature, and moisture content; isokinesis for each test; veneer production rate; front half (particulate) and total (particulate/condensable) emissions.

Tests 1, 2 and 3 were performed at the scrubber inlet on June 9, 10, and 11, respectively. Measured particulate emissions ranged from 0.77 to 2.93 lbs/hr (0.02 to 0.08 lbs/1000 ft² veneer), averaging 1.83 lbs/hr (0.05 lbs/1000 ft² veneer). Total particulate/condensable emissions ranged from 13.4 to 23.0 lbs/hr (0.39 to 0.64 lbs/1000 ft² veneer) for an average of 18.3 lbs/hr (0.53 lbs/1000 ft² veneer). Particulate matter accounted for approximately 10 percent of the total sample weight while the remaining 90 percent of the catch was condensable organics.

Measured particulate grain loadings averaged 0.016 gr/DSCF for tests 1, 2 and 3; ranging from 0.007 to 0.025 gr/DSCF. Total particulate/condensable grain loadings ranged from 0.124 to 0.198 gr/DSCF, for a three-test average of 0.164 gr/DSCF. The bulk of the total emission concentration was accounted for by condensable organics (90 percent).

The average stack gas temperature was 309°F with an average moisture content of 32.6 percent. Moisture content varied from 31.8 percent to 34.0 percent over the three tests. The average stack gas flow rate was 12,300 DSCFM and did not vary significantly among the three tests.

Isokinesis averaged 109 percent for the three tests performed. Isokinesis for test 1 was 116.5 percent due to a nomograph calculation error, while test 2 was high at 111.4 percent due to a higher than expected gas stream moisture content. Isokinesis was acceptable for test 3 at 99.2 percent. Leak checks were performed at the conclusion of each test and leak rates were acceptable at less than 0.02 cfm.

TABLE 2-2

SUMMARY OF METHOD 5X PARTICULATE AND CONDENSIBLE ORGANIC MEASUREMENTS
FOR GASES ENTERING THE GEORGIA-PACIFIC SCRUBBER SYSTEM

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run Number Date	Run 1 6-9-81	Run 2 6-10-81	Run 3 6-11-81	Average
Volume Gas Sampled (DSCF) ^a	45.3	42.1	42.4	43.3
Stack Gas Flow Rate (DSCFM)	12400	12000	12600	12300
Stack Temperature (°F)	303	314	309	309
Percent Moisture by Volume	31.9	34.0	31.8	32.6
Percent Isokinesis	116.5	111.4	99.2	109.0
Production Rate (1000 ft ³ /hr) ^b	35.7	34.4	34.1	34.7
<u>Particulate-Condensible Results</u>				
<u>Front Half Catch (Probe and Filter)</u>				
milligrams	74.2	44.2	19.7	46.0
gr/DCSP	0.0253	0.0162	0.0072	0.0162
lbs/hour	2.93 ^c	1.67 ^c	0.77	1.71
1000 ft ³	0.082	0.049	0.023	0.049
<u>Total Catch</u>				
milligrams	582.3	459.6	340.6	460.8
gr/DSCF	0.198	0.169	0.124	0.164
lbs/hour	23.0 ^c	18.5 ^c	13.4	18.3
lbs/1000 ft ³	0.644	0.538	0.393	0.525
Percent Condensible Emissions	87.3	90.4	94.2	90.0

^a Standard Conditions: 29.92 inches Hg at 68°F.

^b 1000 square feet veneer per hour on (3/8) inch basis; includes trim factor; does not account for redry material.

^c Results are average of concentration and area ratio methods due to high isokinetic values. (See Table 2-4.)

The mass emission rates for tests 1 and 2 were recalculated using the area ratio method because of the unacceptable anisokinetic conditions. The results are presented in Table 2-4 and are only slightly higher than those obtained from the concentration method, which is the normal approach. This result is probably due to the small percentage of particulate matter in the gas stream which would escape collection by the sampling nozzle under superisokinetic sampling conditions. An explanation of the area ratio method for calculating mass emission rates is presented in Section 5.3.1.4 of this report. Mass emission rates presented in Tables 2-1 and 2-2 represent the average of the two calculation methods for tests 1 and 2.

2.2.2 Scrubber Outlet

A summary of Method 5X data collected at the scrubber outlet is presented in Table 2-3. Data presented include sample volume; stack gas flow rate, temperature, and moisture content; isokinesis for each test; veneer production rate; front half (particulate) and total (particulate/condensable) emissions.

Three emission tests were performed at the scrubber outlet. Testing was performed concurrently with tests at the scrubber inlet on June 9, 10 and 11.

Measured particulate emissions for tests 1, 2 and 3 ranged from 2.59 (0.08 lbs/100 ft²) to 3.70 lbs/hr (0.11 lbs/1000 ft²), averaging 3.20 lbs/hr (0.09 lbs/1000 ft² veneer). Total measured particulate/condensable emissions ranged from 12.6 lbs/hr (0.37 lbs/1000 ft²) for test 3 to 16.3 lbs/hr (0.46 lbs/1000 ft²) for test 1. The average total emission rate was 14.9 lbs/hr (0.43 lbs/1000 ft² veneer). Particulate material collected during these three tests accounted for approximately 21 percent of the total emissions on the average, while the remaining 79 percent was condensable organics.

TABLE 2-3

SUMMARY OF METHOD 5X PARTICULATE AND CONDENSIBLE ORGANIC MEASUREMENTS
FOR GASES EXITING THE GEORGIA-PACIFIC SCRUBBER SYSTEM

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run Number Date	Run 1 6-9-81	Run 2 6-10-81	Run 3 6-11-81	Average
Volume Gas Sampled (DSCF) ^a	38.3	37.3	37.4	37.7
Stack Gas Flow Rate (DSCFM) ^b	15200	17500	16100	16300
Stack Temperature (°F)	166	166	168	167
Percent Moisture by Volume ^c	38.3 (37.4) ^e	37.5 (37.4) ^e	39.6 (39.3) ^e	38.5 (38.0) ^e
Percent Isokinesis	120.4	102.1	111.3	111.3
Production Rate (1000 ft ³ /hr) ^d	35.7	34.4	34.1	34.7
<u>Particulate-Condensable Results</u>				
<u>Front Half Catch (Probe and Filter)</u>				
milligrams	56.9	41.9	61.6	53.5
gr/DSCF	0.023	0.017	0.025	0.022
lbs/hour	3.30 ^f	2.59	3.70 ^f	3.20
lbs/1000 ft ³	0.092	0.075	0.109	.092
<u>Total Catch</u>				
milligrams	286.9	257.6	208.8	251.1
gr/DSCF	0.115	0.107	0.086	0.103
lbs/hour	16.3 ^f	15.9	12.6 ^f	14.9
lbs/1000 ft ³	0.457	0.462	0.370	0.430
Percent Condensable Emissions	80.2	83.7	70.5	78.7

- ^a Standard Conditions: 29.92 inches Hg at 68°F.
- ^b Outlet volumetric flows (DSCFM) suspected to be slightly biased high due to possible wind interference.
- ^c Actual measured moisture adjusted to saturated conditions using psychrometric equation. (See Section 5.)
- ^d 1000 ft³ per veneer hour on 3/8 in. basis; includes trim factor; does not account for redry material.
- ^e Theoretical moisture content at saturation (), all results based on this.
- ^f Results are average of concentration and area ratio methods due to high isokinetic values. (See Table 2-4.)

TABLE 2-4

COMPARISON OF PARTICULATE AND CONDENSIBLE MEASURED EMISSIONS
WITH CALCULATED EMISSIONS
(Concentration Method vs. Area Ratio Method)

Georgia-Pacific Plywood Plant, Springfield, Oregon

Sample No.	Sample Fraction	Emission Rate (lbs/hr)		Average
		Concentration Method	Area-Ratio Method	
5X-1-Inlet (%I* = 116.5)	Front half	2.69	3.16	2.93
	Back half	18.4	21.6	20.0
	Total	21.1	24.8	23.0
5X-2-Inlet (%I* = 111.4)	Front half	1.67	1.88	1.78
	Back half	15.7	17.7	16.7
	Total	17.4	19.6	18.5
5X-1-Outlet (%I* = 120.4)	Front half	2.98	3.59	3.30
	Back half	12.0	14.5	13.3
	Total	15.0	18.1	16.3
5X-3-Outlet (%I* = 111.3)	Front half	3.51	3.89	3.70
	Back half	8.39	9.30	8.85
	Total	11.9	13.2	12.6

* isokinesis

Particulate grain loadings measured at the scrubber outlet averaged 0.022 gr/DSCF for these tests, ranging from 0.017 gr/DSCF to 0.025 gr/DSCF. Total grain loadings (particulate/condensable) ranged from 0.086 to 0.115 gr/DSCF, averaging 0.103 gr/DSCF for the three tests.

The average stack gas temperature measured during the three tests was 167°F. The measured moisture content of the gas stream averaged 38.5 percent for the three tests with slight variation.

The moisture content of the gas stream as measured during each test exceeded saturation at the measured temperature. This phenomenon was not surprising since entrained water droplets were observed in the gas stream by TRC and EPA personnel. In accordance with EPA Method 4, the gas stream moisture content was recalculated assuming saturation of the gas stream at the average stack gas temperature for each test. An explanation of this procedure is presented in Section 5.3.1.4. Recalculated gas stream moisture contents ranged from 37.4 percent for tests 1 and 2 to 39.3 percent for test 3, averaging 38.0 percent. These saturation moisture values were carried through the remainder of the emission calculations.

Measured stack gas flow rates ranged from 15,200 DSCFM to 17,500 DSCFM, averaging 16,300 DSCFM. The average outlet stack gas flow rate was measured to be approximately 25 percent greater than that measured entering the scrubber system. One reason for the difference in the flow rate measurements may be leaks within the system (around spray nozzles, in the cyclone ductwork, and before the fan) which would draw ambient air into the system. Another reason may be the inherent inaccuracy of EPA Method 2 at stack gas velocities of approximately 500 feet per minute (fpm). A third possible reason is wind interference. Since sampling was performed only 9 feet from the top of a 9 foot i.d. stack, even a small gust of wind created turbulence within the

duct. Momentary negative flow rates were indeed observed during the test program. These reasons may account for the differences between the measured inlet and outlet flow rates as well as the wide variation in measured flow rates from test to test.

Isokinesis was acceptable only for test 2 at 102 percent. Isokinesis was unacceptable for tests 1 and 3 at 120.4 percent and 111.3 percent, respectively. The average isokinesis for the three tests performed was 111.3 percent. Varying stack gas moisture content was a major factor affecting the unacceptable isokinetic conditions. The preliminary determination indicated 15.8 percent moisture, but measured moistures were more than twice this during the subsequent tests. It was later discovered that different grades of veneer with varying moisture contents were dried throughout the test program, as shown in Table 3-1.

The mass emission rates for tests 1 and 3 were recalculated using the area ratio method because of unacceptable superisokinetic conditions. The results are presented in Table 2-4 and are only slightly higher than those obtained from the concentration method, which is the normal approach. This fact is probably due to the small percentage of particulate matter in the gas stream which would escape collection by the sampling nozzle under anisokinetic sampling conditions. An explanation of the area ratio method for calculating mass emission rates is presented in Section 5.3.1.4 of this report. Mass emission rates presented in Tables 2-1 and 2-3 are the average of the two calculation methods for tests 1 and 3. Leak checks were performed at the conclusion of each test and leak rates were acceptable at less than 0.02 cfm. Some difficulty was encountered maintaining probe and filter outlet temperatures at $350 \pm 25^{\circ}\text{F}$ during these tests. Further discussion is presented in Section 5.3.1.1.

2.3 Method 25 - Total Organic Tests

A summary of the Method 25 total organic data (condensable and noncondensable) collected at the scrubber inlet and outlet is presented in Tables 2-5a (English units), 2-5b (metric units). These tables include TRC, PCS, and NCASI average emission data: stack gas flow rate, moisture content and temperature; veneer drying production rate, and a summary of the total organic emissions by concentration, mass emission rate, and emission rate per unit production. All emissions are expressed as carbon (C_1). NCASI calculates the emission rate as lbs/hr equivalent methane (CH_4) instead of carbon (C_1). Their data in the tables have been converted to lbs/hr C_1 to present the data on a consistent basis, conforming with Method 25.

Emission data are presented for the three test series. Testing was performed simultaneously at the scrubber inlet and outlet on June 9, 10 and 11. Total organic emissions entering the scrubber system ranged from 23.8 lbs/hr (10.6 kg/hr) or 0.67 lbs/1000 ft² veneer (3.20 kg/1000 m²) to 35.8 lbs/hr (16.2 kg/hr) or 1.05 lbs/1000 ft² (5.10 kg/1000 m²), averaging 30.2 lbs/hr (13.6 kg/hr) or 0.87 lbs/1000 ft² veneer (4.22 kg/1000 m²). Emissions exiting the scrubber system ranged from 30.9 lbs/hr (13.8 kg/hr) to 43.6 lbs/hr (19.6 kg/hr) or 1.22 lbs/1000 ft² (5.87 kg/1000 m²) for an average emission rate of 38.8 lbs/hr (17.5 kg/hr) or 1.12 lbs/1000 ft² veneer (5.39 kg/1000 m²). The collection efficiency of the system was measured to be less than zero for tests 1 and 2 and 13.7 percent for test 3. The average collection efficiency of the scrubber system was less than zero.

Detailed summaries of these test data are presented in Sections 2.3.1 and 2.3.2, and in Appendix A. Sample equations and calculations are presented in Appendix B. Field data sheets appear in Appendix C. Sampling logs and summaries are shown in Appendix D. Laboratory analysis data are presented in Appendix G.

TABLE 2-5a (English Units)

SUMMARY OF METHOD 25 TOTAL ORGANIC COLLECTION
EFFICIENCY FOR GEORGIA-PACIFIC SCRUBBER SYSTEM

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run Number Date	Run 1 6-9-81	Run 2 6-10-81	Run 3 6-11-81	Average
Emission Description:	Uncontrolled	Controlled	Uncontrolled	Controlled
Stack Gas Flow Rate (DSCFM) ^a , b	12,400	15,200	12,000	17,500
Stack Temperature (°F)	303	166	314	166
Percent Moisture by Volume ^c	31.9	37.4	34.0	37.4
Scrubber Pressure Drop (Inches H ₂ O)	14.2		15.0	13.9
Production Rate (1000 ft ³ /hr) ^d	35.7		34.4	34.1
Total Organic Results ^e				
parts/million, C ₁	1,027	1,536	1,389	1,286
gr/DSCF, C ₁	0.22	0.33	0.30	0.28
lbs/hour, C ₁	23.8	43.6	31.1	42.0
lbs/1000 ft ³ , C ₁	0.67	1.22	0.90	1.22
System Collection Efficiency (%)	<0	<0	13.7	<0

^a Standard conditions; 29.92 inches Hg at 68°F.

^b Outlet volumetric flows (DSCFM) suspected to be slightly biased high due to possible wind interference.

^c Actual measured moisture adjusted to saturated conditions using psychometric equation (controlled emissions only).

^d 1000 square feet veneer per hour on 3/8 inch basis; includes trim factor; does not account for redry material.

^e Emission results calculated and reported as C₁. Does not include front half results from Method 5X collector, and cannot be compared with Method 5X mass determinations.

TABLE 2-5b (Metric Units)

SUMMARY OF METHOD 25 TOTAL ORGANIC COLLECTION
EFFICIENCY FOR GEORGIA-PACIFIC SCRUBBER SYSTEM

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run Number Date	Run 1 6-9-81		Run 2 6-10-81		Run 3 6-11-81		Average
Emission Description:	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled
Stack Gas Flow Rate (NM ³ /Min) ^{a, b}	351.2	430.2	339.8	495.6	356.0	456.0	348.3
Stack Temperature (°C)	150.6	74.4	156.7	74.4	153.9	75.6	154
Percent Moisture by Volume ^c	31.9	37.4 ^f	34.0	37.4 ^f	31.8	39.3 ^f	32.6
Scrubber Pressure Drop (mm H ₂ O)	360.7		301.0		353.1		365.8
Production Rate (1000 meters ³ /hr) ^d	3.32		3.20		3.17		3.22
<u>Total Organic Results^e</u>							
parts/million, C _I	1.027	1.536	1.389	1.286	1.524	1.030	1.313
g/DSCF, C _I	0.50	0.76	0.69	0.64	0.76	0.50	0.62
kg/hour, C _I	10.6	19.5	14.0	19.1	16.2	14.0	13.6
kg/1000 m ³ , C _I	3.20	5.87	4.37	5.95	5.10	4.42	4.22
System Collection Efficiency (%)	<0		<0		13.6		<0

^a Standard conditions: 760 mm Hg at 20°C.^b Outlet volumetric flows (NM³/min) suspected to be slightly biased high due to possible wind interference.^c Actual measured moisture adjusted to saturated conditions using psychometric equation (controlled emissions only).^d 1000 square meters veneer per hour on 9.5-mm basis; includes trim factor; does not account for redry material.^e Emission results calculated and reported as C_I. Does not include front half results from Method 5X collector, and cannot be compared with Method 5X mass determinations.^f Theoretical moisture content at saturation.

2.3.1 Scrubber Inlet

A summary of Method 25 condensible and noncondensable organics data collected at the scrubber inlet is presented in Tables 2-6 and 2-8. Table 2-6 shows relevant emission data and presents total organic emissions calculated by TRC, PCS, and NCASI as concentration, mass emission rate, and emission rate per unit production. Table 2-8 presents a breakdown of the total organic emissions into condensible and noncondensable organics as analyzed by the three laboratories. In addition, individual sample train analyses results are shown. The relative standard deviation between the paired sample trains is also presented.

Emissions of carbon (C_1) from the scrubber as analyzed by TRC, PCS and NCASI showed good overall correlation. The precision of the test data between paired samples (relative standard deviation-RSD) was excellent overall, averaging 19.8 percent RSD for the three laboratories involved.

2.3.2 Scrubber Outlet

A summary of Method 25 condensible and noncondensable organics data collected at the scrubber outlet is presented in Tables 2-7 and 2-9. Table 2-7 shows relevant emission data and presents total organic emissions calculated by TRC, PCS and NCASI as concentration, mass emission rate, and emission rate per unit production. Table 2-9 presents a breakdown of the total organic emissions into condensible and noncondensable organics as analyzed by the three laboratories. In addition, individual sample train analyses results are shown. The relative standard deviation between paired sample trains is also presented.

Emissions of carbon (C_1) from the scrubber as measured by TRC and NCASI showed good correlation. The average emissions calculated by TRC were slightly greater than those calculated by NCASI and PCS. There is no apparent

TABLE 2-6

SUMMARY METHOD 25 INDIVIDUAL TOTAL ORGANIC MEASUREMENTS
FOR GASES ENTERING THE GEORGIA-PACIFIC SCRUBBER SYSTEM

Georgia-Pacific Plywood Plant Springfield, Oregon

Run Number Date	Run 1 6/9/81				Run 2 6/10/81				Run 3 6/11/81				Average
	TRC	PCS	NCASI	TRC	PCS	NCASI	TRC	PCS	NCASI	TRC	PCS	NCASI	
Stack Gas Flow Rate (DSCFM) ^a			12,400			12,000			12,600			12,300	
Stack Temperature (°F)			303			314			309			309	
Percent Moisture by Volume			31.9			34.0			31.8			32.6	
Production Rate (1000 ft ³ /hr) ^b			35.7			34.4			34.1			34.7	
Laboratory Performing Analysis	TRC	PCS	NCASI	TRC	PCS	NCASI	TRC	PCS	NCASI	TRC	PCS	NCASI	
Total Organic Results ^c													
parts/million, C ₁	1016	855	1210	1482	1392	1295	2137	1101	1334	1545	1116	1280	1314/
g/DSCF, C ₁	0.22	0.19	0.26	0.32	0.30	0.28	0.47	0.24	0.29	0.34	0.24	0.28	
lbs/hour, C ₁	23.7	19.8	28.1	33.3	31.2	29.1	50.4	25.9	31.4	35.8	25.6	29.5	
lbs/1000 ft ³ , C ₁	0.66	0.55	0.78	0.97	0.91	0.84	1.48	0.76	0.92	1.03	0.74	0.85	

^a Standard Conditions: 29.92 inches Hg at 68°F, NCASI uses 0°C.^b 1000 square feet veneer per hour on 3/8 inch basis; includes trim factor; does not account for redry material.^c Emission results calculated and reported as C₁. Does not include front half results from Method 5X collection, cannot be compared with Method 5X mass determination.

TABLE 2-7

SUMMARY OF METHOD 25 INDIVIDUAL TOTAL ORGANIC MEASUREMENTS
FOR GASES EXITING THE GEORGIA-PACIFIC SCRUBBER SYSTEM

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run Number Date	Run 1 10/9/81			Run 2 10/10/81			Run 3 10/11/81			Average
	TRC	PCS	NCASI	TRC	PCS	NCASI	TRC	PCS	NCASI	
Stack Gas Flow Rate (DSCFM) ^{a, b}										
		15,200			17,500			16,100		16,300
Stack Temperature of		166			166			168		167
Percent Moisture by Volume ^c		37.4			37.4			39.3		38.0
Production Rate (1000 ft ³ /hr) ^d		35.7			34.4			34.1		34.7
Laboratory Performing Analysis	TRC	PCS	NCASI	TRC	PCS	NCASI	TRC	PCS	NCASI	
Total Organic Results ^e										
parts/million, C ₁	1762	1538	1306	1694	941.6	1221	1264	903	923	1150
gr/DSCF, C ₁	0.38	0.33	0.28	0.37	0.20	0.27	0.28	0.20	0.20	0.25
lbs/hour, C ₁	50.1	43.7	37.2	55.5	30.8	40.0	38.1	27.2	27.8	35.1
lbs/1000 ft ³ , C ₁	1.40	1.22	1.04	1.61	0.90	1.16	1.12	0.80	0.82	1.01

^a Standard Conditions: 29.92 inches Hg at 68°F, NCASI uses 0°C.^b Outlet flows suspected to be slightly biased high due to wind interference.^c Theoretical moisture content at saturation. (See Section 5.)^d 1000 square feet veneer per hour on 3/8 inch basis; includes trim factor; does not account for redry material^e Emission results calculated and reported as C₁. Does not include front half results from Method 5X collector, and cannot be compared with Method 5X mass determinations.

TABLE 2-8

SUMMARY OF METHOD 25 INDIVIDUAL TOTAL ORGANIC TRAP, TANK MEASUREMENTS
FOR GASES ENTERING THE GEORGIA-PACIFIC SCRUBBER SYSTEM

Georgia-Pacific Plywood Plant, Springfield, Oregon

Stack Gas Flow Rate DSCFH ^a	Sample I.D. No.	Lab	Condensible Catch			NonCondensible Catch (ppm)	Total Catch (ppm)	Pair Average (ppm)	Emission Rate (lbs/hr)	Relation Standard Deviation
			H ₂ O	Ice Trap	CO ₂					
			(ppm)	(ppm)	(ppm)					
Run 1										
June 9 12,400	1-A	TRC	477		300	409	1186	1016	23.7	4.22
	1-B	TRC	245		601	n.d.	846			
	1-C	PCS	509.7		267.7	25.0	802.4	855	19.8	11.6
	1-D	PCS	720.1		164.1	22.5	906.7			
	9-1	NCASI	N.A. b		1231.4	60.9	1292	1210	28.1	4.0
	9-2	NCASI	N.A. b		1045.6	82.3	1128			
	Average		488		601.6	100	1027	1027	23.8	6.6
Run 2										
June 10 12,000	2-A	TRC	483		163	804	1450	1482	33.3	32.2
	2-B	TRC	489		212	814	1515			
	2-C	PCS	539		352.2	433	1324	1392	31.2	14.6
	2-D	PCS	549.7		367.9	541.8	1459			
	10-1	NCASI	N.A. b		1531.1	63.3	1594	1295	29.1	3.06
	10-2	NCASI	N.A. b		863.2	132.0	995			
	Average		515		582	465	1389	1389	31.1	16.6
Run 3										
June 11 12,600	3-A	TRC	545		469	1102	2116	2137	50.4	70.3
	3-B	TRC	940		433	786	2159			
	3-C	PCS	469.0		550.8	159.2	1206	1101	25.9	7.4
	3-D	PCS	576.7		315.9	102.6	995.2			
	11-1	NCASI	N.A. b		1143.1	161.1	1304	1334	31.4	11.2
	11-2	NCASI	N.A. b		1155.2	209.4	1365			
	Average		639		678	420	1524	1524	35.8	36.3
Overall Average							1314	1314	30.2	19.8

^a Standard Conditions: 29.92 inches Hg at 68°F; NCASI uses 0°C.^b NCASI does not use an H₂O ice trap in their train.

TABLE 2-9

SUMMARY OF METHOD 25 INDIVIDUAL TOTAL ORGANIC TRAP, TANK MEASUREMENTS
FOR GASES EXITING THE GEORGIA-PACIFIC SCRUBBER SYSTEM

Georgia-Pacific Plywood Plant, Springfield, Oregon

Stack Gas Flow Rate DSCFM ^a	Sample I.D. No.	Lab	Condensible Catch			Non-Condensible Catch (ppm)	Total Catch (ppm)	Pair Average (ppm)	Emission Rate (lbs/hr)	Relation Standard Deviation
			H ₂ O		CO ₂					
			Ice Trap (ppm)	Ice Trap (ppm)	Ice Trap (ppm)					
Run 1										
15,200	1-A	TRC	815		278	546	1639	1762	50.1	10
	1-B	TRC	758		740	388	1886			
	1-C	PCS	1180.2		405.6	323.3	1909	1538	43.7	2.9
	1-D	PCS	905.0		116.6	145.5	1167			
	9-1	NCASI	N/A ^b		1242.9	49.2	1292	1307	37.2	63
	9-2	NCASI	N/A ^b		1276.3	44.9	1321			
	Average		915		676.6	249	1536	1536	43.6	25.3
Run 2										
17,500	2-A	TRC	465		332	687	1484	1694	55.5	5.7
	2-B	TRC	792		303	810	1905			
	2-C	PCS	579.9		117.5	316.8	1032	941.6	30.8	7.3
	2-D	PCS	571.0		102.4	177.5	850.9			
	10-1	NCASI	N/A ^b		1270.2	23.6	1294	1221	40.0	11.8
	10-2	NCASI	N/A ^b		1039.9	108.5	1148			
	Average		606		527	354	1286	1286	42.0	8.3
Run 3										
16,000	3-C	TRC	831		196	443	1470	1264	38.1	4.3
	3-D	TRC	441		193	424	1058			
	3-A	PCS	534.6		176.8	0	711.4	903	27.2	3.3
	3-B	PCS	414.3		641.1	39.0	1094			
	11-1	NCASI	N/A ^b		949.4	68.6	1018	923	27.8	6.9
	11-2	NCASI	N/A ^b		743.4	85.2	828.6			
	Average		555		483	177	1030	1030	30.9	4.8
Overall Average										
16,300			692		562	260	1284	1284	38.8	12.8

^a Standard conditions; 29.92 inches Hg at 68°F; NCASI uses 0°C.^b NCASI does not use an H₂O ice trap in their train.

explanation for this difference. The precision of the test data between paired samples (relative standard deviation) was excellent overall, averaging 12.8 percent RSD for the three laboratories involved.

2.4 Visible Emissions

Visible emissions observations were not conducted during this sampling program as planned. Overcast skies prevented an accurate determination of the scrubber outlet plume opacity. Further details of the decision to abort this phase of the test program are presented in Sections 1.4 and 5.7.

2.5 Scrubber Operational Summary

A summary of operational parameters of the G-P scrubber system during the test program is presented in Table 2-10. Pressure drop measurements (ΔP) across the scrubber system are presented as well as scrubber solution analysis data.

Scrubber solution samples were taken from the recirculating tank every 30 minutes and then composited into one sample per test. Sample analyses for total organic carbon (TOC) ranged from 3,010 mg/l for test 1 to 2,860 mg/l for test 3, averaging 2,956 mg/l for the three tests.

Pressure drop (ΔP) measurements across the scrubber were made at 30 minute intervals during the test program. The ΔP gradually increased during tests 1 and 2, and averaged 14.2 and 15.0 inches water, respectively. During test 3, however, the ΔP peaked shortly after the start of testing and then gradually declined for the rest of the test, averaging 13.9 inches water. The three test average ΔP was 14.4 inches water.

TABLE 2-10

GEORGIA-PACIFIC SCRUBBER SYSTEM OPERATIONAL DATA SUMMARY

Georgia-Pacific Plywood Plant, Springfield, Oregon
June 1981

Run Number	Date	Pressure Drop Measurements		Scrubber Solution	
		Time	ΔP (in. H ₂ O)	Volume Collected (ml)	TOC (mg/l)
1	June 9	1400	12.5	800	3010
		1430	13.0		
		1500	14.0		
		1530	14.8		
		1600	14.5		
		1630	14.7		
		1700	15.1		
		<u>1730</u>	<u>15.2</u>		
		Average	14.2		
2	June 10	1300	14.7	700	3000
		1400	14.8		
		1430	15.0		
		1500	14.8		
		1530	15.2		
		1600	15.4		
		<u>1630</u>	<u>15.3</u>		
		Average	15.0		
3	June 11	1145	13.8	700	2860
		1215	14.5		
		1245	14.0		
		1315	13.9		
		1345	13.8		
		1415	14.2		
		<u>1445</u>	<u>12.9</u>		
		Average	13.9		

2.6 Summary of Fugitive Emissions (Provided by RTI)

The temperature and pressure changes that a veneer dryer is subjected to make it very difficult for a dryer to be completely air tight. Door seals and skins, green and dry end baffles, and abort stacks will with time all eventually develop leaks. Door seals and dryer skins most readily develop them. At Springfield all the dryers had fugitive emissions. The three older dryers leaked more from around the elephant ears than from individual door seals. The jet dryer also experienced door leaks with quality checks showing varying amounts from one day to another. It was impossible to estimate volume of fugitive gases from any fugitive source.

At the abort stacks there were also fugitive emissions. Very little was seen from the jet dryer abort stacks, while opacities (unofficially) up to 30 percent were seen from the other three dryer abort stacks. Cooling section air volumes are large. No bluish haze was seen coming from cooling section exhausts from the three longitudinal dryers. However, the jet dryer cooling stacks showed some bluish opacity.

All of the fugitive emissions evaluations were purely qualitative and visual. Tables 2-11a, 2-11b and 2-11c contain fugitive emission data.

2.7 Ambient Air Measurements

A summary of ambient temperature and relative humidity measurements by RTI and DGA is presented along with process information in Table 3-1. Ambient temperatures ranged from 54° to 75°F, while relative humidity ranged from 36 percent to 76 percent during the test program.

TABLE 2-11a

FUGITIVE EMISSION SUMMARY

Georgia-Pacific Plywood Plant, Springfield, Oregon
(Provided by RTI)
June 9, 1981

Dryer #/Time	Abort Stacks			Cooling	Overall	Inside		
	Green End	Dry End	Time			Door Seals	Elephant Ears	Above Dryers
1	2:10	L	L	N	L 100 cfm	2:10	2M	1M
	2:45	H 25%	M 30%	N	M 200 cfm	3:25	2L, 2T	1M, 1L
	3:40	H 10%	H 20%	N	M 200 cfm	4:15	4M	1M, 2H
	4:50	M	H 30%	N	H 250 cfm	5:05	1L	4M, 1H
	5:30	H	H 30%	N	H 300 cfm	5:40	3L	2M
2	1:50	M	L	N	M 150 cfm	2:05	1L	1L
	2:45	H	L	N	M 200 cfm	3:25	N	N
	3:45	H	M	N	M 200 cfm	4:15	N	1M
	4:50	L	M 10%	N	M 150 cfm	5:05	N	1L
	5:30	H 10%	M 10%	N	M 150 cfm	5:40	N	1L
3	2:00	H 10%	H 20%	N	H 250 cfm	2:05	N	N
	2:45	H 30%	M 30%	N	H 250 cfm	3:15	N	N
	3:45	H 30%	M 30%	N	H 250 cfm	4:13	N	N
	4:45	H 10%	L	N	M 150 cfm	5:00	N	N
	5:30	H 20%	H 30%	N	H 300 cfm	5:40	N	N
4	3:45	N	N	5%	L -	2:00	1M, 1L	NA
	2:45	N	N	10%	L -	3:18	1L	NA
	3:40	N	N	10%	L -	4:12	1H, 1L	NA
	4:40	N	N	10%	VL	5:00	1H, 1L	NA
	5:27	N	N	15%	L	5:40	2M	NA

KEY

N = None
T = Trace
VL = Very Light
L = Light
M = Moderate
H = Heavy
VH = Very Heavy

1, cfm estimates
are gross
estimates
opacity
on blue
plumes

Building	1	2	3	4	5	6
Fans (Opacity)						
2:00	5%	5%	-	5%	-	-
2:45	5%	10%	-	5%	-	-
3:45	5%	10%	-	5%	-	-
4:45	5%	5%	-	5%	-	-
5:30	5%	5%	-	10%	5%	-

FUGITIVE EMISSION SUMMARY

Georgia-Pacific Plywood Plant, Springfield, Oregon
(Provided by RTI)
June 10, 1981

About Stacks						Inside Appearance				
Dryer #	Time	Green End	Dry End	Cooling	Overall	Time	Door Seals	Elephant Ears	Top	Comments
1	12:20	S 10%	M 20	N	M 150 cfm	12:10	1 VL	N	L	M @ mid fans
	1:15	H	M	N	M 150 cfm	1:25	2 VL	N	L	
	2:20	H	H 20	N	M 250 cfm	2:07	2 VL	N	L	
	2:45	M 10	H 20	N	M 150 cfm	2:40	1 S, 1 L	1 L	M	
	3:45	M 15	H 30	N	M 200 cfm	3:40	2 L	1 L	M	
	4:15	L 10	H 30	N	M 250 cfm	4:05	2 L	1 L	L	
	4:45	L 10	M 20	N	M 200 cfm	4:38	2 L	1 L	M	
2	12:17	H	M	N	M 300 cfm	12:08	2 M	1 S	L	Mod. around mid fans
	1:15	H	S	N	M 150 cfm	1:25	2 VL	1 S	M	
	2:15	H	M 10%	N	M 200 cfm	2:06	N	1 M	M	
	2:50	L 10%	M 10%	N	L 150 cfm	2:40	N	1 L	H	
	3:45	L	M 10	N	L 150 cfm	3:40	N	1 L	M	
	4:15	L 5%	M 10	N	L 100 cfm	4:05	N	1 L	L	
	4:45	L 10	M 10	N	L 150 cfm	4:35	N	1 L	L	
3	12:15	M 20%	M 20%	N	M 200 cfm	12:05	N	N	M	H at dry end
	1:15	L	L	N	50 cfm	1:20	N	N	M	None at Green
	2:15	M 10%	M 10%	N	M 100 cfm	2:05	N	N	H	
	2:50	H 20%	M 20	N	H 250 cfm	2:40	N	N	H	Large leakage
	3:50	M 10	H 20	N	H 250 cfm	3:35	N	N	H	around exhaust dry
	4:15	H 20	H 20	N	H 250 cfm	4:05	N	N	M	end stk.
	4:40	H 20	H 20	N	H 250 cfm	4:33	N	N	H	
4	12:13	N	N	10-15	Bad at Dry End	12:03	1 L, 1 M	NA	M	Cooling stks. from this dryer and roof vents are the major roof-ton emitters.
	1:12	N	N	5	"	1:20	2 M	NA	M	
	2:15	N	N	10%	"	2:03	1 L	NA	L	
	2:48	N	N	10-15	"	2:38	1 L	NA	L	
	3:50	N	N	N	"	3:35	1 L	NA	L	
	4:15	N	N	5-10	"	4:00	1 M	NA	M	
	4:40	N	N	5	"	4:33	1 M, TR	NA	L	
907 908 909 910 911 912						KEY				
Roof Vents						cfm estimates are gross estimates				
12:20	5	5	N	5	5	5	-	N = None		
1:15	5	-	-	-	5	-	-	T = Trace		
2:15	5	5	-	5	-	-	-	VL = Very Light		
2:45	5	5	-	5	-	5	-	L = Light		
3:45	5	5	-	5	-	-	-	M = Moderate	% opacity on blue	
4:15	5	5	-	5	-	-	-	H = Heavy	plumes	
4:40	5	-	-	-	5	-	-	VH = Very Heavy		

TABLE 2-11c

FUGITIVE EMISSION SUMMARY

Georgia-Pacific Plywood Plant, Springfield, Oregon
(Provided by RFI)
June 11, 1981)

Abort Stacks				Inside Appearance					
Dryer/Time	Green End	Dry End	Overall ¹	Cooling	Time	Door Seals	Elephant Ears	Top	Comments
1	10:50	H	H	N	300 H	10:42	3 L	1 L	L
	11:46	H	H 20	N	300 H	11:32	3 L	1 L	M
	12:20	M 5	H 10	N	250 H	12:08	2 L	1 M	M
	12:55	M 5	H 10	N	250 H	12:45	2 VL	1 M	L
	1:06	M 5	H 30	N	300 H	1:26	2 VL	1 L	M
	2:28	M 10	H 20	N	250 H	2:17	2 L	1 L	H
						2:47	1 L	1 L	M
2	11:10	H	M	N	350 H	10:39	N	1 L	L
	11:45	H	M 10	N	300 H	11:30	N	1 L	L
	12:20	H	M 10	N	250 H	12:07	N	1 L	M
	12:55	H	L	N	150 M	12:45	N	1 L	L
	1:46	H	M 10	N	300 H	1:26	N	1 L	L
	2:28	M 10	M 10	N	200 M	2:16	N	1 L	M
						2:47	N	1 L	M
3	11:10	H 30	H 20	N	350 H	10:38	N	N	H
	11:45	H	H 20	N	350 H	11:30	N	N	H
	12:20	H	H 20	N	350 H	12:06	N	N	H
	12:55	H 10	H 20	N	350 H	12:43	N	N	H
	1:48	H 10	H 20	N	300 H	1:27	N	N	M
	2:27	M 20	H 20	N	250 H	2:15	N	N	H
						2:48	N	N	
4	11:10	N	N	10A		10:37	2 VL, 3 T	NA	L
	11:45	N	N	5-10		11:28	2 VL	NA	L
	12:17	N	N	0-5		12:06	N	NA	VL
	12:55	N	N	5-10		12:43	N	NA	VL
	1:48	N	N	5		1:27	N	NA	VL
	2:26	N	N	5-10		2:14	N	NA	VL
						2:47	N	NA	VL
KEY									
Roof	907	908	909	910	911	912			
Vents	5	-	-	5	5	-	cfm estimates are gross estimates		
11:10	-	5	-	-	-	5	N = None		
11:45	5	-	5	-	-	-	T = Traces		
12:19	5	-	5	-	-	-	VL = Very Light		
12:55	10	5	-	5	-	-	L = Light		
1:48	5	10	-	5	-	-	M = Moderate		
2:27	10	5	-	5	-	5	H = Heavy		
							VH = Very Heavy		
							t = opacity on blue plumes		

2.8 Clean-Up Evaluation

Results of the clean-up evaluations performed on both Method 5X sampling trains are presented in Table 2-12. Clean-up evaluation rationale and procedures are presented in Section 1.4.6 and Section 6.1. Front half total residue collected was 55.5 mg and 12.1 mg for the inlet and outlet sampling trains, respectively. Back half total residue collected was 39.8 mg and 164.2 mg, respectively. Total residue collected during the clean-up evaluation was 96.3 mg and 176.3 mg for the inlet and outlet trains, respectively.

The high blank value of the inlet probe wash is probably due to the fact that the probe was not acid washed before the evaluation. The high value detected as impinger residue was probably due to a large amount of chromium residue (2.50 mg/l) remaining from the pretest chromic acid wash of the glassware. Further analysis for chromium was performed on the actual test impinger solutions with only a trace amount being detected in test 1 samples. Therefore, it is believed no test sample interference resulted from chromium contamination. Chromium analytical data are presented in Appendix G.

2.9 Possible Test Interferences

A possibility exists that components and reagents used in the Method 5X sampling train may cause interferences with the Method 25 samples drawn from the Method 5X train. At the time of this report, a study is being performed by TRC to quantify the possible interfering effects of acetone, silicone vacuum grease, and silicone rubber sealant (RTV) on the Method 25 procedures.

The scrubber outlet Method 5X filtration temperature could not be maintained in the planned $350 \pm 25^{\circ}\text{F}$ range due to insufficient heater capacity. Temperatures ranged from 310° to 340°F . Although not a factor in the

TABLE 2-12

METHOD 5X CLEAN-UP EVALUATION RESULTS, JUNE 8, 1981

Georgia-Pacific Plywood Plant, Springfield, Oregon

Train Component	Sample Fraction	Residue Weight (g)	
		Inlet	Outlet
Front Half	Probe Wash (DD H ₂ O)	0.0337*	0.0116
	Probe Wash (acetone)	0.0448	0.0113
	Front Filter	<u>NA†</u>	<u>NA†</u>
	Front Half Total	0.0785	0.0229
Back Half	Impinger Water		
	Organic Extraction	0.0014	0.0019
	Evaporation	0.0230	0.1360**
	Acetone Rinse	0.0151	0.0260
	Back-up Filter	<u>NA†</u>	<u>NA†</u>
	Back Half Total	0.0395	0.1639
	Total Sample	0.1180	0.1868

• Probe not acid washed prior to test program.

** Upon further analysis, it was discovered that Sample 5X-0-0-4 contained 2.50 mg/liter chromium, indicating residue remaining from the chromic acid cleaning solution used in the pretest preparation of the glassware.

† Filters not inserted into trains.

Method 5X sample collection, this may have resulted in a slight low bias for the Method 25 samples. Organic materials which would have passed through the filter at $350 \pm 25^{\circ}\text{F}$ may instead have condensed and been collected on the lower temperature filter.

3.0 PROCESS DESCRIPTION AND OPERATIONS (Provided by RTI)

This section describes the plywood manufacturing process, specifically the veneer drying process and its emission control, a G-P scrubber system. Production monitoring as well as process operational conditions during the test program are also discussed.

3.1 Process Equipment

The veneer drying operation begins after the veneer has been peeled from the log at the lathe operation. The veneer then proceeds to the drying operation. Here, the veneer is continuously hand-fed onto the dryer feed conveyor and into the dryer. The purpose of the operation is to thermally drive the moisture out of the veneer in preparation for the layup and laminating operations which follow. During the drying operation, organic compounds are also driven out of the veneer.

The G-P Springfield plant has four veneer dryers. Each is a steam heated, multideck unit, with the number of drying zones varying between dryers. Dryers 1, 2 and 3 are longitudinal dryers, with 22, 18 and 18 zones, respectively. Dryer 4, a new unit, is a 22 zone jet dryer. Each dryer has two exhausts from the heated zones, except dryer 4 which has three exhausts. Atop each exhaust is an abort damper for emergency use only. These are a source of fugitive emissions. The eight exhausts are ducted to a common manifold which carries the exhaust to the Georgia-Pacific scrubber system.

NINE

3.2 Emission Control Equipment

The Georgia-Pacific scrubber system shown in Figure 1-1 includes a wet spray zone, six wet cyclones, a packed tower, and a mesh pad entrainment separator. As dryer exhaust gases pass through the 35.25-inch inside diameter

duct, six nozzles inject water countercurrently into the gas stream to saturate and cool the gas stream, thereby condensing the organics. Solids are separated and agglomerated droplets are collected in the six wet cyclones which follow. The remaining moisture laden gases are drawn through an induced draft fan and forced through a packed tower and a mesh pad to rid the effluent of aerosols. All water within the scrubber system is recirculated. The gas stream, at approximately 165°F and 35 percent moisture by volume, then discharges to the atmosphere through a 9-foot i.d. stack.

3.3 Production and Control Equipment Monitoring

All production monitoring data collected by RTI and DGA is presented in Table 3-1. Scrubber operational data, collected by TRC, is presented in Table 2-10.

3.4 Process Operating Conditions During Test Program

The operation of each dryer is set according to the size, thickness, and kind of wood being dried. The operation of the three longitudinal dryers does not frequently vary, but it appears that the jet dryer makes more frequent changes. During the testing hours of the first day (June 9) there was a change of production, despite efforts on Georgia-Pacific's part to keep the dryer operation steady state. Dryer 4 changed from drying 1/6-inch sapwood to 1/6-inch heartwood. This was not considered to be a major change worthy of cancelling the test run.

It is normal for small plugups in the feeding and outloading mechanisms to occur and this did happen during the tests. On the third test day (June 11) there was more of this type upset than usual on Dryer 4, but these were considered minor and insufficient cause for cancelling a test.

TABLE 3-1

SUMMARY OF OPERATING CONDITIONS (Provided by RTI)

Georgia-Pacific Plywood Plant, Springfield, Oregon

	June 8	June 9	June 10	June 11
I Production (ft ² per hour on 3/8-in. basis)				
Sapwood	19,935	21,604	21,509	19,847
Heartwood	<u>12,090</u>	<u>14,143</u>	<u>12,863</u>	<u>14,221</u>
Total	31,424	35,747	34,372	34,068
II Redry Rate (%)	9.7	9.0	9.6	11.4
III Steam Use (lbs per hour)	No Evaluation	51,430	50,467	51,450
IV Temperatures	No Evaluation	steady 325-375°F	steady 325-375°F	steady 325-375°F
V Fugitives	No Evaluation			
1. abort stacks		150-300 CFM*	150-300 CFM*	150-300 CFM*
2. door leaks		nos. 1&4	nos. 1,2 & 4 less than on June 9	small leaks
3. above dryers		nos. 1 & 3 had blue haze		noticeable above all dryers
4. cooling stacks		4	4	4
VI Weather	No Evaluation	cloudy, showers, mid 60s 53-74% rel. humidity	cloudy, small showers, 60°-75° 36-70% rel. humidity	morning fog, sunny, 54°-66° 51-76% rel. humidity

*Per dryer, except no. 4

Steam usage, dryer temperatures, and drying times were maintained evenly throughout the three days of tests. Process operating conditions are summarized in Table 3-1.

Production figures provided are not the actual square footage of green veneer dried in the steam-heated dryers but rather a figure that accounts for trim and shrinkage. A full green veneer sheet is approximately 54 inches by 101 inches and will eventually be trimmed to 48 inches by 96 inches following shrinkage in the dryer. The amount of shrinkage depends on the original moisture level. As is the case with all western softwoods, Douglas fir sapwood will shrink more than heartwood. An expected shrinkage loss is 5 percent to 7 percent. The production figures reported are, therefore, approximately 85 percent of the actual throughput of the dryers. All veneer has been converted to a 3/8-inch basis.

4.0 DESCRIPTION OF THE SAMPLING LOCATIONS

This section presents a description of each sampling location and a summary of the work performed at each site. Figure 4-1 presents a schematic layout of the veneer dryer exhaust system and identifies all sampling locations.

4.1 Scrubber Inlet

The inlet to the scrubber system was sampled employing EPA Methods 1, 2, 4, 5X and 25 in the 35.25-inch inside diameter insulated duct at sampling ports 45° above the horizontal duct axis. These ports were located 30 feet downstream (>8 diameters) and 24 feet upstream (>2 diameters) from the nearest respective flow disturbances. In accordance with EPA Method 1, sampling was performed at 12 traverse points. Sampling port and traverse point locations are presented in Figure 4-2. Duct static pressure was also measured at this location.

Method 5X tests performed at this location were 60 minutes in duration as were the Method 25 tests performed simultaneously. A total of three Method 5X and 18 Method 25 tests was performed at this location.

4.2 Scrubber Outlet

Sampling ports were located 9 feet upstream (1 diameter) from the top of the 9-foot i.d. stack and approximately 6 feet ($2/3$ diameter) downstream from the mesh pad entrainment separator. In accordance with EPA Method 1, sampling was performed at 48 traverse points. Sampling port and traverse point locations are presented in Figure 4-3.

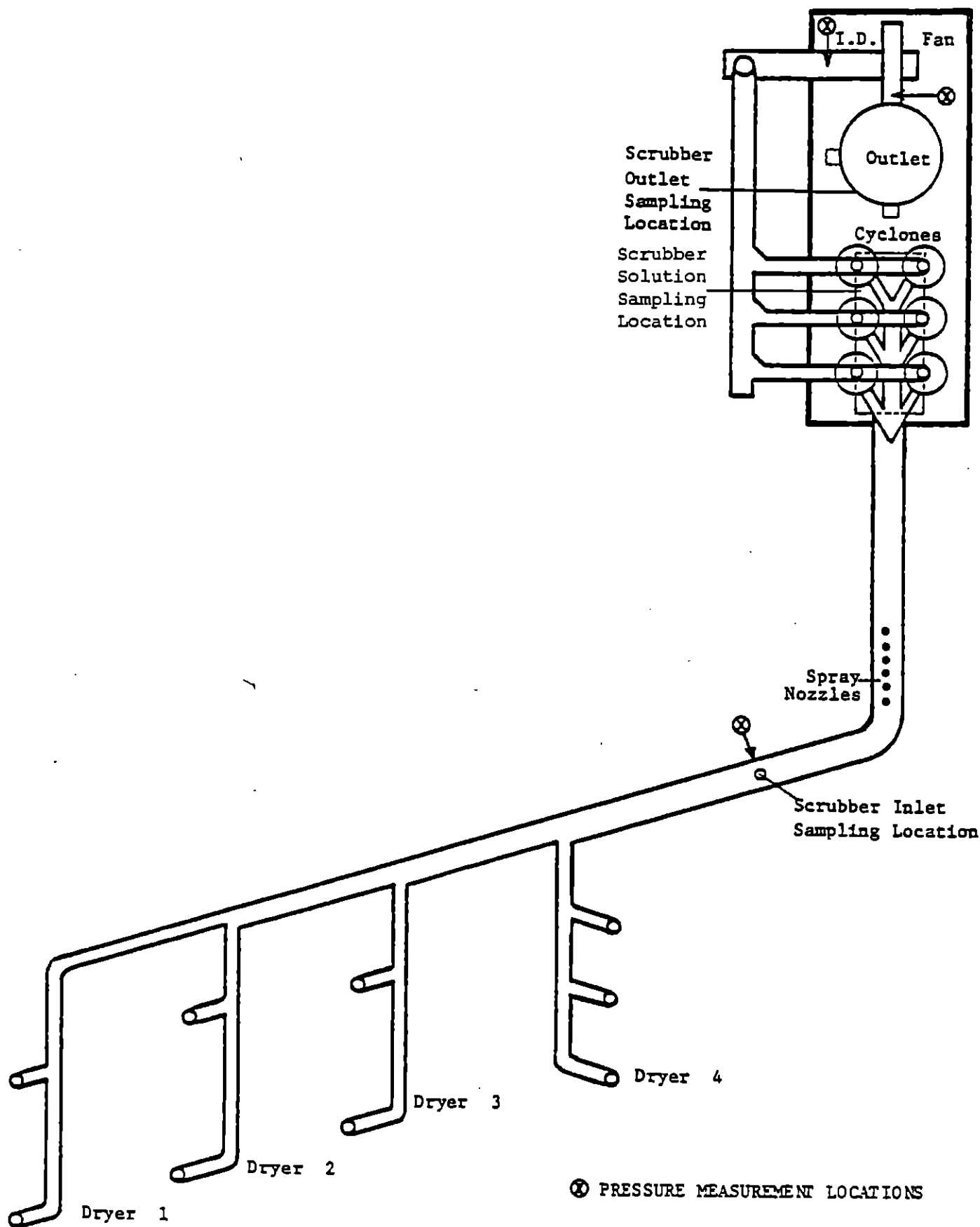
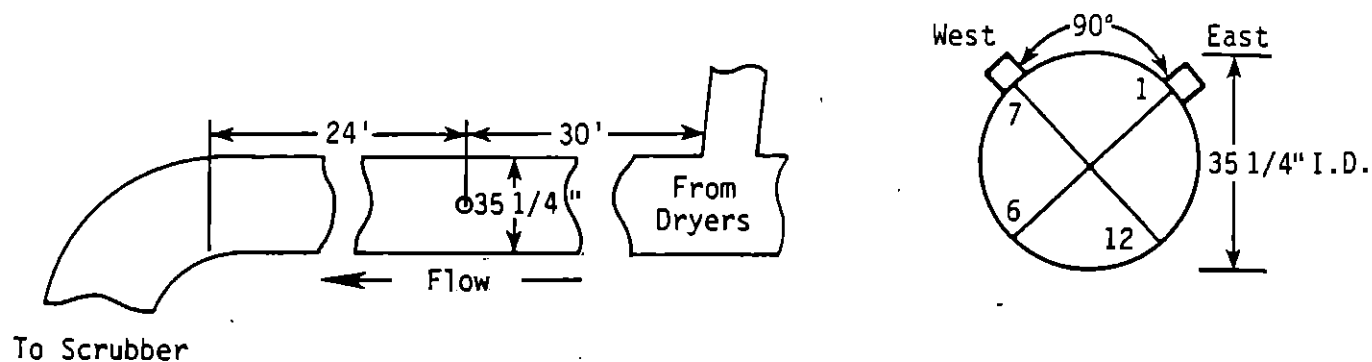
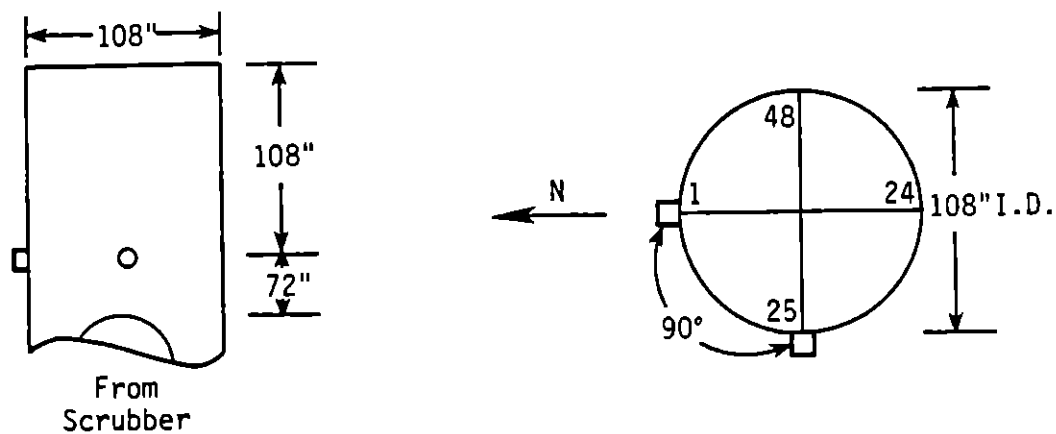


Figure 4-1. Veneer Dryer Exhaust and Scrubber System Sampling Locations
Georgia-Pacific Plywood Plant
Springfield, Oregon



Traverse Point Number	Traverse Point Location From Inside Duct Wall (Inches)
1	1.6
2	5.1
3	10.4
4	24.8
5	30.1
6	33.7

Figure 4-2. Scrubber Inlet Sampling Port Configuration and Traverse Point Locations, Georgia-Pacific Plywood Plant Springfield, Oregon



Traverse Point Number	Traverse Point Location From Inside Duct Wall
1	1.2
2	3.5
3	5.9
4	8.5
5	11.3
6	14.3
7	17.4
8	21.0
9	24.8
10	29.4
11	34.9
12	43.0
13	65.0
14	73.1
15	78.6
16	83.2
17	87.0
18	90.6
19	93.7
20	96.7
21	99.5
22	102.1
23	104.5
24	106.8

Figure 4-3. Scrubber Outlet Sampling Port Configuration and Traverse Point Locations Georgia-Pacific Plywood Plant, Springfield Oregon

Method 5X tests performed at this location were 96 minutes in duration. Method 25 sampling began 18 minutes into each Method 5X test and ran for 60 minutes, leaving 18 minutes of Method 5X testing after the completion of the Method 25 tests. A total of three Method 5X and 18 Method 25 tests were performed at this location.

4.3 Scrubber Operational Measurement Locations

Scrubber solution samples were taken from the scrubber recirculation tank during each test. Pressure drop across the scrubber system was calculated from static pressures in the duct measured at the scrubber inlet and at two pressure taps each located 2 feet from the scrubber fan inlet and outlet. These sampling locations are shown in Figure 4-1.

4.4 Fugitive Emissions

Fugitive emissions were observed by RTI and DGA around the veneer dryers and their abort dampers.

5.0 SAMPLING AND ANALYTICAL METHODS

This section presents descriptions of sampling and analysis procedures employed during the emission testing conducted at the Georgia-Pacific plywood facility in Springfield, Oregon during the week of June 8, 1981. EPA Methods 1, 2, 4, 5X*, 9, 22 and 25 were used to measure emissions at the veneer dryer exhaust and from the scrubber outlet. These methods are presented in greater detail in Appendix G.

5.1 EPA Reference Methods Used in This Program

The following EPA Reference Methods were used for the testing at the G-P plywood plant. These methods** were taken from CFR 40, July 1, 1980, part 60, "Standards of Performance for New Stationary Sources," Appendix A, pp. 183 ff.; and Federal Register, volume 45, no. 194, Friday, October 3, 1980, pp. 65959 ff.

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 an S-type pitot tube, manometer, and temperature sensor. The physical dimensions of the pitot tube and its spatial relationship to the temperature sensor and a sampling probe are also specified.

Method 4 - Determination of Moisture Content in Stack Gases

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

- Method 5X will be assigned a reference letter designation when the NSS regulation is proposed in the Federal Register. This method was derived from EPA Method 5 and ODEQ Method 7.

** With the exception of the Provisional Method 5X, which has yet to be proposed.

Method 5X - Determination of Particulate and Condensible Organic (Provisional) Emissions from Stationary Sources in the Plywood Industry

This method, based upon EPA Method 5 and ODEQ Method 7, describes procedures for measuring emissions in the context of the following definitions. Particulate matter is material which condenses at or above filtration temperature and is collected by the front half of the sampling train. Condensible organic matter is that material which remains after extraction, filtration, and evaporation of the impinger portion of the train.

Method 9 - Visual Determination of the Opacity of Emissions From Stationary Sources

This method specifies the procedures by which opacity of emissions are measured.

Method 22 - Visual Determination of Fugitive Emissions from Material Processing Sources

This method specifies the procedures for visual determination of the presence and total time of occurrence of fugitive process emissions.

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

This method describes procedures for the sampling and analysis of gaseous nonmethane organic emissions. 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.

5.2 Preliminary Measurements

Before the start of emission sampling, each location was tested according to EPA Methods 1, 2 and 4 to determine the preliminary stack gas velocity and moisture content within the ducts.

5.3 Measurements for Particulate, Condensible and Noncondensable Emissions

5.3.1 EPA Method 5X (Provisional) - Particulate and Condensible Organic Compounds

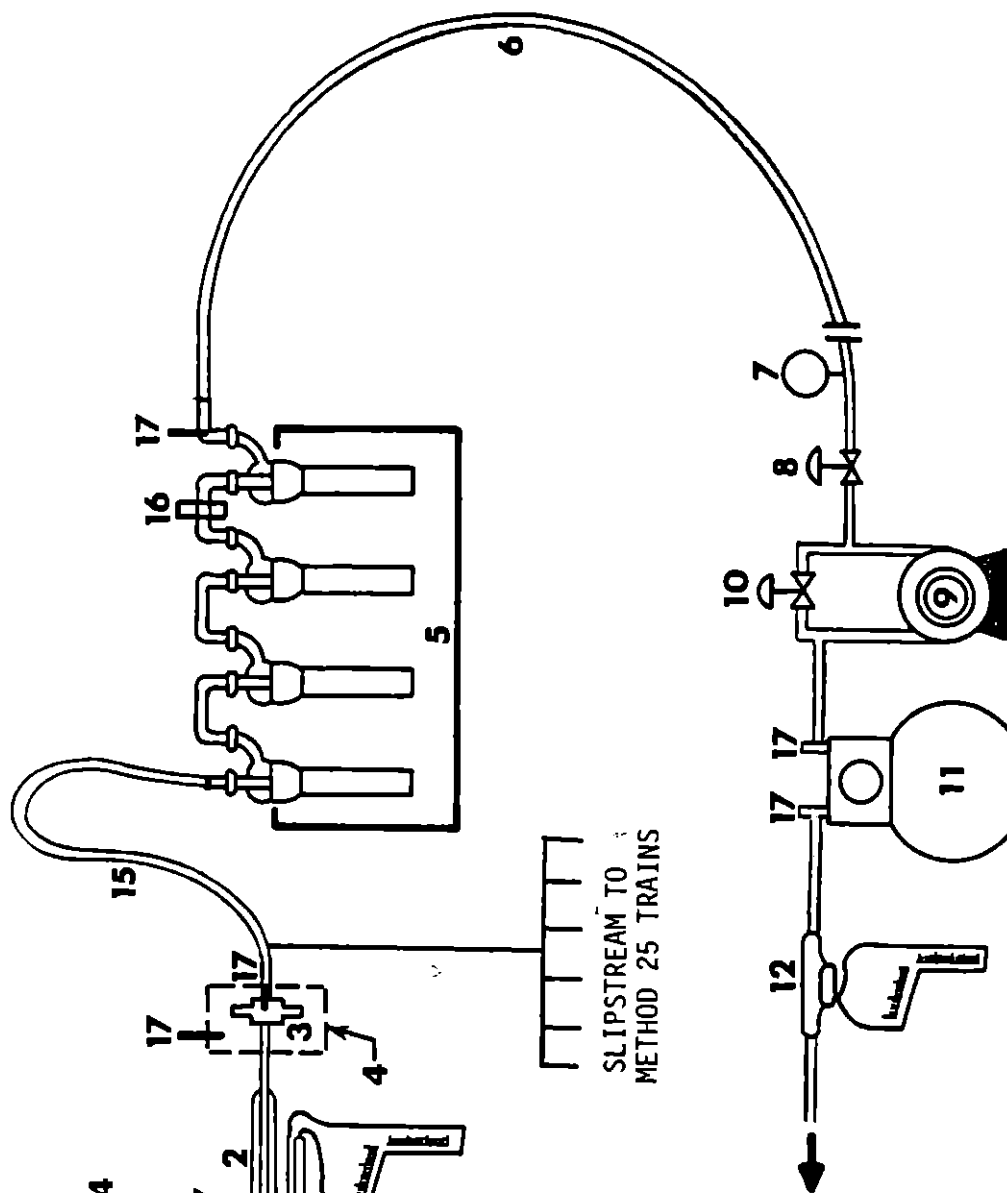
This section presents a summary of procedures followed by TRC during particulate and condensible organic sample collection, recovery and preparation, analysis, and data reduction. Deviations from the specified method are

explained in this section. Further details of this method are presented in Appendix G.

5.3.1.1 Method 5X - Sample Collection

The sampling train was a modified EPA Method 5X train as shown in Figure 5-1. This train was designed and built by TRC. A slipstream was drawn from behind the heated Method 5X filter to quadruplicate TRC and duplicate NCASI Method 25 sampling trains. Vacuum grease was used in the assembly of the Method 5X train ahead of the Teflon sample line-impinger train connection for test 1. This may have caused contamination of the total organic compound samples for test 1. No vacuum grease was used at those locations during tests 2 and 3. A minimum amount of grease was used in the impinger train. Leak checks were performed on the complete sampling train (modified 5X train attached to the six Method 25 trains) before and after each test. Field data were recorded on standard EPA Method 5 data sheets which are presented in Appendix C.

The Method 5X sampling train is essentially the same as that described by EPA Method 5 with the following modifications. A flexible Teflon sample line was used to connect the outlet of the 4-1/2 inch glass-fiber Gelman Spectrograde no. 64948 filter to the impinger train. Since the filter was at a higher elevation than the impinger train, condensation in the sample line ran into the first impinger and not back into the filter. The Method 5X impinger train consisted of four impingers and a 2-1/2 inch glass-fiber filter. The first impinger was a modified Greenburg-Smith (impingement plate removed) charged with 100 ml of deionized distilled (D.D.) water. The second impinger was a regular Greenburg-Smith unit also charged with 100 ml D.D. water. The third was another modified Greenburg-Smith and was empty. The fourth was



LEGEND	
1 -	NOZZLE
2 -	PROBE
3 -	FILTER HOLDER
4 -	HEATED FILTER BOX
5 -	IMPINGING 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 5-1. Modified EPA particulate and condensable organics sampling train.
(August 18, 1977 Federal Register)

also a modified Greenburg-Smith type and was charged with 200 grams of silica gel. A 2-1/2 inch glass-fiber filter (similar to the 4-1/2 inch filter) was inserted between the third and fourth impinger to collect any organic material condensed but not collected in the impingers.

Prior to initial field use, all glassware was washed with a chromic acid solution and rinsed with D.D. water and acetone according to Method 5X.

Sampling train operations were identical to those of EPA Method 5, with several exceptions. In order to prevent condensation of organic materials in the probe and on the 4-1/2 inch glass-fiber filter, the stainless steel probe and the filter were heated to $350^{\circ} \pm 25^{\circ}\text{F}$. Thermocouples were inserted into the probe and the filter outlet gas stream to ensure that proper temperatures were maintained. These temperatures were noted on the field data sheet during routine data recording intervals.

During sampling at the scrubber outlet it was sometimes impossible to maintain probe and filter outlet temperatures in the range of $350^{\circ} \pm 25^{\circ}\text{F}$ because of insufficient heater capacity. Probe and filter outlet temperatures ranged between 310° to 340°F at the scrubber outlet throughout the test program and averaged about 320°F . Filter box temperatures were maintained at $350^{\circ} \pm 25^{\circ}\text{F}$ with no problems.

Impinger outlet temperatures were monitored and maintained below 68°F throughout the test program. These temperatures were not, however, recorded on the scrubber outlet field data sheets.

Velocity pressure at the scrubber outlet was extremely low as measured by the S-type pitot tube, hovering near the lower detection limit of EPA Method 2. In addition, wind gusting across the top of the stack sometimes caused turbulence within the 9-foot i.d. duct, creating the illusion of negative flows. If this phenomenon was more than momentary, sampling was halted until flows again appeared positive, and then restarted.

A 2 1/2-inch filter was used in the front half of the inlet sampling train for tests 1 and 2, and the outlet sampling train for test 2. This was done because the 4 1/2-inch filter assembly would not pass the leak check. During outlet test 3, the filter assembly was broken in the process of changing sampling ports. The filter was recovered and replaced with another filter assembly to complete the test.

5.3.1.2 Method 5X - Sample Recovery and Preparation

Sample recovery was performed in an improvised laboratory on site. Because this area had a clean, wind-free environment and was well lighted, it was suited for sample recovery and preparation for shipment.

Sample recovery was performed in accordance with EPA Methods 5 and 5X as presented in Appendix G. At the conclusion of each test run, separate sample fractions were collected from each Method 5X sampling train by a three-person clean-up crew. The liquid samples were placed in glass sample jars with Teflon-lined lids, and the filters were placed in inert petri dishes and sealed. The sample fractions collected were as follows:

- Container 1 - 4-1/2 inch glass-fiber filter (2-1/2 inch filters were used during test I-1, I-2, and O-2).
- Container 2 - D.D. H₂O wash of nozzle, probe and front half of the 4-1/2 inch filter holder.
- Container 3 - Acetone wash of nozzle, probe and front half of the 4-1/2 inch filter holder.
- Container 4 - Exposed impinger solution from impingers 1, 2 and 3 and D.D. H₂O wash of impingers, connectors, Teflon sample line, back half of 4-1/2 inch filter holder and front half of 2-1/2 inch filter holder.
- Container 5 - Acetone wash of first three impingers, connectors, Teflon sample line, back half of 4-1/2 inch filter holder, and front half of 2-1/2 inch filter holder.
- Container 6 - 2-1/2 inch glass-fiber filter.

The probe and nozzle were brushed and rinsed three times with D.D. H_2O , which was deposited in container 2. The front half of the 4-1/2 inch filter holder was also rinsed with D.D. H_2O , which was deposited in container 2. The probe, nozzle and front half of the 4-1/2 inch filter holder were brushed and rinsed with acetone in the same manner and deposited in container 3.

The Teflon sample line was drained into the impinger train. The Teflon sample line was not brushed because the particulate catch in the sample line is generally considered to be insignificant. Impinger contents were weighed to determine moisture catch and deposited in container 4. The Teflon sample line, impingers, connectors and the back half of the 4-1/2 inch filter holder were rinsed three times with D.D. H_2O into container 4, and then rinsed three times with acetone into container 5.

Prior to tests 2 and 3 both the probe and Teflon sample line were washed with D.D. H_2O after the acetone wash to remove any acetone residue which might have contaminated the EPA Method 25 samples. These washes were discarded and the components allowed to dry at ambient conditions before being reassembled. A possibility of Method 25 acetone contamination exists for test 1.

Both filters were removed from their holders and deposited into their respective petri dishes, containers 1 and 6. Filter residue on the filter holders was scraped and deposited into the same acetone rinse containers as the front halves of their respective filter holders. The stainless steel and glass filter frits used in the filter holders were not rinsed during sample recovery, because any organic material collected on the frits is generally considered to be insignificant. Glass and/or metal particles could become detached and contaminate sample fractions.

Silica gel samples were weighed immediately at the conclusion of each test and the weights recorded by the clean-up crew. All Method 5X samples

were packed in shock-proof containers and driven to the CH₂Mhill laboratory in Corvallis, Oregon for analysis at the conclusion of the test program.

5.3.1.3 Method 5X - Sample Analysis

With the exception of the silica gel samples, all sample fractions were analyzed by CH₂Mhill. CH₂Mhill was chosen to perform the analytical phase of the Method 5X sampling program because of their extensive experience with Oregon DEQ Method 7, from which EPA Method 5X was derived. All analyses were performed in accordance with EPA Method 5X and as approved by EPA/EMB. The sample fractions were analyzed as follows:

- Container 1 - (4-1/2 inch glass-fiber filter) - desiccate and weigh after 24 hours.
- Container 2 - (D.D. H₂O probe rinse) - evaporate, desiccate and weigh after 24 hours.
- Container 3 - (acetone probe rinse) - evaporate, desiccate and weigh after 24 hours.
- Container 4 - (impinger water solution and D.D. H₂O rinse) - extract, desiccate and weigh.
- Container 5 - (impinger acetone wash) - evaporate, desiccate and weigh.
- Container 6 - (2-1/2 inch glass-fiber filter) - desiccate and weigh after 24 hours.

Silica gel samples were weighed on site with a triple-beam balance at the conclusion of each test by the Method 5X sample recovery crew. The weight gain of the silica gel was determined to the nearest 0.5 gram and recorded.

All analytical data were recorded on the data sheets as presented in Appendix H. Sample residue remaining after analysis was retained for 90 days after the end of the field program after which they were discarded according to EPA instructions.

5.3.1.4 Method 5X Data Reduction

All Method 5X data reduction was performed in a manner identical to procedures described by EPA Method 5. (See Appendices B and G.) The only variation from these calculations was as follows. Because of the unacceptable super-isokinetic sampling conditions during tests 1 and 2 at the scrubber inlet and tests 1 and 3 at the scrubber outlet, the particulate mass emission rate (MER) for these runs were calculated by two methods: the concentration method (by which calculations are normally done) and the area ratio method.* With the former method, the concentration of particulate matter entering the nozzle is calculated and then multiplied by the volumetric flow rate to obtain the mass emission rate:

$$(m/V) \times Q = \text{MER (lbs/hr)} \quad (\text{Eq. 5-1})$$

where m = amount of particulate sampled (lbs)
V = volume of sampled gas (DSCF)
Q = volumetric flow rate (DSCF/hr)

If the nozzle sampling velocity is greater than the stack gas velocity (superisokinetic sampling conditions), then the calculated mass flow rate will be less than the true MER. This is because the heavier particles will leave their streamlines (gas streamlines diverted into the nozzle) and will not enter the nozzle, as they would under isokinetic conditions. Since the volume of gas sampled is greater than what would be sampled under isokinetic conditions, the concentration (m/V) will be less than that under isokinetic conditions.

With the area ratio method, the mass of particulate matter collected is divided by the sampling time and then multiplied by the ratio of the stack area to the nozzle area to obtain the mass emission rate:

* Brenchley, D.F., C.D. Turley and R.F. Yarmac. Industrial Source Sampling. Ann Arbor Science Publishers, Inc., 1973, p. 173 ff.

$$(m/t) \times (A_s/A_n) = \text{MER (lbs/hr)} \quad (\text{Eq. 5-2})$$

where m = amount of particulate sample (lbs)
 t = sampling time (hrs)
 A_s = area of stack (ft²)
 A_n = area of nozzle (ft²)

Again, if the nozzle sampling velocity is greater than the stack gas velocity, then the MER calculated by this method will be somewhat greater than the true MER. The lighter particles follow the diverted streamlines into the nozzle; the amount of particulate matter sampled in time (t) is therefore assumed to be greater than what should be sampled. The volume of sampled gas is not a factor in this calculation. The average of the two calculated MERs was used as an estimate of the true MER.

Gas stream moisture content measured at the scrubber outlet exceeded the saturation values for the duct temperatures measured. Therefore moisture values were recalculated using the following psychometric equation:

$$\% \text{ H}_2\text{O} = \frac{P_v \times 100}{P_B} \quad (\text{Eq. 5-3})$$

where P_v = vapor pressure of air at a given temperature
 P_B = barometric pressure

5.3.2 EPA Reference Method 25 - Condensible and Noncondensable Organic Compounds

This section presents a summary of procedures followed by TRC during condensible and noncondensable organic sampling equipment preparation, sample collection, field sample recovery, and sample analysis. The TRC Method 25 sampling train is shown in Figure 5-2. Deviations from the method are also

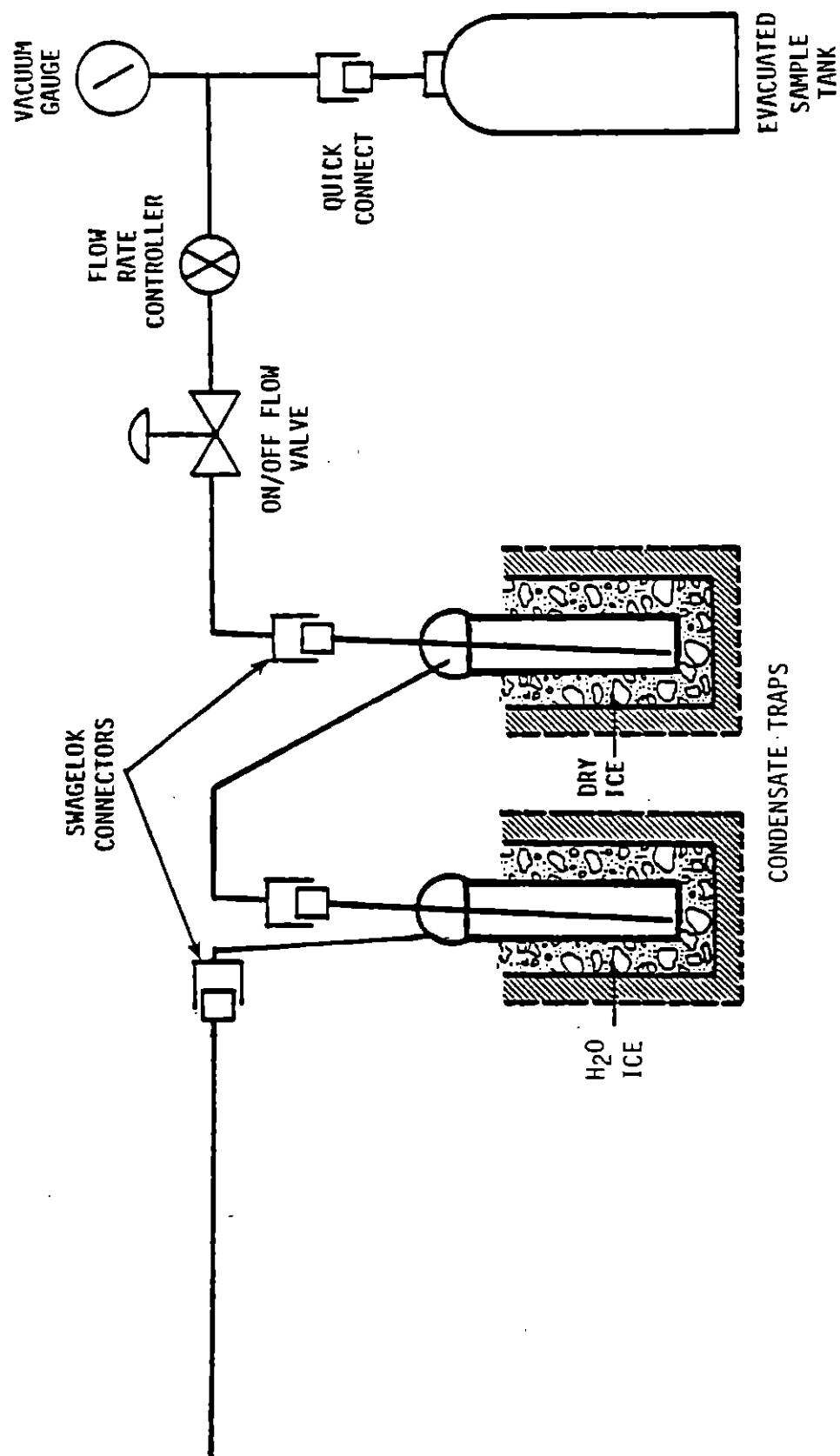


Figure 5-2. Method 25 Sampling Train

explained in this section. Further details of Method 25 are presented in Appendix G. NCASI Method 25 procedures are also presented in Appendix G.

5.3.2.1 Method 25 - Sampling Equipment Preparation

This procedure is based on and supplements EPA Method 25, "Determination of Total Gaseous Nonmethane Organic Emissions as Carbon."*

Condensate Trap

After being checked for any sign of physical damage, each trap was interconnected to a hydrocarbon (HC)-free air cylinder, flowmeters and CO₂ monitor (nondispersive infrared detector (NDIR)) and inserted in the furnace as shown in Figure 5-3. 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 that extend outside the furnace. The purge was performed until the CO₂ monitor indicated a concentration of 10 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 5-4. The tank was evacuated to 29 inches Hg vacuum after which the three-way valve was switched and the tank 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 TGNMO analyzer and a sample analysis was performed. If a nonmethane organic concentration greater than 10 ppm was measured, the tank was again subjected

* Federal Register, volume 45, no. 194, October 3, 1980, pp. 65959-73.

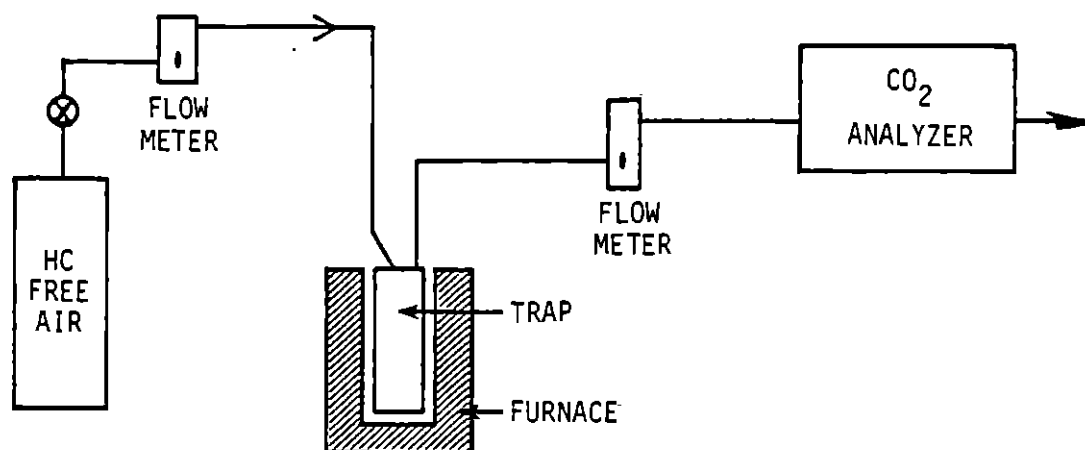


Figure 5-3. Method 25 Trap Preparation

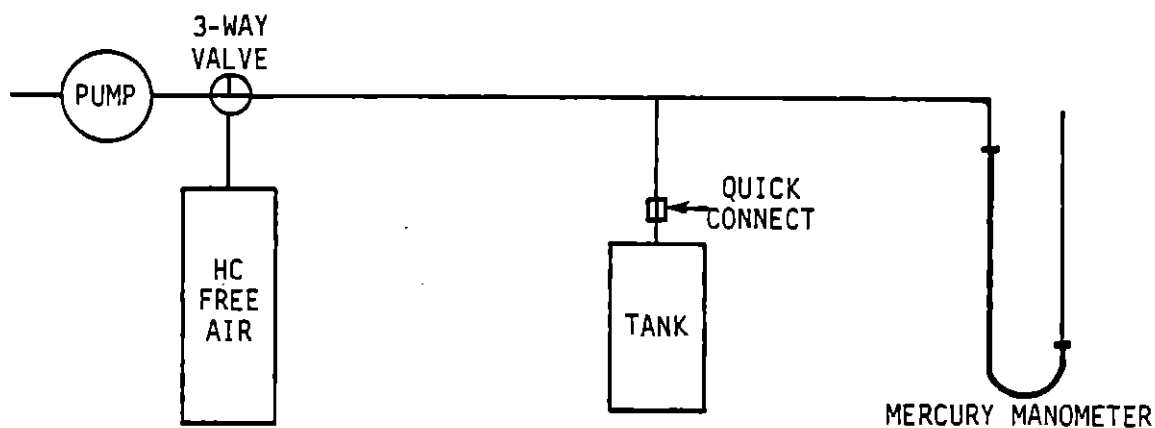


Figure 5-4. Method 25 Tank Purging and Evacuation

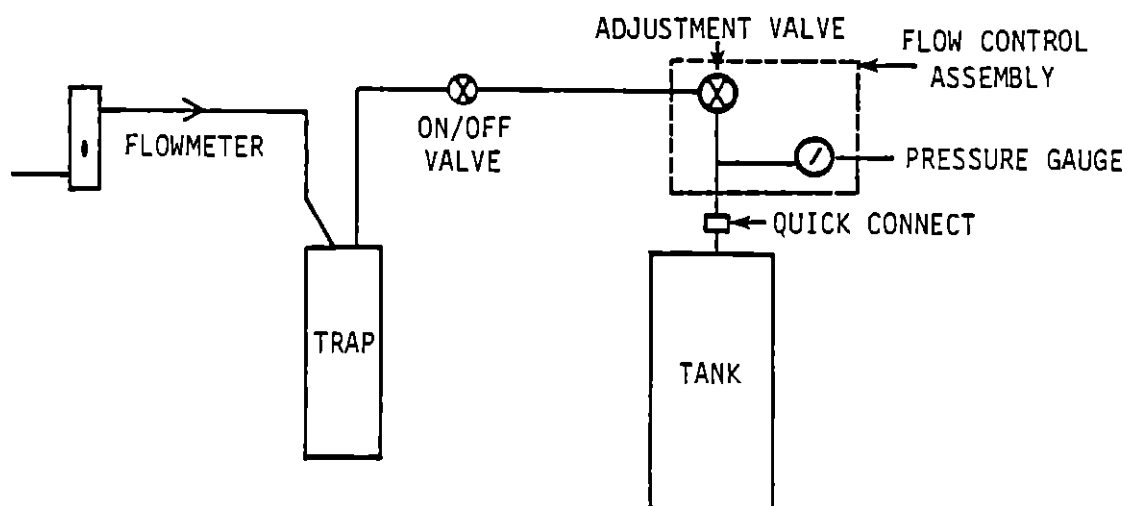


Figure 5-5. Method 25 Flow Control Assembly Adjustment

to the evacuation-pressurization analysis procedure until accepted. Each tank was then evacuated and pressurized with dry nitrogen for shipment to the field.

Flow Control Assembly

The sampling train was assembled as shown in Figure 5-5 and leak checked. The probe end cap was removed and the probe connected to a flow meter 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/minute. The flow control adjustment screw was sealed after the flow rate was achieved. The flow control valve number and calibration data were recorded on forms presented in Appendix E.

5.3.2.2 Method 25 - Sample Collection

The sampling train was a modified EPA Method 25 apparatus. The modification consists of placing an additional condensibles trap, immersed in a water ice bath, ahead of the trap immersed in dry (CO_2) ice. (See Figure 5-2.) The additional trap is intended to remove the high moisture content associated with the process emission streams and prevent freezeup in the dry ice trap which leads to premature sample flow stoppage.*

The sample tanks were shipped to the site slightly pressurized with dry nitrogen. Immediately prior to each test, tanks were evacuated. The tank vacuum, ambient temperature and barometric pressure were recorded on the field sampling data sheet. (See Appendix C.)

* "Method Development for the Plywood/Plywood Veneer Industry," EPA Contract 68-02-3543, Work Assignment 1. TRC - Environmental Consultants, Inc., August 1981.

With the flow shut-off valve in the closed position, the train was 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 leak checked by opening the flow shut-off valve. After a short period to allow pressure stabilization (not more than 2 minutes), the indicated gauge vacuum was formed. The tank vacuum as indicated by the vacuum gauge was recorded and assembled as shown in Figure 5-2. The pretest leak check was then performed. 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 occurred. The pretest leak rate (inches 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 had been performed, the sample tank number and trap numbers for each sampling train were recorded on the field data sheet with the respective test run number and sampling site. Four TRC and two NCASI sampling trains were connected to each Method 5X sampling train at the insulated outlet of their respective hotbox filters. Immediately prior to sampling, the gauge vacuum and clock time were noted. The flow shut-off valve was opened and sampling begun. TRC 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 recorded. After the Method 5X sampling was completed, the Method 25 probe lines were disconnected from the Method 5X interface and tightly capped.

A post-test leak check was performed prior to disassembly of the sampling train. After assuring that the probe had 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 occurred. The post-test leak rate (inches Hg/10 minutes) was recorded if observed. At the completion of the leak check, the flow shut-off valve was closed.

5.3.2.3 Method 25 - Field Sample Recovery

After the post-test leak check was completed, the TRC 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.

5.3.2.4 Method 25 - Sample Analysis

Two inlet sampling trains and two outlet sampling trains from each test were analyzed by TRC. The other two inlet sampling trains and two outlet sampling trains from each test were analyzed by Pollution Control Science, Inc., (PCS). NCASI analyzed the samples collected with their equipment. Additional analyses of the PCS analyzed samples were performed at the TRC laboratory. The purpose of this approach was to identify the cause of the poor paired sample data precision obtained during the method development program.

The analyses were performed in general accordance with the method as published (Appendix F). Prior to the nonmethane organic analysis of the tank samples, a preliminary analysis was performed with an FID to determine the relative sample concentrations. The purpose of this analysis was to provide additional information for the resolution of any poor precision. If the pre-

liminary tank sample analyses indicated relatively equal tank concentrations for paired samples, the nonmethane organic analyses should also produce relatively equal values. These data are presented in Appendix F.

Preliminary Sample Tank Analysis

The preliminary sample tank analysis was performed using the nonmethane organic analyzer. However, the separation column, oxidation catalyst, and reduction catalyst were bypassed. The sample tank was pressurized to approximately 100 mmHg gauge and then connected to the analyzer. The sample loop was purged and charged with sample gas. The sample was then injected from the loop into the analyzer, bypassing the separation column and catalysts, and introduced directly to the flame ionization detector. The detector response was plotted and scaled by the integrator. The responses for paired sample tanks were compared for relative magnitude on a ppm CH₄ (methane) basis and recorded for reference during the nonmethane organic analysis procedure.

TRC Analysis Equipment

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

Varian Model 2800 gas chromatograph with flame ionization detector; and Hewlett-Packard Model 3390A Reporting Integrator.

These components were interconnected to provide an analyzer scheme very similar to that described in the method. However, TRC has made some changes which improved the ease of operation without affecting analyzer performance. Figure 5-6 is a schematic rendering of the analyzer as assembled. A high-grade, HC-free carrier gas is used which eliminates the necessity for the purification furnace.

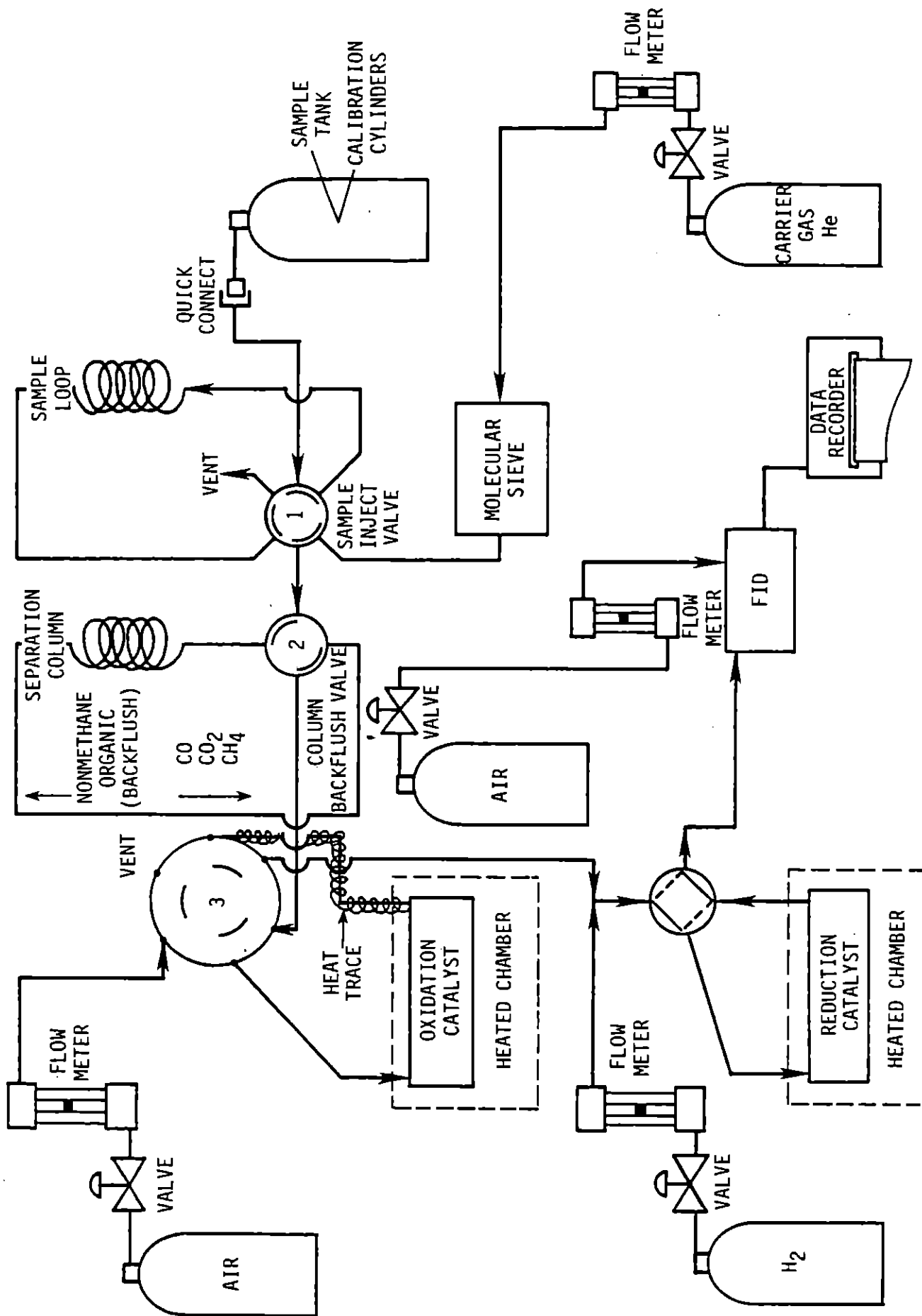


Figure 5-6 TRC Nonmethane Organic Analyzer

A six-port valve (Carle Model 5521) was substituted for the two four-port valves in the oxidation catalyst flow scheme. 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 hydrogen venting 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 contains 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 reduction catalyst was a Byron Instruments unit with integral heater. This was mounted within the Varian gas chromatograph oven to ensure constant temperature operation.

Although not clearly shown in Figure 5-6, a single combustion air source services both the oxidation catalyst and the flame ionization detector. Individual metering valves are 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 5-7 and was essentially the same as the configuration detailed by the method. The NDIR incorporated was an Anarad AR 400, with a range of 0 to 10,000 ppm CO₂.

The TRC arrangement did not incorporate the vacuum pump in a direct link with 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 provides more even, high temperature heating of the trap. A propane torch was used to heat those parts of the trap, including the probe, which remain outside the furnace during the sample recovery procedure. Valves A, B, C and D in Figure 5-7 and their connecting tubing were enclosed in a thermostatically controlled oven maintained at 180°C to prevent condensation. An oxygen rich carrier gas passed through the condensate trap during heating and oxidized the organic compounds to CO₂ and water vapor. The flow exited the trap, passed through a water trap and NDIR, and entered the intermediate collection vessel.

Analyzer Operating Conditions:

<u>Gas</u>	<u>Regulator Pressure (psig)</u>	<u>Flow Rate (cc/min)</u>
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:

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

Oxidation catalyst temperature - 850°C

Details of the NCASI analyzer and procedures are presented in Appendix H.

Nonmethane Organic Analysis Procedure

The analysis was performed in accordance with the published procedure. (See Appendix H.) However, the condensate trap carbon dioxide purge (Section A.3.2 of the published procedure) was modified. After briefly purging the trap according to the procedure, the valves were switched so that the trap

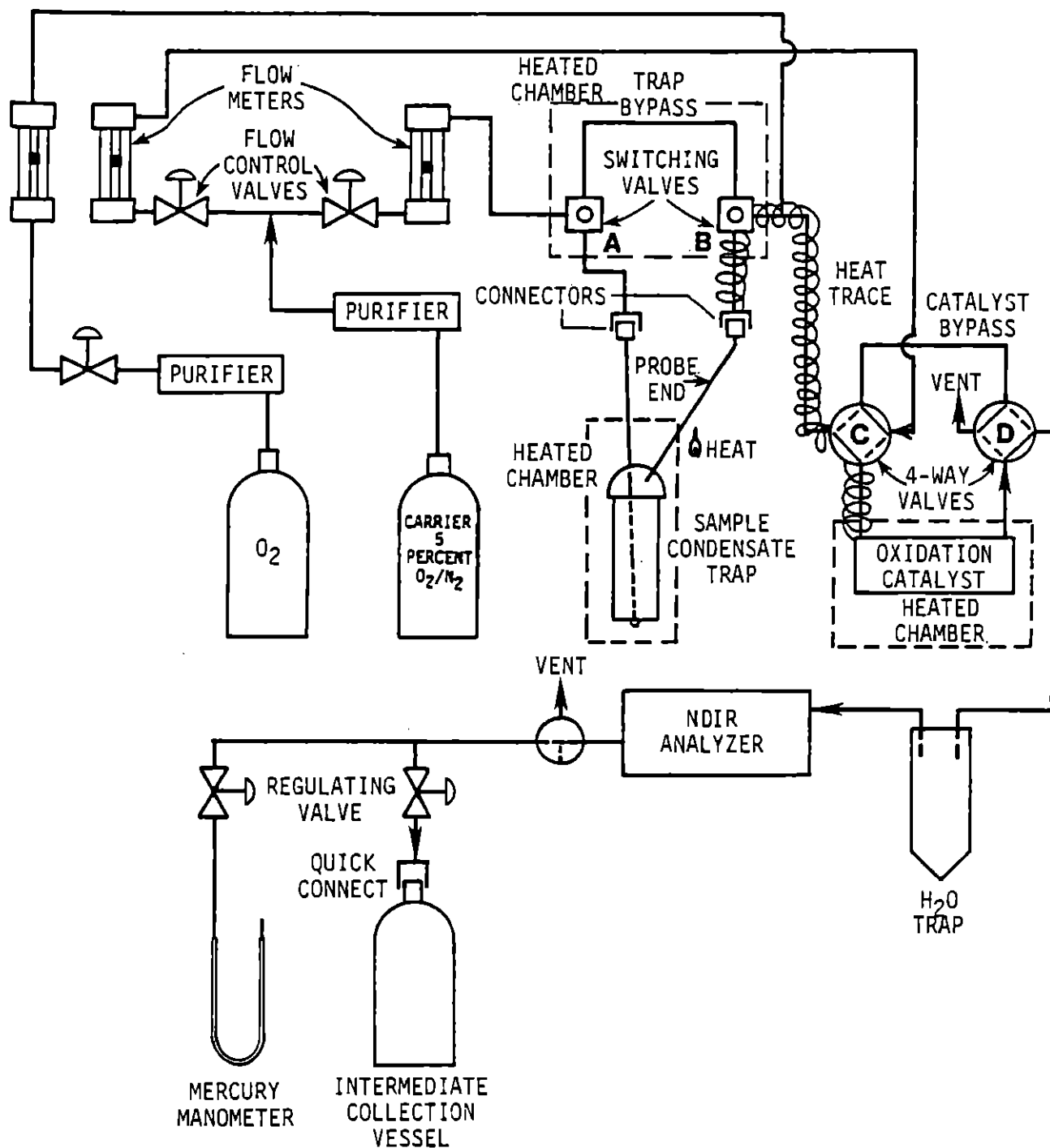


Figure 5-7. TRC Condensate Recovery and Conditioning Apparatus

was bypassed. After the trap had been bypassed, the carrier gas flow continued through the system and into the tank for approximately 5 minutes. It was then vented to the atmosphere through the valve located downstream of the NDIR. (See Figure 5-7.) This time period was sufficient to purge the inter-connecting tubing and NDIR cell volume. Prior to resuming flow through the condensate trap, the valve was switched to introduce again the flow into the sample tank. The trap was removed from the dry ice bath and allowed to warm to room temperature (determined by touch). The trap was placed back into the dry ice bath and the valves switched to resume carrier gas flow through the trap after frosting appeared on external trap surfaces. The procedure was then completed as described. This modification to the procedure was intended to assure the removal of any CO_2 which may be trapped within the ice crystals present in the trap.*

5.4 Preliminary Moisture Determination

Preliminary moisture tests were performed at the scrubber inlet and outlet prior to emission testing. Testing was performed in accordance with EPA Method 4. Data were recorded on field moisture determination forms as presented in Appendix C.

5.5 Preliminary Velocity Determination

Preliminary velocity measurements were made at the scrubber inlet and outlet prior to emission testing. EPA Methods 1 and 2 were followed in measuring the velocity of the gas stream. Data were recorded on the field data sheets (Traverse Point Location for Circular Ducts and Preliminary Velocity Traverse, Appendix C).

* "Investigation of Carbon Dioxide Interference with Method 25." EPA Contract 68-02-2814, Work Assignment 41. Midwest Research Institute, April 15, 1981, p. 7.

5.6 Visible Emissions

Scrubber outlet visible emissions were not monitored as planned because of overcast sky background conditions. The controlled emissions were bluish-white which made it impossible to distinguish the emissions from the overcast sky. Overcast skies were present on June 8, 9 and 10. During the last test day, June 11, the sky began to clear and only scattered clouds were present in the afternoon. However, the final test sequence was nearly completed by this time. Consequently, no visible emission observations were recorded.

Although the scrubber outlet stack had an attached steam plume, the Method 9 observations were not cancelled because of this condition. The method provides for attached steam plumes by requiring that observations be made at the point where the condensed water vapor is no longer visible.

5.7 Pressure Drop Measurements

The pressure drop across the scrubber system was measured in order to determine if the unit was operating at design conditions and to provide a means of correlating a scrubber operating parameter with collection efficiency. U-tube water manometers were used to measure static pressure at three points at 30-minute intervals during the test period. Measurements were made at the inlet sampling location, just before, and just after the induced draft fan. Pressure drop across the scrubber system was then calculated from the static pressures.

5.8 Scrubber Solution Samples

Scrubber solution samples were taken from the holding tank of the recirculating system concurrently with the particulate/condensable organics testing performed at the scrubber outlet. These samples were taken to determine

the relationship between the total organic carbon content of the scrubber solution and the actual measured emissions.

A 100-ml sample was taken approximately every 30 minutes while Method 5X was being performed at the outlet. These samples were taken by dipping a 100 ml graduated cylinder into the holding tank. Sample numbers and collection times were recorded on the Scrubber Solution Sample Collection form. The 100-ml aliquots collected during a test were composited into one sample jar for that test.

The composite samples were placed in shock-proof containers and transported to CH₂M Hill at the conclusion of the test program. The scrubber solution samples were analyzed for total organic carbon (TOC) following Standard Method 415.1. All analyses were performed within two weeks of sample collection.

5.9 Fugitive Emissions

The purpose of these measurements was to visually determine the frequency of occurrence of emissions that are not emitted directly from the process stack or duct. These are generally referred to as fugitive emissions and include such emissions as those: (1) escaping capture by process equipment exhaust hoods; (2) emitted during material transfer; (3) emitted from buildings housing material processing or handling equipment; (4) emitted directly from process equipment.

EPA Method 22 modified guidelines, as presented in Appendix F, were used to determine fugitive emissions from the veneer dryer doors and abort stacks. The method does not require that the opacity of emissions be determined. Instead, the amount of time that any visible emissions occur during the observation period is measured.

Fugitive emissions from the veneer dryers were monitored by RTI and DGA. Observations were recorded periodically throughout the test program.

5.10 Ambient Temperature and Relative Humidity

Outdoor ambient air temperature and relative humidity were measured with a psychrometer at the beginning and end of each test period. Measurements were made by RTI and their subcontractor to determine if a relationship exists between ambient temperature and relative humidity, and the emissions from the veneer dryers. Data was recorded on a form presented in Appendix I.

6.0 QUALITY ASSURANCE

The TRC quality assurance program is designed to ensure that emission measurement work is performed by qualified people using proper equipment following written procedures in order to provide accurate, defensible data. This program is based upon the EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III (EPA-600/4-7-027b).

At the beginning of each day, a meeting was held to orient personnel to the activities scheduled for that day and to discuss results from the previous day, and to determine if any special considerations were appropriate for the day's work.

6.1 Method 5X

TRC's measurement devices, pitot tubes, dry gas meters, thermocouples, probes and nozzles are uniquely identified and calibrated with documented procedures and acceptance criteria before and after each field effort. Records of all calibration data are maintained in TRC files. Samples of these calibration forms are presented in Appendix F.

All Method 5X sampling shall be 100 ± 10 percent isokinetic. Probe and hotbox temperatures were maintained at $350^{\circ} \pm 25^{\circ}\text{F}$. Deviations from these criteria were reported to the EPA/EMB task manager to decide whether a test run should be repeated or continued.

A single clean-up evaluation test was performed on each initial set (collector train) of glassware prior to collecting field samples. The evaluation tests (Method 5X) were performed in the field clean-up laboratory and were observed by the EPA task manager. Necessary changes or modifications to the clean-up procedures were specified by the EPA task manager prior to collecting field samples. The sets of glassware, including the probes,

were prepared and precleaned before conducting the clean-up evaluation tests. The impingers were precharged as specified in the actual test program. Afterward, the sample collectors, including probes, were cleaned and the blank samples recovered and analyzed as specified in the actual test program. Results are presented in Section 2 of this report.

In summary, the evaluation tests were designed to precondition the sample collectors, to establish blank background values, and to educate the clean-up personnel in specific sample recovery procedures.

Acetone was provided by CH₂MHill in glass-lined containers. Both the acetone and D.D. water were analyzed by CH₂MHill prior to field use. Residue data from this preliminary analysis was evaluated by the EPA/EMB task manager with respect to the suitability for use during the test program. These data are presented in Appendix H. In addition, three blank samples of D.D. water, acetone, and both 2-1/2 inch and 4-1/2 inch filters were collected for background analysis. All clean-up evaluation and blank samples were analyzed in conjunction with the actual test samples.

All sample recovery was performed by a three-person clean-up crew. Appropriate sample recovery data were recorded on the sample identification log, sample handling log, chain-of-custody form, and analytical data forms as presented in Appendix D.

Recovered samples were secured in padlocked, shock-proof, steel containers for storage and shipment for analysis.

All preparation and analysis of Method 5X samples were performed by CH₂MHill, which has extensive experience with Oregon DEQ Method 7, from which Method 5X derives. CH₂MHill adhered to the standards of quality assurance set forth in the Quality Assurance Handbook for Air Pollution

Measurement Systems, Volume III (EPA-600/4-7-027b) and the Handbook for Analytical Quality Control in Water and Wastewater Laboratories (EPA-600/4-79-019, March 1979).

6.2 Method 25

Method 25 traps were burned out according to the method prior to testing and spot-checked for contamination. All Method 25 tanks were flushed with nitrogen and checked for contamination prior to field use.

Six sampling trains were used to provide a check on data precision. Two trains were analyzed by TRC; two by PCS, and NCASI analyzed the remaining two trains. All tanks and traps have permanently engraved identification numbers.

Analyzers were calibrated over the specified ranges using certified calibration gases. Certification forms are provided in Appendix F.

6.3 Method 9

The TRC observer had been certified within the past 6 months to perform visible emission evaluations.

APPENDIX A

SUMMARY OF TEST DATA

- A.1 EPA Method 5X - Results
- A.2 EPA Method 25 - Results

APPENDIX A.1
EPA METHOD 5X - RESULTS

TABLE A-1
METHOD 5X PARTICULATE/CONDENSIBLE EMISSION DATA SUMMARY
Georgia-Pacific Plywood Plant, Springfield, Oregon

Run No.	Meter Volume (DSCF)	% H ₂ O Vapor**	Percent Isokinesis	Average Stack Velocity (FPM)	Stack Gas Flow Rate (DSCFM)	Pollutant Catch (g)		Particulate Emissions		Condensible Emissions		Total Emissions		Scrubber Removal Efficiency (%)***	
						Front	Back	Total	Lb/DSCF	Lb/Hr	Lb/DSCF	Lb/Hr	Lb/DSCF	Lb/Hr	Part. Cond. Total
5X-1-1*	45.3	31.9	116.5	3920	12400	0.074	0.508	0.582	3.61x10 ⁻⁴	2.69	2.47x10 ⁻⁴	18.4	2.83x10 ⁻⁴	21.1	
5X-1-0	38.3	37.4	120.4	457	15200	0.057	0.230	0.287	3.27x10 ⁻⁴	2.98	1.32x10 ⁻⁴	12.0	1.64x10 ⁻⁴	15.0	10.6 54.2 28.9
5X-2-1	42.1	34.0	111.4	4000	12000	0.044	0.415	0.459	2.32x10 ⁻⁴	1.67	2.18x10 ⁻⁴	15.7	2.41x10 ⁻⁴	17.4	-55.1 15.3 8.6
5X-2-0	37.3	37.4	102.1	524	17500	0.042	0.216	0.258	2.48x10 ⁻⁴	2.59	1.28x10 ⁻⁴	13.3	1.53x10 ⁻⁴	15.9	
5X-3-1	42.4	31.8	99.2	4020	12600	0.020	0.321	0.341	1.03x10 ⁻⁴	0.77	1.67x10 ⁻⁴	12.6	1.77x10 ⁻⁴	13.4	-356 33.2 11.2
5X-3-0	37.4	39.3	111.3	500	16100	0.062	0.147	0.209	3.63x10 ⁻⁴	3.51	0.87x10 ⁻⁴	8.42	1.23x10 ⁻⁴	11.9	
Avg. 1	43.3	32.6	109.0	3980	12300	0.046	0.415	0.461	2.32x10 ⁻⁴	1.71	2.11x10 ⁻⁴	15.6	2.34x10 ⁻⁴	17.3	
Avg. 0	37.7	38.0	111.3	494	16300	0.054	0.198	0.251	3.3x10 ⁻⁴	3.03	1.16x10 ⁻⁴	11.2	1.47x10 ⁻⁴	14.3	-77.2 28.2 17.3

Run 1 - June 9, 1981
Run 2 - June 10, 1981
Run 3 - June 11, 1981

* test/number/1; Inlet, 0; Outlet

** Percent H₂O vapor for outlet runs is the saturated & moisture at stack temperature.
Inlet (lbs/hr) - Outlet (lbs/hr)

*** Percent Efficiency = $\frac{\text{Inlet (lbs/hr)} - \text{Outlet (lbs/hr)}}{\text{Inlet (lbs/hr)}} \times 100$

dryer
exhaust

PARTICULATE TEST DATA

TEST 5X-1 TIME 1529-1715
LOCATION Inlet DATE June 9, 1981
FIRM Georgia Pacific - Spalding / EPA Plywood PROJECT NO. 1460-E80

Input A

P bar Barometric Pressure - in. Hg
As Stack Area - Ft²
Dn Nozzle Diameter - in.
Time Total Sampling Time - min.
Y Calibration Factor
Cp Pitot Coefficient
(ΔP)^{1/2} Average Square Root of Velocity Head (in. H₂O)
ΔH Average Orifice Pressure Drop - in. H₂O
Tm Average Meter Temperature °F
Pstk Average Stack Pressure - in. H₂O
Tstk Average Stack Temperature °F
Vm Meter Volume at Meter Conditions - Ft³
Vl Total Water Vapor Collected - ml
→ CO₂ % CO₂ in Stack Gas (Dry)
O₂ % O₂ in Stack Gas (Dry)
→ CO % CO in Stack Gas (Dry)

Input B

Mn Total Particulate Catch - Mg

Input C

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

Calculated

Vm (std) Meter Volume at Standard Conditions (Dry)-Ft³
% H₂O % H₂O Vapor in Stack Gas
Mws Molecular Weight of Stack Gas (Wet)
Vs Average Velocity of Stack Gas - FPM
Qs Actual Stack Gas Flowrate - ACFM
Qs (std) Stack Gas Flowrate (0.0% H₂O; STP) - DSCFM
% I % Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)
Cs Particulate Concentration-lb/DSCF
Er Particulate Emission Rate-lb/hour
F F Factor - DSCF/MM BTU
E Particulate Emissions - lbs/MM BTU

29.75	29.75
~~7.88~~ 6.78	6.78
0.255	0.255
60	60
0.99	0.99
0.84	0.84
0.903	0.903
2.00	2.00
74	74
-2.05	-2.05
303	303
46.26	46.26
50.9	50.9
0	0
20.9	20.9
0	0
74.2	74.2
Parc	Cond
74.2	508.1
45.25564319	
5.030928441	
28.29084359	
3713.918971	
25180.37063	
16370.86325	
88.1302056	
.0000036146	
3.550429953	

PARTICULATE TEST DATA

TEST 5X-2 TIME 1418 to 1521
 LOCATION Chobot DATE June 10, 1981
 FIRM G.P. Seftel / EPA - Plymouth PROJECT NO. 1460-E80

Input A

P bar	Barometric Pressure - in. Hg	<u>29.71</u>	
As	Stack Area - Ft ²	<u>~~7.08~~ 6.78</u>	29.71
Dn	Nozzle Diameter - in.	<u>0.255</u>	6.78
Time	Total Sampling Time - min.	<u>60</u>	0.255
Y	Calibration Factor	<u>0.99</u>	60.
Cp	Pitot Coefficient	<u>0.84</u>	0.99
(ΔP) 1/2	Average Square Root of Velocity Head (in. H ₂ O)	<u>0.909</u>	0.84
ΔH	Average Orifice Pressure Drop - in. H ₂ O	<u>1.74</u>	0.909
Tm	Average Meter Temperature °F	<u>78</u>	1.74
Pstk	Average Stack Pressure - in. H ₂ O	<u>-2.2</u>	78.
Tstk	Average Stack Temperature °F	<u>314</u>	-2.2
Vm	Meter Volume at Meter Conditions - Ft ³	<u>43.43</u>	314.
V1	Total Water Vapor Collected - ml	<u>460.3</u>	43.43
→ CO ₂	% CO ₂ in Stack Gas (Dry)	<u>0</u>	460.3
O ₂	% O ₂ in Stack Gas (Dry)	<u>20.9</u>	0.
→ CO	% CO in Stack Gas (Dry)	<u>0</u>	20.9

Input B

Mn	Total Particulate Catch - Mg	<u>~~44.4~~ 44.2</u>	<u>Cond</u> 44.2

Input C

% H	% Hydrogen in Fuel		42.08780837
% C	% Carbon in Fuel		33.99848035
% S	% Sulfur in Fuel		25.15192467
% N	% Nitrogen in Fuel		3996.951063
% O	% Oxygen in Fuel		27099.32821
GCV	Gross Calificoric Volume of Fuel - BTU/lb		12049.63616
			111.3540457

Calculated

Vm (std)	Meter Volume at Standard Conditions (Dry)-Ft ³	<u>42.1</u>	
% H ₂ O	% H ₂ O Vapor in Stack Gas	<u>34.0</u>	.0000023152
Mws	Molecular Weight of Stack Gas (Wet)	<u>25.1</u>	1.67385601
Vs	Average Velocity of Stack Gas - FPM	<u>4000</u>	
Qs	Actual Stack Gas Flowrate - ACFM	<u>~~31500~~ 27100</u>	
Qs (std)	Stack Gas Flowrate (0.0% H ₂ O; STP) - DSCFM	<u>~~19000~~ 12000</u>	
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)	<u>111.4</u>	
Cs	Particulate Concentration-lb/DSCF	<u>0.232</u>	<u>0.233x10⁻⁵</u> <u>2.18x10⁻⁵</u>
Er	Particulate Emission Rate-lb/hour	<u>1.67</u>	<u>~~1.95~~ 1.68</u> <u>~~18~~ 15.7</u>
F	F Factor - DSCF/MM BTU		
E	Particulate Emissions - lbs/MM BTU		

PARTICULATE TEST DATA

TEST 5X-3 TIME 1159-1430
 LOCATION Inlet DATE June 11, 1981
 FIRM Georgia-Pacific Springfield PROJECT NO. 1460-E80

Input A

P bar	Barometric Pressure - in. Hg	29.65
As	Stack Area - Ft ²	6.78
Dn	Nozzle Diameter - in.	0.255
Time	Total Sampling Time - min.	65
Y	Calibration Factor	0.99
Cp	Pitot Coefficient	0.84
(ΔP) 1/2	Average Square Root of Velocity Head (in. H ₂ O)	0.92
ΔH	Average Orifice Pressure Drop - in. H ₂ O	1.48
Tm	Average Meter Temperature °F	69
Pstk	Average Stack Pressure - in. H ₂ O	-1.8
Tstk	Average Stack Temperature °F	309
Vm	Meter Volume at Meter Conditions - Ft ³	43.09
V ₁	Total Water Vapor Collected - ml	420
→ CO ₂	% CO ₂ in Stack Gas (Dry)	0
O ₂	% O ₂ in Stack Gas (Dry)	20.9
→ CO	% CO in Stack Gas (Dry)	0

Input B

Mh Total Particulate Catch - Mg

Input C

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

Calculated

Vm (std)	Meter Volume at Standard Conditions (Dry)-Ft ³	42.4
% H ₂ O	% H ₂ O Vapor in Stack Gas	31.8
Mws	Molecular Weight of Stack Gas (Net)	25.4
Vs	Average Velocity of Stack Gas - FPM	4020
Qs	Actual Stack Gas Flowrate - ACFM	37200
Qs (std)	Stack Gas Flowrate (0.0% H ₂ O; STP) - DSCFM	12600
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)	99.2
Cs	Particulate Concentration-lb/DSCF	0.103 x 10 ⁻⁵ / 1.67 x 10 ⁻⁵
Er	Particulate Emission Rate-lb/hour	0.773 / 12.6
F	F Factor - DSCF/MM BTU	
E	Particulate Emissions - lbs/MM BTU	

PARTICULATE TEST DATA

TEST 5X-1 TIME 1400 to 1732
 LOCATION Outlet DATE June 9, 1981
 FIRM GP-Spfd / EPA-Plywood PROJECT NO. 1460-E80

Input A

P bar	Barometric Pressure - in. Hg	<u>29.75</u>
As	Stack Area - Ft ²	<u>63.62</u>
Dn	Nozzle Diameter - in.	<u>0.504</u>
Time	Total Sampling Time - min.	<u>96</u>
Y	Calibration Factor	<u>1.00</u>
Cp	Pitot Coefficient	<u>0.84</u>
(ΔP) ^{1/2}	Average Square Root of Velocity Head (in. H ₂ O)	<u>0.115</u>
ΔH	Average Orifice Pressure Drop - in. H ₂ O	<u>0.70</u>
Tm	Average Meter Temperature °F	<u>81</u>
Pstk	Average Stack Pressure - in. H ₂ O	<u>0</u>
Tstk	Average Stack Temperature °F	<u>166</u>
Vm	Meter Volume at Meter Conditions - Ft ³	<u>39.43</u>
Vl	Total Water Vapor Collected - ml	<u>505.2</u>
CO ₂	% CO ₂ in Stack Gas (Dry)	<u>0</u>
O ₂	% O ₂ in Stack Gas (Dry)	<u>20.9</u>
CO	% CO in Stack Gas (Dry)	<u>0</u>

Input B

Mh	Total Particulate Catch - Mg	<u>56.9</u>	<u>230</u>

Input C

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

Calculated

Vm (std)	Meter Volume at Standard Conditions (Dry)-Ft ³	<u>38.3</u>
% H ₂ O	% H ₂ O Vapor in Stack Gas	<u>35.3</u>
Mws	Molecular Weight of Stack Gas (Wet)	<u>24.7</u>
Vs	Average Velocity of Stack Gas - FPM	<u>457</u>
Qs	Actual Stack Gas Flowrate - ACFM	<u>29100</u>
Qs (std)	Stack Gas Flowrate (0.0% H ₂ O; STP) - DSCFM	<u>15100</u>
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)	<u>121.8</u>
Cs	Particulate Concentration-lb/DSCF	<u>0.327 × 10⁻⁵ / 1.32 × 10⁻⁵</u>
Er	Particulate Emission Rate-lb/hour	<u>2.96 / 12.0</u>
F	F Factor - DSCF/MM BTU	
E	Particulate Emissions - lbs/MM BTU	

29.75
63.62
0.504
96
1.00
0.84
0.115
0.70
81
0
166
39.43
505.2
0
20.9
0
56.9
230
38.3
35.3
24.7
457
29100
15100
121.8
0.000032721
2.956774746
121.8313704

0.000032721
2.956774746

(37.4)
(24.8)
(456)
(29,000)
(15,200)
(120.4)

(2.98/12.0)

PARTICULATE TEST DATA

TEST 5X-2 TIME 1400-1530
 LOCATION Outlet DATE June 10, 1981
 FIRM G-P-Spfa/EPA-Plywood PROJECT NO. 1460-E91

Input A

P bar	Barometric Pressure - in. Hg	<u>29.71</u>
As	Stack Area - Ft ²	<u>63.62</u>
Dn	Nozzle Diameter - in.	<u>0.504</u>
Time	Total Sampling Time - min.	<u>96</u>
Y	Calibration Factor	<u>1.0</u>
Cp	Pitot Coefficient	<u>0.84</u>
(ΔP) 1/2	Average Square Root of Velocity Head (in. H ₂ O)	<u>0.132</u>
ΔH	Average Orifice Pressure Drop - in. H ₂ O	<u>0.58</u>
Tm	Average Meter Temperature °F	<u>78</u>
Pstk	Average Stack Pressure - in. H ₂ O	<u>0</u>
Tstk	Average Stack Temperature °F	<u>166</u>
Vm	Meter Volume at Meter Conditions - Ft ³	<u>38.21</u>
V1	Total Water Vapor Collected - ml	<u>475</u>
→ CO ₂	% CO ₂ in Stack Gas (Dry)	<u>0</u>
O ₂	% O ₂ in Stack Gas (Dry)	<u>20.9</u>
→ CO	% CO in Stack Gas (Dry)	<u>0</u>

Input B

Mn Total Particulate Catch - Mg

Part / Cond
41.9 / 215.7

Input C

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

Calculated

Vm (std) Meter Volume at Standard Conditions (Dry)-Ft³
 % H₂O % H₂O Vapor in Stack Gas
 Mws Molecular Weight of Stack Gas (Wet)
 Vs Average Velocity of Stack Gas - FPM
 Qs Actual Stack Gas Flowrate - ACFM
 Qs (std) Stack Gas Flowrate (0.0% H₂O; STP) - DSCFM
 % I % Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)
 Cs Particulate Concentration-lb/DSCF
 Er Particulate Emission Rate-lb/hour
 F F Factor - DSCF/MM BTU
 E Particulate Emissions - lbs/MM BTU

<u>37.3</u>	
<u>37.5</u>	(37.4)
<u>24.8</u>	(24.8)
<u>525</u>	(524)
<u>33400</u>	(33,300)
<u>17500</u>	(17,500)
<u>102.2</u>	(102.1)
<u>.248 x 10⁻⁵ / 1.28 x 10⁻⁵</u>	
<u>2.59 / 13.4</u>	(2.59 / 13.3)

PARTICULATE TEST DATA

TEST 5X-3 TIME 1144-1445
 LOCATION Outlet DATE June 11, 1981
 FIRM G. P. - Spfd. / EPA - Plym PROJECT NO. 1460-E80

Input A

P bar	Barometric Pressure - in. Hg	<u>29.65</u>
As	Stack Area - Ft ²	<u>63.62</u>
Dn	Nozzle Diameter - in.	<u>0.504</u>
Time	Total Sampling Time - min.	<u>96</u>
Y	Calibration Factor	<u>1.0</u>
Cp	Pitot Coefficient	<u>0.84</u>
(ΔP) 1/2	Average Square Root of Velocity Head (in. H ₂ O)	<u>0.125</u>
ΔH	Average Orifice Pressure Drop - in. H ₂ O	<u>0.52</u>
Tm	Average Meter Temperature °F	<u>74</u>
Pstk	Average Stack Pressure - in. H ₂ O	<u>0</u>
Tstk	Average Stack Temperature °F	<u>168</u>
Vm	Meter Volume at Meter Conditions - Ft ³	<u>3812</u>
Vl	Total Water Vapor Collected - ml	<u>520.7</u>
→ CO ₂	% CO ₂ in Stack Gas (Dry)	<u>0</u>
O ₂	% O ₂ in Stack Gas (Dry)	<u>20.9</u>
→ CO	% CO in Stack Gas (Dry)	<u>0</u>

Input B

Mh	Total Particulate Catch - Mg	<u>Part 1 Cond</u> <u>61.6 / 147.2</u>

Input C

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

Calculated

Vm (std)	Meter Volume at Standard Conditions (Dry)-Ft ³	<u>37.4</u>
% H ₂ O	% H ₂ O Vapor in Stack Gas	<u>39.6</u>
Mws	Molecular Weight of Stack Gas (Wet)	<u>24.5</u>
Vs	Average Velocity of Stack Gas - FPM	<u>500</u>
Qs	Actual Stack Gas Flowrate - ACFM	<u>31,800</u>
Qs (std)	Stack Gas Flowrate (0.0% H ₂ O; STP) - DSCFM	<u>16000</u>
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stk Vel)	<u>111.8</u>
Cs	Particulate Concentration-lb/DSCF	<u>.363 x 10⁻⁵ / .867 x 10⁻⁵</u>
Er	Particulate Emission Rate-lb/hour	<u>3.49 / 8.34</u>
F	F Factor - DSCF/MM BTU	
E	Particulate Emissions - lbs/MM BTU	

Part 1
 5X
 29.65
 63.62
 0.504
 96
 1.0
 0.84
 0.125
 0.52
 74
 0
 168
 520.7
 0
 20.9
 0
 37.40595336
 39.60052373
 24.54488725
 500.314188
 31829.98864
 16017.90067
 111.7691712
 .0000036305
 3.489183297

APPENDIX A.2
EPA METHOD 25 - RESULTS

A-8

Test Run Number Date Analytical Laboratory	1			2			3			Average			
	6-9-81			6-10-81			6-10-81			Average			
	TRC	PCS	NCASI	TRC	PCS	NCASI	TRC	PCS	NCASI	TRC	PCS	NCASI	
Scrubber Inlet (lb C ₁ /hr)	27.4	19.8	28.0	33.2	31.2	29.0	50.3	25.9	31.4	37.0	25.6	29.5	30.7
Scrubber Outlet (lb C ₁ /hr)	50.4	43.9	37.3	55.4	30.8	39.9	38.0	27.1	27.7	47.9	33.9	35.0	38.9
Scrubber Efficiency (%)	-83.9	-122	-33.2	-66.9	1.3	-37.6	24.5	-4.6	11.8	-29.5	-32.4	-18.6	-26.7

TABLE A-3

SUMMARY OF EPA METHOD 25 EMISSION MEASUREMENTS

Georgia-Pacific Plywood Plant, Springfield, Oregon
(Analysis by TRC)

Test Run Number	1				2			
	6-9-81		6-10-81		6-10-81		6-10-81	
	Scrubber Inlet	Scrubber Outlet	Scrubber Inlet	Scrubber Outlet	Scrubber Inlet	Scrubber Outlet	Scrubber Inlet	Scrubber Outlet
Location	25-1-81-A	25-1-81-B	25-1-81-A	25-1-81-B	25-2-81-A	25-2-81-B	25-2-81-A	25-2-81-B
Sample Number	25-1-81-A	25-1-81-B	25-1-81-A	25-1-81-B	25-2-81-A	25-2-81-B	25-2-81-A	25-2-81-B
Sample Volume (liters)	2.64	2.78	3.08	3.38	2.64	2.68	2.65	2.58
Condensable Concentration (ppm C ₁)								
H ₂ O Ice Trap	477	245	815	758	483	489	465	792
CO ₂ Ice Trap	300	601	278	740	163	212	332	303
TOTAL	777	846	1093	1498	646	701	797	1095
Noncondensable Concentration (ppm C ₁)	409	n.d.	546	388	804	814	687	810
Total Sampled Concentration (ppm C ₁)	1186	846*	1637	1886	1450	1515	1484	1905
Pair Average (ppm C ₁)	1186		1763		1483		1695	
Emission Rate (lbs C ₁ /hr)	27.4		50.4		33.2		55.4	
Scrubber Efficiency* (%)		-83.9				-66.9		
Test Run Number	3				3			
	6-11-81		6-11-81		6-11-81		6-11-81	
	Scrubber Inlet	Scrubber Outlet	Scrubber Inlet	Scrubber Outlet	Scrubber Inlet	Scrubber Outlet	Scrubber Inlet	Scrubber Outlet
Location	25-3-81-A	25-3-81-B	25-3-81-A	25-3-81-B	25-3-81-A	25-3-81-B	25-3-81-A	25-3-81-B
Sample Number	25-3-81-A	25-3-81-B	25-3-81-A	25-3-81-B	25-3-81-A	25-3-81-B	25-3-81-A	25-3-81-B
Sample Volume (liters)	2.28	3.10	2.94	3.14				
Condensable Concentration (ppm C ₁)								
H ₂ O Ice Trap	545	940	831	441				
CO ₂ Ice Trap	469	433	196	193				
TOTAL	1014	1373	1027	634				
Noncondensable Concentration (ppm C ₁)	1102	786	443	424				
Total Sampled Concentration (ppm C ₁)	2116	2159	1470	1058				
Pair Average (ppm C ₁)	2138		1264					
Emission Rate (lbs C ₁ /hr)	50.3		38.0					
Scrubber Efficiency** (%)		24.5						

n.d.: none detected (tank leaked).

* Concentration not included in calculation of average.

** 100 [(inlet (lbs/hr) - outlet (lbs/hr))/inlet (lbs/hr)]

TABLE A-4

SUMMARY OF EPA METHOD 25 EMISSION MEASUREMENTS

Georgia-Pacific Plywood Plant, Springfield, Oregon
(Analysis by PCS)

Test Run Number Date Location Sample Number	1				2			
	6-9-81		6-10-81		6-10-81		6-10-81	
	Scrubber Inlet 25-1-SI-C	Scrubber Inlet 25-1-SI-D	Scrubber Outlet 25-1-SO-C	Scrubber Outlet 25-1-SO-D	Scrubber Inlet 25-2-SI-C	Scrubber Inlet 25-2-SI-D	Scrubber Outlet 25-2-SO-C	Scrubber Outlet 25-2-SO-D
Sample Volume (liters)	2.652	2.773	2.471	2.947	2.112	2.677	2.704	3.698
Condensable Concentration (ppm C ₁)								
H ₂ O Ice Trap	510	720	1180	905	539	550	598	571
CO ₂ Ice Trap	268	164	406	117	352	368	110	102
TOTAL	778	884	1586	1022	891	918	716	673
Noncondensable Concentration (ppm C ₁)	25.0	22.5	323	146	433	542	317	178
Total Sampled Concentration (ppm C ₁)	803	907	1909	1168	1324	1460	1033	851
Pair Average (ppm C ₁)	885		1539		1392		942	
Emission Rate (lbs C ₁ /hr)	19.8		43.9		31.2		30.8	
Scrubber Efficiency* (%)		-122				1.3		
Test Run Number Date Location Sample Number	3				3			
	6-11-81		6-11-81		6-11-81		6-11-81	
	Scrubber Inlet 25-3-SI-C	Scrubber Inlet 25-3-SI-D	Scrubber Outlet 25-3-SO-A	Scrubber Outlet 25-3-SO-B	Scrubber Inlet 25-3-SI-C	Scrubber Inlet 25-3-SI-D	Scrubber Outlet 25-3-SO-A	Scrubber Outlet 25-3-SO-B
Sample Volume (liters)	3.145	3.459	3.135	3.028				
Condensable Concentration (ppm C ₁)								
H ₂ O Ice Trap	496	577	535	414				
CO ₂ Ice Trap	551	316	177	641				
TOTAL	1047	893	712	1055				
Noncondensable Concentration (ppm C ₁)	159	103	55	39.0				
Total Sampled Concentration (ppm C ₁)	1206	996	712	1094				
Pair Average (ppm C ₁)	1101		903					
Emission Rate (lbs C ₁ /hr)	25.9		27.1					
Scrubber Efficiency* (%)		4.6						

* 100 (inlet (lbs/hr) - outlet (lbs/hr))/inlet (lbs/hr)

TABLE A-5

SUMMARY OF EPA METHOD 25 EMISSION MEASUREMENTS

Georgia-Pacific Plywood Plant, Springfield, Oregon
(Sampling and Analysis by NCA&I)

Test Run Number Date Location Sample Number	1				2				3			
	6-9-81		6-10-81		6-11-81		6-11-81		6-11-81		6-11-81	
	Scrubber Inlet 9-1	Scrubber Inlet 9-2	Scrubber Inlet 9-3	Scrubber Inlet 9-4	Scrubber Inlet 10-1	Scrubber Inlet 10-2	Scrubber Inlet 10-3	Scrubber Inlet 10-4	Scrubber Inlet 11-1	Scrubber Inlet 11-2	Scrubber Inlet 11-3	Scrubber Inlet 11-4
Sample Volume (liters*)	8.95	8.97	11.83	11.88	8.84	9.61	5.34	11.06	12.03	10.83	10.51	12.03
Condensable Concentration (ppm C ₁)	1231	1045	1243	1276	1531	863	1270	1040	1143	1155	949	743
Non-Condensable Concentration (ppm C ₁)	61	82	49	45	63	132	24	108	161	209	69	85
Total Sampled Concentration (ppm C ₁)	1292	1127	1292	1321	1594	995	1294	1148	1304	1364	1018	828
Pair Average (ppm C ₁)	1210		1307		1294		1221		1334		923	
Emission Rate (lbs C ₁ /hr)	28.0		37.3		29.0		39.9		31.4		27.7	
Scrubber Efficiency** (%)		-33.2				-37.6				11.8		

* Standard temperature defined as 0°C.
** 100 [(Inlet (lbs/hr) - outlet (lbs/hr))/Inlet (lbs/hr)]

APPENDIX B

SAMPLE EQUATIONS AND CALCULATIONS

B.1 EPA Method 5X

B.2 EPA Method 25

APPENDIX B.1
EPA METHOD 5X

6p

method 5X
EMISSION CALCULATION SYMBOLS

La - Allowable leak rate, cfm

V_{m_total} - Total meter sample volume, ft^3

T_{total} - Total sampling time, min

L_p - Final leak rate of sampling train, cfm

V_{mc_total} - Total volume sampled corrected for excessive leakage, ft^3

Y - Dry gas meter calibration factor, dimensionless

T_{std} - Standard temperature, $^{\circ}F$

$T_{m\_avg.}$ - Average dry gas meter temperature, $^{\circ}F$

P_{bar} - Barometric pressure, "Hg

$\Delta H_{avg.}$ - Average orifice pressure drop, "H₂O

P_{std} - Standard pressure, "Hg

V_I - Volume of liquid collected in impingers, ml

V_{SG} - Volume of liquid collected in silica gel, grams

M_S - Molecular weight of stack gas, lb/lb-mole

%CO₂ - Percent CO₂ by volume (dry basis), %

%CO - Percent CO by volume (dry basis), %

%N₂ - Percent N₂ by volume (dry basis), %

%O₂ - Percent O₂ by volume (dry basis), %

D_{st} - Average duct gas density, lbs/ft^3

P_{s_avg} - Average duct static pressure, "H₂O

T_{s_avg} - Average duct temperature, $^{\circ}F$

EA - Excess air, %

V_s - Average duct velocity, ft/min

C_p - Pitot tube coefficient, dimensionless

$(\sqrt{\Delta P})_{avg}$ - Average square root of velocity head, $\sqrt{"H_2O}$

A_s - Cross-sectional area of duct, ft^2

method 5X

EMISSION CALCULATION SYMBOLS (cont'd)

Q - Duct volumetric flow rate, acfm
Q_{std} - Duct volumetric flow rate, corrected to dry standard conditions, dscfm
D_n - Nozzle diameter, inches
F - F factor, DSCF/MM BTU
%H - Percent by weight of hydrogen in fuel
%C - Percent by weight of carbon in fuel
%S - Percent by weight of sulfur in fuel
%N - Percent by weight of nitrogen in fuel
%O - Percent by weight of oxygen in fuel
GCV - Gross calorific value of fuel, BTU/lb.
C - Actual particulate concentration, grains/acf
C_s - Particulate concentration, grains/dscf
ER - Particulate emission rate, lbs/hr
E - Particulate emissions, lbs/MM BTU
C_s @ 12% CO₂ - Particulate concentration, grains/dscf @ 12% CO₂
C_s @ 50% EA - Particulate concentration, grains/dscf @ 50% EA
C_{Lb} - Particulate concentration, lbs/1000 duct gas
C_{Lb} @ 12% CO₂ - Particulate concentration, lbs/1000 lbs @ 12% CO₂
C_{Lb} @ 50% EA - Particulate concentration, lbs/1000 lbs @ 50% EA
M_n - Total particulate collected, mg

RUN 5X-1-I

1. Allowable Leak Rate

$$La = 0.02 \text{ cfm or } 0.04 \frac{V_m \text{ total}}{T \text{ total}} \quad \text{which ever is less.}$$

$$\frac{0.04 V_m \text{ total}}{T \text{ total}} = \frac{0.04 \times 46.26}{60}$$

$$La = 0.031 \text{ cfm}$$

2. Correction for Excessive Leak Rate

$$Lp = 0.010 \text{ cfm}$$

if $Lp > La$ use V_{mc} total in place of V_m total in all subsequent equations.

$$V_{mc} \text{ total} = V_m \text{ total} - (Lp - La) T \text{ total}$$

$$V_{mc} \text{ total} = \quad - (\quad - \quad) = \quad \text{ft}^3$$

3. Volume of Sample Measured by Dry Gas Meter, Corrected to Standard Conditions

$$V_m \text{ total (std)} = V_m \text{ total} \times \left(\frac{T_{\text{std}} + 460}{T_{m \text{ avg}} + 460} \right) \left[\frac{P_{\text{bar}} + \frac{\Delta H \text{ avg}}{13.6}}{P_{\text{std}}} \right]$$

$$V_m \text{ total (std)} = 46.26 \times 0.99 \left(\frac{68 + 460}{74 + 460} \right) \left[\frac{29.75 + \frac{2.0}{13.6}}{29.92} \right] = 45.36 (0.9888) [0.9992]$$

$$V_m \text{ total (std)} = 45.3 \text{ dscf}$$

4. Moisture Content of Duct Gas

$$\% H_2O = \frac{0.04707 (V_I + V_{SG})}{V_m \text{ total (std)} + 0.04707 (V_I + V_{SG})} \times 100$$

$$\% H_2O = \frac{0.04707 (446 + 5)}{45.3 + 0.04707 (446 + 5)} \times 100$$

$$\% H_2O = 31.9 \%$$

Run 5x-1-I

5. Molecular Weight of Stack Gas

$$M_s = \left[(0.44 \times \% \text{CO}_2) + (0.28 \times \% \text{CO}) + (0.28 \times \% \text{N}_2) + (0.32 \times \% \text{O}_2) \right] \left(1 - \frac{\% \text{H}_2\text{O}}{100} \right) + 0.18 (\% \text{H}_2\text{O})$$

$$M_s = \left[(0.44 \times 0) + (0.28 \times 0) + (0.28 \times 79.1) + (0.32 \times 20.9) \right] \left(1 - \frac{31.9}{100} \right) + 0.18 (31.9)$$

$$M_s = 25.4 \text{ lb/lb-mole}$$

6. Average Duct Gas Density

$$D_{st} = 0.0458 \times M_s \left(\frac{P_{bar} + \frac{P_{s \text{ avg}}}{13.6}}{T_{s \text{ avg}} + 460} \right)$$

$$D_{st} = 0.0458 \times \left(\frac{+ 13.6}{+ 460} \right) \quad NA$$

$$D_{st} = \text{lbs/ft}^3$$

7. Excess Air

$$EA = 100 \left[\frac{\% \text{O}_2 - 0.5 \% \text{CO}}{0.264 \% \text{N}_2 - (\% \text{O}_2 - 0.5 \% \text{CO})} \right]$$

$$EA = 100 \left[\frac{- 0.5 x}{0.264 x - (- 0.5 x)} \right] \quad NA$$

$$EA = \%$$

8. Average Duct Velocity

$$V_s = 5129.4 C_p (\sqrt{\Delta P})_{avg} \sqrt{\frac{T_{s \text{ avg}} + 460}{\left(\frac{P_{bar} + \frac{P_{s \text{ avg}}}{13.6}}{Ms} \right)}}$$

$$V_s = 5129.4 \times 0.34 \times 0.903 \sqrt{\frac{303 + 460}{\left(\frac{29.75 + \frac{-2.1}{13.6}}{25.4} \right)}}$$

$$V_s = 3920 \text{ ft/min}$$

9. Duct Volumetric Flow Rate

$$Q = V_s \times A_s$$

$$Q = 3920 \times 6.78$$

$$Q = 26600 \text{ acfm}$$

10. Duct Volumetric Flow Rate, Corrected to Dry Standard Conditions

$$Q_{std} = Q \left(1 - \frac{\% H_2O}{100} \right) \left(\frac{T_{std} + 460}{T_s \text{ avg} + 460} \right) \left(\frac{P_{bar} + \frac{P_s \text{ avg}}{13.6}}{P_{std}} \right)$$

$$Q_{std} = 26600 \left(1 - \frac{31.9}{100} \right) \left(\frac{68 + 460}{303 + 460} \right) \left(\frac{29.75 + \frac{-2.1}{13.6}}{29.92} \right) \quad (0.9892)$$

$$Q_{std} = 12400 \text{ dscfm}$$

11. Isokinetic Factor

$$I = \frac{5.67 (T_s \text{ avg} + 460) (V_m \text{ std})}{\left(P_{bar} + \frac{P_s \text{ avg}}{13.6} \right) V_s \times T_{total} \left(1 - \frac{\% H_2O}{100} \right) \left(\frac{(Dn)^2 \times 0.7854}{144} \right)}$$

$$I = \frac{5.67 (303 + 460) (45.3)}{\left(29.75 + \frac{-2.1}{13.6} \right) 3920 \times 60 \left(1 - \frac{31.9}{100} \right) \left(\frac{(2.55)^2 \times 0.7854}{144} \right)}$$

$$I = 116.4 \%$$

12. F - Factor NA

$$F = \frac{10^6 (3.64\% H + 1.53\% C + 0.57\% S + 0.14\% N - 0.46\% O)}{GCV}$$

$$F = \frac{10^6 (3.64 \times +1.53 \times +0.57 \times +0.14 \times -0.46 \times)}{}$$

$$F = \text{DSCF/MM BTU}$$

Run 5x-1 - I

13. Actual Particulate Concentration

$$C = \frac{0.01543 \times Mn \left(\frac{T_{std} + 460}{T_{s avg} + 460} \right) \left(\frac{P_{bar} + \frac{P_{s avg}}{13.6}}{P_{std}} \right) \left(1 - \frac{\%H_2O}{100} \right)}{V_{m std}}$$

$$C = \frac{0.01543 \times 582.3 (68 + 460) (29.75 + \frac{-2.1}{13.6}) \left(1 - \frac{31.9}{100} \right)}{45.3 (303 + 460) (29.92)}$$

$$C = 0.092 \text{ grains/acf}$$

14. Particulate Concentration, Corrected to Dry Standard Conditions

$$C_s = 0.01543 \times \frac{Mn}{V_{m std}}$$

$$C_s = 0.01543 \times \frac{582.3}{45.3}$$

$$C_s = 0.198 \text{ grains/dscf} = 2.84 \times 10^{-5} \text{ lbs/dscf}$$

15. Particulate Emission Rate

$$ER = 0.008571 \times C_s \times Q_{std}$$

$$ER = 0.008571 \times 0.198 \times 12400$$

$$ER = 21.1 \text{ lbs/hr.}$$

16. Particulate Emission

$$E = 0.0001429 C_s \times F \left(\frac{20.9}{20.9 - \%O_2} \right)$$

NA

$$E = 0.0001429 \times \quad \times \left(\frac{20.9}{20.9 - \quad} \right)$$

$$E = \quad \text{lbs/MM BTU}$$

17. Particulate Concentration Corrected to Dry Standard Conditions and 12% CO₂

$$C_s @ 12\% CO_2 = \frac{12}{\% CO_2} \times C_s$$

NA

$$C_s @ 12\% CO_2 = \frac{12}{\quad} \times \quad$$

$$C_s @ 12\% CO_2 = \quad \text{grains/dscf @ 12\% CO}_2$$

Modified EPA Method 5X Calculations

All calculations and nomenclature are the same as in Method 5, with the following additions.

Nomenclature

C_e = Ether-chloroform-water blank residue concentration, mg/ml.

m_b = Residue mass from acetone rinse of impingers after ether-chloroform extraction and evaporation, mg.

m_c = Residue mass from EC extraction of impinger water after evaporations, mg.

m_e = Extract residue mass of water blank, mg.

m_f = Residue mass collected on 47 mm filter, mg.

m_o = Total amount of condensed organic matter collected, mg.

V_e = Volume of water blank used in the EC extraction, ml.

V_{ww} = Volume of liquid collected in the impingers, ml.

W_e = Mass of ether-chloroform-water blank extract, mg.

Ether-Chloroform-Water Blank Concentration

$$C_e = \frac{m_e}{V_e}$$

$$W_e = C_e V_{ww}$$

$$m_o = m_c + m_b + m_f - W_e$$

Total Particulate and Condensed Organic Matter Concentration

$$C_t = (0.001 \text{ g/mg}) (m_n + m_o) / V_m (\text{std})$$

APPENDIX B.2
EPA METHOD 25

GP

EPA METHOD 25
(MODIFIED)

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-1-I-A

Date Analyzed: 6/27/81

Laboratory Sample Run No. _____

Analyst: PAL

SAMPLING TRAIN DATA

H₂O Ice Trap No. 215 CO₂ Ice Trap No. 111 Sample Tank No. 5

Sample Tank Data

V (liters) 4.83

P_{ti} (mm Hg) 13.6

P_t (mm Hg) 432.6

P_{tf} (mm Hg) 1514.9

T_{ti} (°C) 284 K

T_t (°C) 295 K

T_{tf} (°C) 299 K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 52

V_{v1} (liters) 4.877

P_{f1} (mm Hg) 1473.6

T_{f1} (°C) 299 K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 111

V_{v2} (liters) 4.86

P_{f2} (mm Hg) 1070.9

T_{f2} (°C) 299 K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ 114.6 ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 136 ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 118 ppm C₁

METHOD 25
CALCULATIONS

GP

25-1-I-4

1. Sample Volume, V_s (m^3 liters)

$$V_s = 0.386 \cdot V \left[\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right]$$

$$V_s = 0.386 (1.4186)(0.00483)$$

$$V_s = 0.00264 \text{ m}^3 = 2.64 \text{ l}$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{ti}}{T_{ti}} \right]} \right] \bar{C}_{tm}$$

$$C_t = \left[3.57 \right] (114.6)$$

$$C_t = 409. \text{ ppm}$$

3. Condensible Organics, C_c (ppm C_1)

a. H_2O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 \left[9.10 \right] (136)$$

$$C_{c1} = 477 \text{ ppm}$$

METHOD 25 CALCULATIONS (Cont.)

b. CO₂ Ice Trap $C_{c2} = 0.386 \left[\frac{V_{v2} P_{f2}}{V_{sT} T_{f2}} \right] \bar{C}_{m2}$

$C_{c2} = 0.386 \left[6.59 \right] (118)$

$C_{c2} = 380 \text{ ppm}$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$C = C_t + C_{c1} + C_{c2}$

$C = 1186 \text{ ppm}$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$M_c = 3.11 \times 10^{-8} C$

$M_c = 3.69 \times 10^{-5}$

APPENDIX C

FIELD DATA SHEETS

- C.1 EPA Methods 1, 2 and 5X
 - C.1.1 Scrubber Inlet
 - C.1.2 Scrubber Outlet
- C.2 EPA Method 25 - Scrubber Inlet
 - C.2.1 TRC Data
 - C.2.2 NCASI Data
- C.3 EPA Method 25 - Scrubber Outlet
 - C.3.1 TRC Data
 - C.3.2 NCASI Data
- C.4 Pressure Drop Measurements and Scrubber Solution Sample Collection

APPENDIX C.1
EPA METHODS 1, 2 and 5X

APPENDIX C.1.1
SCRUBBER INLET

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

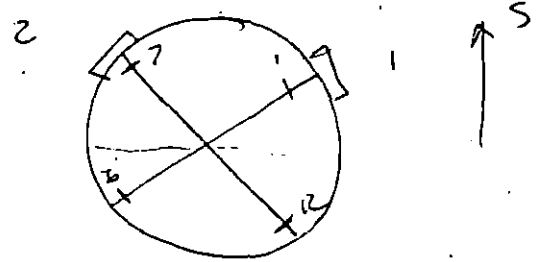
PLANT Georgia Pacific
DATE 2 Nov 1981
SAMPLING LOCATION Scrubber inlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE (DISTANCE A) _____
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE (DISTANCE B) _____
STACK I.D. (DISTANCE A - DISTANCE B) _____
NEAREST UPSTREAM DISTURBANCE 24'
NEAREST DOWNSTREAM DISTURBANCE 30'
CALCULATOR J Powell

SCHEMATIC OF SAMPLING LOCATION

[illegible]

PRELIMINARY VELOCITY TRAVERSE

PLANT Georgia-Pacific
DATE June 8, 1981
LOCATION Scrubber Inlet
STACK I.D. 38" 35.25"
BAROMETRIC PRESSURE, in. Hg 29.66
STACK GAUGE PRESSURE, in. H₂O ~~2.2~~ -2.2
OPERATORS SDP/DDE



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s) , in. H ₂ O	STACK TEMPERATURE (T _s), °F
1	0.47	~~208~~ 300
2	0.49	~~226~~ 300
3	0.76	~~188~~ 300
4	1.10	~~177~~ 300
5	1.10	~~177~~ 300
6	0.95	~~181~~ 300
7	0.60	~~178~~ 300
8	0.87	~~225~~ 300
9	0.94	~~207~~ 300
10	0.89	~~188~~ 300
11	0.77	~~185~~ 300
12	0.80	~~170~~ 300
AVERAGE	0.89	183

EPA (Dur) 233
4/72

0.796 306

3751 JPM
29,560 acfm
16560 DSCFM

~~W-102~~

~~SECRET~~

C-2

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s) , in.H ₂ O	STACK TEMPERATURE (T_s) , °F
AVERAGE		

FIELD MOISTURE DETERMINATION

Location Scrubber Inlet

Comments:

Test: Preliminary Moisture

Date June 8, 1981

Operator SDP/DDE

By Absorption:

Barometric Pressure 29.66

Clock Time	Meter (Ft ³)	Flow Meter Setting (CFH)	Meter Temperature, Tm
1730	125.67	1.0	63
1746	129.00	1.0	62
1756	133.20		
1810	142.90		64

17.23

Tube No.	Weight, grams		
	Final	Initial	Difference
Imp			82
SG			6

(W) = weight of moisture collected = 88

% Moisture by Volume = $\frac{100 \cdot W}{V}$

% Moisture by Volume = $\left(\frac{375 \cdot P \cdot V}{T_m + 460} \right) \cdot W$ 19.4%

by Wet and Dry Bulb Temperature:

Wet Bulb Temp. _____ °F

% Moisture by Wet Bulb Temperature Chart

Wet Bulb Temp. 63

NOMOGRAPH DATA

PLANT Georgia Pacific Springfield Oregon

DATE 6/9/81

SAMPLING LOCATION Inlet Scrubber

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	ΔH_{θ}	1.83
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m\text{ avg.}}$	70
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wa}	19
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.75
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	~~29.75~~ -2.1
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	U/A.
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{ avg.}}$	300
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ avg.}}$	0.7
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ max.}}$	1.1
C FACTOR		0.76
CALCULATED NOZZLE DIAMETER, in.		0.250
ACTUAL NOZZLE DIAMETER, in.		0.255
REFERENCE Δp , in. H ₂ O		0.8



FIELD DATA SHEET

Firm Name Georgia Pacific Orifice No. T-2 Ambient Temp. 70 °F
 Plant Location Engen Oregon Bar. Press. 29.75 "Hg
 Test Number 1 Probe Ident. No. 501/A Filter Ident. No. 3
 Sampling Location Inlet to Scrubber Duct Area 6.78 ft²
 TRC Project No. H60-EBD DIA 35.25 inches
 Date 6/1/81 Plot tube to 3 A
 Tester EDA/MA

Port	Point	Time Min.	Velocity ΔP in H ₂ O	All in H ₂ O	T _M in °F	T _M out °F	P Stack in H ₂ O	T Stack °F	Gas Sample Volume cu. ft.	P R O B E	Cyc. Angle β	Heater Box Temp. °F	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	CO ₂ %
1	1	5	0.35	086	76	75	-21	226	146	25		362	43	4.0	352	35
	2	1	0.91	220	76	75		270	148	83		386	43	7.0	352	37
	3	1	1.10	265	75	75		316	152	77		375	47	10.0	352	345
	4	1	0.95	225	76	75		314	157	20		379	52	10.0	352	340
	5	1	0.82	200	75	75		314	161	35		380	52	10.0	352	347
	6	1	0.62	150	77	76		316	165	27		378	65	7.0	351	348
2	1	5	0.59	145	72	73	-20	314	168	82		377	43	7.0	340	356
	2	1	0.68	165	73	73		314	172	16		385	46	8.0	335	375
	3	1	0.82	195	73	73		314	175	68		335	53	9.6	355	360
	4	1	1.10	265	73	74		314	181	83		363	55	12.0	330	354
	5	1	1.10	265	74	74		314	183	92		367	62	13.0	325	365
	6	1	0.94	225	74	74		313	188	26		367	67	12.0	327	375
									192	61						
Average		Σ-ΔP		000	74	74	-205	303								

H₂O Collected 445.7 ml
 SG Condition 1/2 pink
 SG Weight 5.2 gm
 Total Volume Collected 450.9 ml

Orsat Bag Sample
 Triplicate Analysis, %
 CO₂ O₂ CO N₂

Comments: Missed reading

NOMOGRAPH DATA

PLANT Georgia Pacific
 DATE 9/10/81
 SAMPLING LOCATION Inlet to Scrubber

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	ΔH_{θ}	1.83
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m \text{ avg.}}$	65
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	32
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.71
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	-2
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1
AVERAGE STACK TEMPERATURE, °F	$T_{s \text{ avg.}}$	383
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{avg.}}$	0.95
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{max.}}$	1.10
C FACTOR		0.56
CALCULATED NOZZLE DIAMETER, in.		0.25
ACTUAL NOZZLE DIAMETER, in.		0.255
REFERENCE Δp , in. H ₂ O		—

50
66
300

TRC

FIELD DATA SHEET

Firm Name: Georgian Pipeline Corp. Office No. 7-2
 Plant Location: Spartanburg Ambient Temp. 69 °F
 Test Number: 2 Bar. Press. 29.11 "Hg
 Sampling Location: INLET Probe Ident. No. 501/A
 TRC Project No. 1460-ES0 Filter Ident. No. 5
 Date: June 10, 1981 Diet Area: 6.78 ~~3.44~~ ft²
 Tester: EOH: MAA Rictube ID: 35.25"
 DWA: 38.28

Nozzle No. & Dia. 4-2 0.255 in.
 Assumed Moisture 32.7%
 Test Duration 60 min.
 Traverse Point Interval min.
 Probe Identifier Settling 380±25 °F
 Filter Temp. Settling 380±25 °F
 Dry Gas Meter Y 0.99

Manograph C Factor 0.86
 Pilot Coefficient 0.84
 Orifice All 1.83
 Test Start Time 1418
 Test Final Time 1521
 Leak Test Start -12 CINE 0.015 "Hg
 Leak Test Final -10 CINE 0.013 "Hg
-13 0.016

Port	Point	Time Min.	Velocity in H ₂ O	All in H ₂ O	T _M in °F	T _M out °F	P Stack in H ₂ O	T Stack of	Gas Sample Volume cu. ft.	P R O D	Cyc. Augto	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O ₂ %	CO ₂ %	F.O Temp
1	1	52	061	125	74	73	-21	311	194.12	50	52	349	57	5.0	367	2	350	
2	2	52	110	225	74	74	-21	313	197.19	44	45	344	56	9.0	360		324	
3	3	52	110	225	75	74	-22	313	201.35	40	41	359	59	9.0	364		327	
4	4	52	090	185	75	74	-23	313	205.41	35	36	350	61	8.0	354		331	
5	5	52	083	175	75	74	-23	313	209.18	30	31	352	63	8.0	354		338	
6	6	52	067	140	75	75	-24	311	212.85	25	26	367	63	6.0	360		344	
2	1	50	039	082	81	79	-20	311	216.13	48	49	CHECK		5.0	380		340	
2	2	50	106	135	81	79	-20	311	216.53			378	51	6.0	385		325	
3	3	50	111	150	82	79	-23	315	219.05			350	45	7.0	383		325	
4	4	50	110	225	84	80	-23	317	222.30			335	47	10.0	285		325	
5	5	50	110	225	85	80	-23	319	225.71			346	59	10.0	285		353	
6	6	50	095	195	86	80	-24	317	229.84			390	54	9.0	335		375	
Average		Σ-JAP	174	174	78	78	-22	314	237.95			315	55		327			
										413.43								

Orsat Bag Sample
 Triplicate Analysis, 1

CO ₂	O ₂	CO	N ₂

H₂O Collected 448.2 ml
 SG Condition 12.1 gm
 SG Weight 460.3 ml
 Total Volume Collected

COMMENTS:

C-7 1448

NOMOGRAPH DATA

PLANT Georgia Pacific
 DATE 6/11/81
 SAMPLING LOCATION Inlet

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	ΔH_0	1.83
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m \text{ avg.}}$	75
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{w0}	33
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.65
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times \text{STACK GAUGE PRESSURE in in. H}_2\text{O}$)	P_s	-1.9
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	—
AVERAGE STACK TEMPERATURE, °F	$T_{s \text{ avg.}}$	310
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{avg.}}$	0.9
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{max.}}$	1.1
C FACTOR	≈ 0.54	
CALCULATED NOZZLE DIAMETER, in.	0.25	
ACTUAL NOZZLE DIAMETER, in.	0.255	
REFERENCE Δp , in. H ₂ O	1.05	



FIELD DATA SHEET

Firm Name Geogig PacificOrifice No. T-2Plant Location Geogig FieldAmbient Temp. 60 °FTest Number 3Bar. Press. 29.65 "HgSampling Location INLETProbe Ident. No. 501 / ATRC Project No. 1410-EB0-20Filter Ident. No. 6-78 ~~78~~ Ft²Date 6/1/8128-15

35.725" ID

Tester EDANozzle No. & Dia. 4-2 0.255 in.Assumed Moisture 33Test Duration 60 min.Traverse Point Interval 5 min.Probe Heater Setting 380 ± 25 °FFilter Temp. Setting 380 ± 25 °FDry Gas Meter Y 0.99

Nomograph

C Factor 0.55Pitot Coefficient 0.84Orifice Alt_a 1.83Test Start Time 1159Test Final Time 1430Leak Test Start 0.005 CIMELeak Test Final 0.005 CIME

CIME -12 "Hg

CIME -10 "Hg

Port	Point	Time Min.	Velocity ΔP in H ₂ O	Alt in H ₂ O	T _M in °F	T _M out °F	P Stack in H ₂ O	T _{Stack} °F	Gas Sample Volume cu. ft.	P R O B E	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O ₂ %	CO ₂ %	BACK HALF FILTER
1	1	5	060	105	67	64	-19	296	240	0		372	43	5	363			340
2	2	1	100	175	68	65	-19	308	242	89		366	41	7	362			335
3	3	1	099	170	67	65	-19	313	246	43		360	43	7	364			337
4	4	1	091	160	68	66	-19	311	250	02		377	45	7	366			350
5	5	1	076	135	68	67	-19	311	253	53		369	46	7	346			351
6	6	1	065	115	68	67	-19	312	256	78		367	47	7	365			360
2	1	1	051	085	72	71	-16	300	259	96		354	50	4	367			350
2	2	1	072	125	72	71	-17	312	262	57		363	49	6	355			337
3	3	1	078	135	72	71	-17	312	265	65		360	49	6	375			363
4	4	1	110	190	72	71	-17	312	268	97		360	49	6	375			363
4	4	1	110	190	72	71	-17	312	272	78		360	50	8	375			363
5	5	1	110	190	72	71	-17	310	276	11		328	50	9	373			374
6	6	1	085	150	73	73	-16	310	279	92		324	53	8	355			374
Average			$\Sigma \Delta P$	148	69	69	-18	309	283.36									

COMMENTS: 8 Pump calibrationpull vac or after had to shut downtop of divider jar

43-26

43.09

Orsat Bag Sample

Triplicate Analysis, %

CO ₂	O ₂	CO	N ₂

H₂O Collected 410.6 mlSG Condition 9.4 gmSG Weight 9.4 gmTotal Volume Collected 420 ml

APPENDIX C.1.2
SCRUBBER OUTLET

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

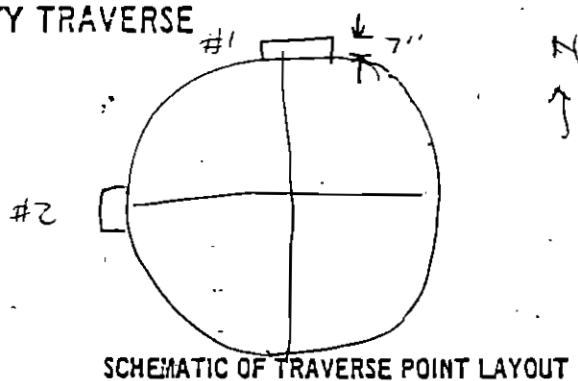
PLANT George Pacific
 DATE 8 June 81
 SAMPLING LOCATION Scrubber outlet
 INSIDE OF FAR WALL TO
 OUTSIDE OF NIPPLE, (DISTANCE A) _____
 INSIDE OF NEAR WALL TO
 OUTSIDE OF NIPPLE, (DISTANCE B) _____
 STACK I.D., (DISTANCE A - DISTANCE B) 9' = 108"
 NEAREST UPSTREAM DISTURBANCE 9'
 NEAREST DOWNSTREAM DISTURBANCE 6'
 CALCULATOR JP

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.011	108"	1.2		
2	0.032		3.5		
3	0.055		5.9		
4	0.079		8.5		
5	0.105		11.3		
6	0.132		14.3		
7	0.161		17.4		
8	0.194		21.0		
9	0.230		24.8		
10	0.272		29.4		
11	0.323		34.9		
12	0.398		43.0		
13	0.602		65.0		
14	0.677		73.1		
15	0.728		78.6		
16	0.770		83.2		
17	0.806		87.0		
18	0.839		90.6		
19	0.868		93.7		
20	0.895		96.7		
21	0.921		99.5		
22	0.945		102.1		
23	0.968		104.5		
24	0.989		106.8		

PRELIMINARY VELOCITY TRAVERSE

PLANT Georgia Pacific
 DATE June 8, 1981
 LOCATION Outlet Scrubber
 STACK I.D. 9 ft.
 BAROMETRIC PRESSURE, in. Hg 29.66
 STACK GAUGE PRESSURE, in. H₂O -0.025
 OPERATORS SDP/DF



TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H ₂ O	STACK TEMPERATURE (T_s), °F
1	0.005	161
2	0.006	162
3	0.008	164
4	0.009	163
5	0.012	164
6	0.017	165
7	0.015	164
8	0.010	164
9	0.008	165
10	0.011	165
11	0.012	164
12	0.006	164
13	0.005	165
14	0.004	165
15	0.004	166
16	0.006	166
17	0.006	166
18	0.009	166
19	0.015	166
20	0.039	164
21	0.070	164
22	0.025	164
23	0.068	163
24	0.045	165
AVERAGE	$\overline{V} = 16.2$	

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H ₂ O	STACK TEMPERATURE (T_s), °F
25	0.009	161
26	0.006	162
27	0.002	162
28	0.001	162
29	0.001	161
30	0.003	163
31	0.005	162
32	0.003	162
33	0.004	163
34	0.002	164
35	0.005	163
36	0.017	164
37	0.010	165
38	0.004	164
39	0.002	164
40	0.002	164
41	0.001	163
42	0.002	166
43	0.005	164
44	0.006	167
45	0.006	165
46	0.008	166
47	0.007	163
48	0.064	165
AVERAGE	$\overline{V} = 0.095$	164

350 fpm
22750 acfm
16100 acfm
C-11

FIELD MOISTURE DETERMINATION

Location Outlet Scrubber

Comments:

Test Preliminary

Date June 8, 1981

Operator S.D. Peirce

By Absorption:

Barometric Pressure 29.66

Clock Time	Meter (Ft ³)	Flow Meter Setting (CFH)	Meter Temperature, Tm
1610	222.19	0.60 in H ₂ O	~~75~~ 75
162	227.0	0.8 in H ₂ O	75
1623	227.44	1.0 in H ₂ O	75
1631	232.10	1.0 in	76
1641	237.54		77

15.35

Tube No.	Weight, grams		
	Final	Initial	Difference
H ₂ O	71.232 ml #2 106 ml	100 100	58
SG			3.5 g

(W) = weight of moisture collected = 61.5

% Moisture by Volume = $\frac{100 \cdot W}{V}$

$$\left(\frac{375 \cdot P \cdot V}{T_m + 460} \right) \cdot W$$

% Moisture by Volume = 15.8%

by wet and dry bulb temperatures:

Wet Bulb Temp. _____ °F % Moisture from Psychrometric Chart

Dry Bulb Temp. _____ °F C-12

NOMOGRAPH DATA

PLANT Georgia Pacific
 DATE Jun 9 1981
 SAMPLING LOCATION Scrubber Outlet

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	ΔH_0	1.76
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m\text{avg.}}$	60
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{w0}	15.8
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.75
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	0
~~RATIO OF STATIC PRESSURE TO METER PRESSURE~~	~~$\frac{P_s}{P_m}$~~	0.84
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{avg.}}$	164
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta P_{\text{avg.}}$	0.095
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta P_{\text{max.}}$	0.08
C FACTOR		0.76
CALCULATED NOZZLE DIAMETER, in.		0.48
ACTUAL NOZZLE DIAMETER, in.		0.504
REFERENCE Δp , in. H ₂ O		0.045



FIELD DATA SHEET

Plant Name Georgian Pacific
Plant Location Springfield
Test Number 1
Sampling Location Scrubland
TIC Project No. 1440-ES8
Date June 2, 1981
Tester SDP/DFE

Orifice No. T-1
Ambient Temp. 60° °F
Bar. Press. 29.75 "Hg
Probe Ident. No. 1001/D
Filter Ident. No. 636
Inlet Area 9 Dia.
636

Nozzle No. & Dia. 1.504 In.
Assumed Moisture 16.0 min.
Test Duration 96 min.
Transverse Point Interval 2 min.
Probe Heater Setting 350 °F
Filter Temp. Setting 350 °F
Dry Gas Meter Y 1.0

Manograph C Factor 0.76
Pilot Coefficient 0.84
Orifice ΔP 1.76
Test Start Time 1400
Test Final Time 1732
Leak Test Start 0.01 CINE 10 "Hg
Leak Test Final 0.07 CINE 10 "Hg

Port	Point	Time Min.	Velocity AP In H ₂ O	All In H ₂ O	T _H In °F	T _H out °F	P _{Stack} In H ₂ O	T _{Stack} Op	Gas Sample Volume cu. ft.	P R O D R	Cyc. Angle β	Heater Box Temp.	Temp. of Gas Leaving Condenser Op	Temp Vac. In Hg	Probe Temp. of	O ₂ %	CO ₂ %	F.O. Temp
1	1	0	0.19	75	77	80	0.0	166	238	22		351	328	0.5	328			326
2	2	2	0.09	36	78	76		166	239	27		355	326	0.5	326			325
3	3	4	0.09	36	78	77		165	240	28		353	326	0.5	326			325
4	4	6	0.10	39	78	77		162	240	74		351	329	0.5	329			328
5	5	8	0.16	39	78	77		164	241	26		352	328	0.5	328			330
6	6	10	0.11	43	78	77		167	242	60		346	330	0.5	330			332
7	7	12	0.10	39	78	77		168	242	75		351	328	0.5	328			329
8	8	14	0.03	13	78	77		169	243	45		362	331	0.5	331			329
9	9	16	0.03	13	78	77		170	244	55		370	330	0.5	330			328
10	10	18	0.07	27	83	81		171	244	29		373	325	0.5	325			330
11	11	20	0.12	48	83	81		170	244	87		370	321	0.5	321			325
12	12	22	0.09	36	83	81		167	245	52		375	324	0.5	324			323
13	13	24	0.09	36	83	81		166	246	20		350	320	0.5	320			315
14	14	26	0.13	13	83	81		165	246	90		358	319	0.5	319			310
Average			Σ ΔP										✓					

page 1 of 4

Orsat Bag Sample
Tripartite Analysis, 1

CO ₂	O ₂	CO	N ₂

H₂O Collected 460.6 ml
SG Condition THUR
SG Weight 44.6 gm
Total Volume Collected 505.2 ml

COMMENTS:

C-14



FIELD DATA SHEET

Firm Name Chemica Pacific
Plant Location Spokane
Test Number 1
Sampling Location Downer
TIC Project No. 1460-580
Date June 9, 1981
Tester SOP/DPK

Orifice No. T-1
Ambient Temp. 60 °F
Bar. Press. 29.75 "Hg
Probe Ident. No. 101
Filter Ident. No. 63.62 ft.
Inlet Area dig. = 9'

Nozzle No. & Dia. 6.504 in.
Assumed Moisture 16 %
Test Duration 96 min.
Traverse Point Interval 2 min.
Probe Heater Setting 350 °F
Filter Temp. Setting 350 °F
Dry Gas Meter Y 1.0

Manograph
C Factor 0.76
Pilot Coefficient 0.84
Orifice All 1.76
Test Start Time 1400
Test Final Time 1732
Leak Test Start 0.1 CINE 10 "Hg
Leak Test Final 0.01 CINE 10 "Hg

Port	Point	Time Min.	Velocity AP In H ₂ O	All In H ₂ O	T _H In °F	T _H Out °F	P Stack In H ₂ O	T Stack °F	Gas Sample Volume cu. ft.	P R O D	Cyc. Angle	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Temp. Vnc. In Hg	Probe Temp. °F	O ₂ %	CO ₂ %	F.O. Temp
1	15	28	003	13	82	81		165	24740			376	<68	0.5	319			315
	16	30	006	31	82	81		167	24803			373		0.5	316			320
	17	32	006	31	82	81		169	24841			378		0.5	318			319
	18	34	006	31	82	81		171	24913			375		0.5	317			316
	19	36	010	39	82	81		169	24970			376		0.5	320			319
	20	38	035	140	82	81		170	25021			374		0.5	322			322
	21	40	040	158	81	80		169	25194			378		0.5	320			329
	22	42	045	176	81	80		170	25291			376		0.5	321			320
	23	44	030	120	81	80		168	25412			374		0.5	324			327
	24	46	020	080	81	80		167	25560			375		0.5	325			321
2	1	48	008	031	82	81		160	25670			370		0.5	320			341
	2	50	008	031	82	81		165	25746			365		0.5	320			320
	3	52	010	040	82	81		165	25813			371		0.5	319			321
Average			Σ-ΔP															

P. 2 of 4

Orsat Bag Sample
Triplet Analysis

CO ₂	O ₂	CO	N ₂

COMMENTS:

H₂O Collected 460.6 ml
SC Condition
SC Weight 44.6 gm
Total Volume Collected 508.2 450.9 ml



FIELD DATA SHEET

Firm Name Deveria Pacific Office No. T-1
Plant Location Springfield Ambient Temp. 60 °F
Test Number 1 Bar. Press. 29.75 "Hg
Sampling Location Scrubber Outlet Probe Ident. No. 10
Filter Ident. No. 11A
TMC Project No. 1460 E80 Inlet Asset dec
Date June 9, 1981 9
Tester SDP/DDE

Nozzle No. & Dia. 1.504 In.
Assumed Moisture 16.0 min.
Test Duration 96 min.
Transverse Point Interval 2 min.
Probe Heater Setting 750 °F
Filter Temp. Setting 750 °F
Dry Gas Meter Y 7.0

Manograph C Factor 0.76
Pilot Coefficient 0.84
Orifice dia. 1.76
Test Start Time 1400
Test Final Time 1732
Leak Test Start 0.01 "Hg
Leak Test Final 0.01 "Hg

Port	Point	Time Min.	Velocity ft/min	All In H ₂ O	T _H In °F	T _H Out °F	T _H In H ₂ O	T _{Stack} °F	Gas Sample Volume cu. ft.	P n	Cyc. Angle β	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. In Hg	Probe Temp. °F	O ₂ %	F.O. Temp
2	4	54	010	40	82	81		164	258	74		371	<68	0.5	319		335
3	5	56	010	40	82	81		165	250	13		370		0.5	320		332
4	6	58	042	155	82	81		166	260	20		370		0.5	323		328
5	7	60	050	200	82	81		166	261	42		372		0.5	319		328
6	8	62	060	400	82	81		164	262	60		371		0.5	321		330
7	9	64	013	060	82	81		163	265	36		369		0.5	315		323
8	10	66	056	200	82	81		165	265	77		372		0.5	319		321
9	11	68	050	260	82	81		164	267	20		376		0.5	319		323
10	12	70	000	400	82	81		165	270	00		380		0.5	319		321
11	13	72	010	040	82	81		165	272	09		379		0.5	315		323
12	14	74	006	023	82	81		166	272	15		381		0.5	317		327
13	15	76	007	027	82	81		165	272	85		379		0.5	315		324
14	16	78	005	011	82	81		166	273	44		375		0.5	319		321
15	17	80	005	019	82	81		165	273	92		380		0.5	317		
Average			ΣΔP														

p. 3 of 4

Orsat Bag Sample
Triplicate Analysis, %

CO ₂	O ₂	CO	N ₂

COMMENTS:

H₂O Collected 460.6 ml
SG Condition 44.6 gm
SG Weight 55.2 gm
Total Volume Collected 505.2 ml



FIELD DATA SHEET

Firm Name Georgia Pacific
Plant Location Danville
Test Number 1460 E20
Sampling Location Danville
TMC Project No. 1460 E20
Date June 9, 1981
Tester SDP/PDE

Orifice No. I-1
Ambient Temp. 60 °F
Bar. Press. 29.75 "Hg
Probe Ident. No. 10
Filter Ident. No. 9
Inlet Area dia

Nozzle No. & Dia. 504 In.
Assumed Moisture 16.0 min.
Test Duration 96 min.
Traverse Point Interval 2 min.
Probe Identifier Settling 350 °F
Filter Temp. Settling 350 °F
Dry Gas Motor V 1.0

Manograph C Factor 0.76
Pilot Coefficient 0.84
Orifice Δh_A 1.76
Test Start Time 1400
Test Final Time 1732
Leak Test Start 0.01 CINE 10 "Hg
Leak Test Final 0.01 CINE 10 "Hg

Port	Point	Time Min.	Velocity AP In H ₂ O	All In H ₂ O	T _M In °F	T _M out °F	P Stack In H ₂ O	T Stack of	Gas Sample Volume cu. ft.	P R O Angle	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. In Hg	Probe Temp. °F	O ₂ %	F.O Temp
2	18	62	0.03	0 1 1	82	82		165	274	0	376	<68	0.5	317		321
	19	84	0.03	0 1 1	82	82		165	274	4	380		0.5	321		328
	20	86	0.03	0 1 1	82	82		164	275	6	381		0.5	319		334
	21	88	0.03	0 1 1	82	82		163	278	3	379		0.5	317		330
	22	90	0.03	0 1 1	82	82		164	276	0	378		0.5	319		332
	23	92	0.06	0 2 1	82	82		164	276	46	381		0.5	318		330
	24	94	0.06	0 2 1	82	82		166	277	00	384		0.5	317		342
		96							277	65						
Average			3-5AP	70	81	81	000	166								

p. 484

39.43

H₂O Collected 460.6 ml
SG Condition 44.6
SG Weight 5.2 gm
Total Volume 510.2 450.9ml

Orsat Bag Sample Triplette Analysis, 1

O ₂	O ₂	CO	N ₂

COMMENTS:

NOMOGRAPH DATA

PLANT Georgia Pacific
 DATE June 10 1981
 SAMPLING LOCATION Scrubber Outlet

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	ΔH_0	1.76
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m\text{avg.}}$	73
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	35
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.71
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	29.71
~~RATIO OF STATIC PRESSURE TO METER PRESSURE~~	~~P_s/P_m~~	0.84
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{avg.}}$	164
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{avg.}}$	0.095
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{max.}}$	0.085
C FACTOR		0.5
CALCULATED NOZZLE DIAMETER, in.		0.48
ACTUAL NOZZLE DIAMETER, in.		0.504
REFERENCE Δp , in. H ₂ O		0.066



FIELD DATA SHEET

Firm Name George Reitz
Plant Location Springfield
Test Number 2
Sampling Location Scrubber
THE Project No. 1460 E80
Date June 10, 1981
Tester SDP/PDF

Orifice No. T-1
Ambient Temp. 68 °F
Bar. Press. 29.21 "Hg
Probe Ident. No. 1001/D
Filter Ident. No. 636 ft.
Inlet Area dia = 9'

Nozzle No. & Dia. .504 in.
Assumed Moisture 35
Test Duration 96 min.
Traverse Point Interval 2 min.
Probe Inlet Settling 350 °F
Filter Temp. Settling 350 °F
Dry Gas Meter Y 1.0

Manograph
C factor 5
Pilot Coefficient .84
Orifice M_A 1.76
Test Start Time 1400
Test Final Time 1640
Leak Test Start 2:005 CIME 10 "Hg
Leak Test Final .01 CIME 10 "Hg

Port	Point	Time Min.	Velocity AP in H ₂ O	All in H ₂ O	T _H in °F	T _H out °F	T _{Stack} in H ₂ O	T _{Stack} °F	Gas Sample Volume cu. ft.	P R O D N	Cyc. Angle °	Heater Box Temp. °F	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O ₂ %	CO ₂ %	F. O. Temp.
1	1	09	055	155	75	74	00	168	280	63		327	<68	1.0	319			327
2	2	02	085	240	75	74		169	281	90		330		15.0	322			328
3	3	04	075	210	75	74		169	283	10		349		18.0	319			352
4	4	06	060	170	75	74		169	285	02		342		18.5	317			351
5	5	08	060	170	75	74		168	286	21		349		18.5	320			356
6	6	10	055	155	77	76		171	287	65		362		18.5	318			356
7	7	12	037	105	78	75		171	289	36		370		14.5	317			371
8	8	14	020	057	78	76		171	290	40		367		7.0	321			372
9	9	16	020	057	78	76		172	291	35		359		7.0	320			376
10	10	18	020	057	78	76		170	292	26		361		7.0	320			379
11	11	20	040	070	78	76		171	293	08		349		17.0	318			375
12	12	22	030	086	78	77		167	295	02		364		16.0	319			380
13	13	24	015	043	78	77		169	295	86		368		5.5	321			576
14	14	26	020	067	78	77		167	296	31		357		7.1	316			581
Average			Σ-ΔP															

p. 1 of 4

H₂O Collected 458.8 ml
SG Condition 16.2 gm
SG Weight 475.0 ml
Total Volume Collected 475.0 ml

Orsat Bag Sample
Triplicate Analysis, 1

CO ₂	O ₂	CO	N ₂

COMMENTS: Point designation
different from previous
test, pt. 1 is all the way
in the stack, pt. 12 is
all the way out



FIELD DATA SHEET

Firm Name Georgia Pacific
Plant Location Springfield
Test Number 2
Sampling Location Scrubber Outlet
TRC Project No. 1460 E80
Date June 10, 1971
Tester SDT/DBE

Orifice No. T-1
Ambient Temp. 68 °F
Bar. Press. 29.71 "Hg
Probe Ident. No. 10
Filter Ident. No. 7
Inlet Area 4.9 ft²

Nozzle No. & Dia. .504 in.
Assumed Moisture 35 min.
Test Duration 96 min.
Transverse Point Interval 2 min.
Probe Heater Setting 350 °F
Filter Temp. Setting 350 °F
Dry Gas Meter Y 1.0

Manograph C Factor 0.5
Pilot Coefficient .84
Orifice Adj. 1.76
Test Start Time 1400
Test Final Time 1640
Leak Test Start .005 CINE 10 "Hg
Leak Test Final .01 CINE 10 "Hg

Port	Point	Time Min.	Velocity AP In H ₂ O	All In H ₂ O	T _H In °F	T _H Out °F	P Stack In H ₂ O	T Stack °F	Gas Sample Volume cu. ft.	P R O D	Cyc. Angle β	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Temp. Vac. In Hg	Probe Temp. °F	O ₂ %	CO ₂ %	F.O. Temp.
1	15	28	0.25	0.72	78	77		167	29	7	41	356	<68	7.0	318			381
	16	30	0.12	0.31	78	77		168	29	8	05	373		9.0	320			383
	17	32	0.12	0.31	78	77		170	29	8	63	380		9.0	316			384
	18	34	0.15	0.43	78	77		171	29	9	31	385		9.4	317			385
	19	36	0.16	0.45	78	77		172	29	9	25	367		6.2	320			389
	20	38	0.20	0.52	78	77		170	30	0	95	330		7.0	321			374
	21	40	0.20	0.52	78	77		170	30	1	60	335		7.0	321			377
	22	42	0.18	0.51	78	77		168	30	2	52	357		7.0	320			377
	23	44	0.18	0.51	78	77		169	30	3	31	337		7.0	316			378
	24	46	0.20	0.57	78	77		169	30	4	21	341		7.0	318			371
		48	0.28						30	4	92							
2	1	50	0.23	0.11	78	77		170	30	4	92	372		0.5	319			310
	2	52	0.25	0.11	78	77		170	30	5	81	360		0.6	322			312
	3	54	0.05	0.14	78	77		169	30	6	10	363		0.7	319			315
Average			Σ-ΔP															

p. 2 of 4

Orsat Bag Sample
Triplicate Analysis, %

CO ₂	O ₂	CO	N ₂

H₂O Collected 458.8 ml
SG Correction 16.2 gms
SG Weight 475 ml
Total Volume Collected

COMMENTS:





FIELD DATA SHEET

Firm Name Leavitt Pacific
Plant Location Spunfield
Test Number 2
Sampling Location Subscriber
TRC Project No. 1460 E80
Date June 10, 1971
Tester SDP/00E

Orifice No. T-1
Ambient Temp. 68 °F
Bar. Press. 29.71 "Hg
Probe Ident. No. 10
Filter Ident. No. 9
Net Area 1.0 ft²

Nozzle No. & Dia. .504 in.
Assumed Moisture 35 %
Test Duration 96 min.
Transverse Point Interval 2 min.
Probe Heater Setting 350 °F
Filter Temp. Setting 350 °F
Dry Gas Meter 1.0

Manograph C Factor 0.5
Pilot Coefficient 0.84
Orifice All 1.76
Test Start Time 1400
Test Final Time 1640
Leak Test Start 0.005 gpm
Leak Test Final 10.1 gpm

Port	Point	Time Min.	Velocity AP In H ₂ O	All In H ₂ O	T _M In °F	T _M Out °F	P Stack In H ₂ O	T Stack °F	Gas Sample Volume cu. ft.	P R O N	Cyc. Angle	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. In Hg	Probe Temp. °F	O ₂ %	CO ₂ %	F.O. Temp
2	4	54	005	014	78	77		164	306	1		364	<68	0.5	324			310
5	5	56	007	020	78	77		163	307	2		363		0.5	323			312
6	6	58	007	020	78	77		162	307	2		374		0.5	321			315
7	7	60	007	020	78	77		161	308	09		369		0.5	324			317
8	8	62	007	020	78	77		161	308	63		375		0.5	321			315
9	9	64	010	028	78	77		161	309	17		365		1.0	320			335
10	10	66	010	028	78	77		168	309	81		370		1.0	323			337
11	11	68	010	028	78	77		163	315	44		376		1.0	315			319
12	12	70	007	020	80	79		166	311	06		372		0.5	317			317
13	13	72	014	035	81	80		164	311	69		365		1.2	324			320
14	14	74	014	035	82	80		165	312	48		369		1.2	320			319
15	15	76	006	017	82	80		162	312	97		370		0.5	324			317
16	16	78	010	028	82	81		165	313	50		371		1.0	321			319
17	17	80	015	043	82	81		165	314	05		376		1.5	327			319
Average		Σ-ΔP																

P. 3.04

Orsat Bag Sample			TriPLICATE ANALYSIS		
CO ₂	O ₂	CO	N ₂		

H₂O Collected 458.8 ml
SG Collected 16.2 gm
SG Weight 475 ml
Total Volume Collected

COMMENTS:



FIELD DATA SHEET

Firm Name Georgian Pacific
Plant Location Springfield
Test Number 2
Sampling Location Outlet
Location Scrubber
TRC Project No. 1460 E80
Date June 10, 1981
Tester SDP/DDE

Orifice No. T-1
Ambient Temp. 68 °F
Bar. Press. 29.71 "Hg
Probe Ident. No. 10
Filter Ident. No. 9
Inlet Assm. dia

Nozzle No. & Dia. 4504 in.
Assumed Moisture 35 min.
Test Duration 96 min.
Traverse Point Interval 2 min.
Probe Inlet Settling 350 of
Filter Temp. Settling 350 of
Dry Gas Meter Y 1.0

Manograph C Factor 0.8
Pilot Coefficient 0.84
Orifice dia. 1.78
Test Start Time 1400
Test Final Time 1640
Leak Test Start 0.005 gpm
Leak Test Final 0.005 gpm

Port	Point	Time Min.	Velocity ΔP in H ₂ O	All in H ₂ O	T _M in °F	T _M out °F	P Stack in H ₂ O	T Stack of	Gas Sample Volume cu. ft.	P R O B	Cyc. Angle β	Heater Box Temp.	Temp. of Gas Leaving Condenser of	Pump Vac. in Hg	Probe Temp. of	O ₂ %	CO ₂ %	F.O. Temp.
2	18	82	0.14	0.41	82	81		159	314			373	<68	1.5	321			315
	19	84	0.12	0.34	82	81		160	315			376		1.2	320			316
	20	86	0.06	0.17	82	81		162	316			370		0.5	319			317
	21	88	0.03	0.10	82	81		162	316			366		0.2	321			318
	22	90	0.05	0.14	82	80		161	317			376		0.5	320			319
	23	92	0.02	0.20	82	80		162	317			376		0.6	321			320
	24	94	0.12	0.34	82	81		161	318			375		0.10	320			319
		96							318									
Average			Σ-ΔP	58	78	78		166	38.21									

P.4 B.4

Orsat Bag Sample
Triplicate Analysis, 1

CO ₂	O ₂	CO	N ₂

H₂O Collected 458.8 ml
SG Completion
SG Weight 16.2 gm
Total Volume Collected 475 ml

COMMENTS:



FIELD DATA SHEET

Firm Name George Pacific
 Plant Location Springfield
 Test Number 3
 Sampling Location Grubber
 TRC Project No. 1460 E80
 Date June 11, 1987
 Tester SDP/DRF

Orifice No. T-1
 Ambient Temp. 60 °F
 Bar. Press. 29.65 "Hg
 Probe Ident. No. 1001/D
 Filter Ident. No. 742/46
 Duct Area 63.62 ft²
 Area = 9'

Nozzle No. & Dia. 504 in.
 Assumed Moisture 35 %
 Test Duration 96 min.
 Traverse Point Interval 2 min.
 Probe Heater Setting 350 °F
 Filter Temp. Setting 350 °F
 Dry Gas Meter Y 1.0

Nomograph C Factor 5
 Pitot Coefficient .84
 Orifice A₁ 1.76
 Test Start Time 1144
 Test Final Time 1445
 Leak Test Start 0.01 CME 10 "Hg
 Leak Test Final 5.01 CME 10 "Hg

Port	Point	Time Min.	Velocity ΔP in H ₂ O	Alt in H ₂ O	T _M in °F	T _M out °F	P _{Stack} in H ₂ O	T _{Stack} °F	Gas Sample Volume cu. ft.	P R O B E	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O ₂ %	CO ₂ %	F.O. Temp
1	1	0	045	125	67	65	0.0	165	319.72		370	<68	1.0	320			314
2	2	02	030	088	67	65		164	320.99		365		0	319			315
3	3	04	051	145	67	65		166	322.09		365		1.2	321			319
4	4	06	051	145	67	65		167	323.42		362		1.0	320			314
5	5	08	050	140	67	65		168	324.78		365		1.0	319			318
6	6	10	039	112	67	65		169	326.10		365		1.0	317			319
7	7	12	015	044	69	67		167	327.39		365		0	321			321
8	8	14	008	024	69	67		166	328.30		363		0	311			315
9	9	16	008	024	69	67		168	328.97		369		0	316			315
10	10	18	008	024	70	68		168	329.57		368		0	320			319
11	11	20	025	072	70	68		167	330.21		370		1.0	321			322
12	12	22	040	112	70	68		166	331.39		370		1.2	322			319
13	13	24	010	035	70	68		167	332.05		369		1.2	319			319
14	14	26	025	072	71	68		168	332.94		368		0	323			316
Average		ΣΔP															

p. 1 of 4

Orsat Bag Sample
Triplicate Analysis, %

CO ₂	O ₂	CO	N ₂

COMMENTS: Pt. 1 all the way
in stack

H₂O Collected 512.4 ml
 SG Condition 8.3 gm
 SG Weight 520.7 ml
 Total Volume Collected



FIELD DATA SHEET

Firm Name Georgia Pacific
 Plant Location SPRINGER
 Test Number 3
 Sampling Location Scrubber
 Location Outlet
 TRC Project No. 1460 E80
 Date June 11, 1971
 Tester SDP / DDE

Orifice No. T-1
 Ambient Temp. 60 °F
 Bar. Press. 14.29.65 "Hg
 Probe Ident. No. 10
 Filter Ident. No. 144 + 146
 Inlet Area 9 ft²
dry

Nozzle No. & Dia. 1504 in.
 Assumed Moisture 35 %
 Test Duration 96 min.
 Traverse Point Interval 2 min.
 Probe Heater Setting 350 °F
 Filter Temp. Setting 350 °F
 Dry Gas Meter Y 1.0

Nonograph
 C Factor .5
 Pitot Coefficient .84
 Orifice All 1.76
 Test Start Time 1144
 Test Final Time 1445
 Leak Test Start 40.01 CMH 10 "Hg
 Leak Test Final 4.01 CMH 10 "Hg

Port	Point	Time Min.	Velocity AP in H ₂ O	All in H ₂ O	T _M in °F	T _M out °F	P _{Stack} in H ₂ O	T _{Stack} °F	Gas Sample Volume cu. ft.	P R O B E	Cyc. Angle β	Heater Box Temp. °F	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O ₂ %	CO ₂ %	F.O. Temp
	15	28	015	044	72	68		168	333.8	9		368	<68	0	321			321
	16	30	015	044	72	69		167	334.7	3		363		0	319			321
	17	32	009	027	72	69		166	335.4	1		364		0	320			317
	18	34	010	029	73	71		168	336.0	7		373		0	320			314
	19	37	015	044	73	71		167	336.7	0		370		0	322			318
	20	38	015	044	73	71		167	337.3	9		373		0	319			315
	21	40	015	044	73	71		168	338.2	1		371		0	316			316
	22	42	010	029	73	71		167	339.0	0		372		0	320			317
	23	44	010	027	73	71		167	339.6	6		358		0	318			323
	24	46	005	014	73	71		165	340.2	8		360		0	323			328
		48							340.7	7		(Change Filter)						
2	P	50	010	029	78	78		169	341.5	4		369		0	321			315
2		50	010	029	78	77		167	342.2	7		370		0	323			315
3		52	010	029	78	78		167	342.9	1		365	✓	0	321			313
Average		Σ-ΔP																

P. 2 of 4

Orsat Bag Sample			
Triplicate Analysis, %			
CO ₂	O ₂	CO	N ₂

COMMENTS: Due to leak-checks between ports, final volume must be adjusted for 0.77 ft³

H₂O Collected 512.4 ml
 SG Condition _____
 SG Weight 8.3 gm
 Total Volume Collected 520.7 ml

C-24

1230
1352



FIELD DATA SHEET

Firm Name Georgia-PacificPlant Location SpringfieldTest Number 3Sampling Location ScrubberTRC Project No. 1460 E80Date June 11, 1981Tester SDP/DOEOrifice No. 7-1Ambient Temp. 60° °FBar. Press. 29.65 "HgProbe Ident. No. 10'Filter Ident. No. 1443/4CDist. Across 9 ftDry Gas Motor Y 1.0Nozzle No. & Dia. 504Assumed Moisture 35Test Duration 96 min.Transverse Point Interval 2 min.Probe Heater Setting 350 °FFilter Temp. Setting 350 °FDry Gas Motor Y 1.0Manograph
C Factor .5Pilot Coefficient .84Orifice M_A 1.76Test Start Time 1144Test Final Time 1445Leak Test Start 0.01 CINE 10 "HgLeak Test Final 0.01 CINE 10 "Hg

Port	Point	Time Min.	Velocity AP in H ₂ O	All in H ₂ O	T _H in °F	T _H out °F	P _{Stack} in H ₂ O	T _{Stack} °F	Gas Sample Volume cu. ft.	P R O D B	Cyc. Angle β	Heater Box Temp.	Temp. of Gas Leaving Condenser Op	Pump Vac. in Hg	Probe Temp. of	O ₂ %	CO ₂ %	F.O. Temp.
2	4	54	0.15	0.44	78	78		168	343	56		363	<68	0	321			316
5	56	0.15	0.44	0.44	78	78		169	344	31		363		0	320			315
6	58	0.15	0.44	0.44	79	78		167	345	10		376		0	318			319
7	60	0.10	0.29	0.29	79	78		169	345	88		361		0	321			320
8	62	0.10	0.29	0.29	79	78		168	346	58		375		0	322			319
9	64	0.09	0.25	0.25	79	78		167	347	23		365		0	321			321
10	66	0.10	0.29	0.29	79	78		169	347	85		370		0	324			319
11	68	0.10	0.17	0.17	79	78		170	348	61		372		0	328			290
12	70	0.10	0.29	0.29	79	78		170	349	01		374		0	329			292
13	72	0.15	0.44	0.44	80	78		171	349	62		376		0	320			290
14	74	0.10	0.29	0.29	80	78		169	350	41		376		0	323			289
15	76	0.10	0.29	0.29	82	80		169	351	06		380		0	321			292
16	78	0.15	0.44	0.44	82	80		169	351	76		378		0	321			295
17	80	10.0	2.80	2.80	82	80		168	352	47		357		0	323			300
Average		Σ-ΔP																

Orsat Bag Sample
Triplet Analysis, %

CO ₂	O ₂	CO	N ₂

COMMENTS:

H₂O Collected 512.4 mlSO₂ Collected 8.3 gmSO₃ Weight 520.7 mlTotal Volume
Collected

p.3 of 4.



FIELD DATA SHEET

Firm Name Genova Pacific
Plant Location Springfield
Test Number 3
Sampling Location Scrubber Outlet
TIC Project No. 1760 E80
Date June 1, 1981
Tester SDP/dac

Orifice No. T-1
Ambient Temp. 60 °F
Bar. Press. 29.65 "Hg
Probe Ident. No. 10
Filter Ident. No. 144, 146
Inlet Apert. 9 in.

Nozzle No. & Dia. 504 in.
Assembled Moisture 35
Test Duration 96 min.
Traverse Point Interval 2 min.
Probe Heater Setting 350 °F
Filter Temp. Setting 250 °F
Dry Gas Meter Y 1.0

Manograph C Factor 0.5
Pilot Coefficient .84
Orifice All 1.76
Test Start Time 1144
Test Final Time 1445
Leak Test Start 0.01 CINE 10 "Hg
Leak Test Final 0.01 CINE 10 "Hg

Port	Point	Time Min.	Velocity AP In H ₂ O	All In H ₂ O	T _H In °F	T _H out °F	P Stack In H ₂ O	T Stack °F	Gas Sample Volume cu. ft.	P O ₂ %	Cyc. Angle °	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. In Hg	Probe Temp. °F	O ₂ %	F.O. Temp
2	18	82	0.10	0.29	81	79		171	354	24		380	<68	0	315		302
	19	84	0.06	0.17	81	79		172	355	10		381		0	319		310
	20	86	0.07	0.20	80	79		172	355	9		366		0	321		299
	21	88	0.05	0.14	81	79		172	356	29		372		0	323		298
	22	90	0.08	0.23	81	79		170	356	8		376		0	324		299
	23	92	0.10	0.29	81	79		171	357	35		372		0	321		302
	24	94	0.10	0.29	81	79		170	358	0		375		0	323		299
		96							358	6							
Average			Σ-ΔP	52	78	78		1168									

38-12 P. 464

Substrate 0.7775

COMMENTS: for mid test check

Orsat Bag Sample Triplicate Analysis, %			
CO ₂	O ₂	CO	N ₂

H₂O Collected 512.4 ml
SG Correction
SG Weight 8.3 gm
Total Volume Collected 520.7 ml

APPENDIX C.2
EPA METHOD 25 - SCRUBBER INLET

APPENDIX C.2.1
TRC DATA

FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>	SAMPLE LOCATION <u>SCRUBBER INLET</u>
PROCESS TYPE <u>PLYWOOD EPA</u>	OPERATOR <u>SDP</u>
DATE <u>9 JUN 81</u>	RUN NUMBER <u>25-1-SI-A</u>
TANK I.D. (s) <u>5</u>	TRAP I.D. (s) <u>H₂O-215</u>
	FILTER I.D. (s) <u>NA</u>
	<u>DRY-111</u>

TANK VACUUM, in Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) <u>742</u> GAUGE <u>30⁺</u> (in Hg) (in Hg)	<u>226</u>	<u>29.75</u>	<u>11°C / 64°F</u> <u>62°F</u>
POST TEST (MANOMETER) <u>323</u> GAUGE <u>16.2</u> (in Hg) (in Hg)	<u>313</u>	<u>11</u>	<u>22°C / 66°F</u>

LEAK RATE, in Hg/10 min.:	TANK	TRAP	FLOW REGULATOR SETTING
PRETEST	<u>0</u>	<u>0</u>	<u>50</u> cc/min.
POST TEST	<u>X</u>	<u>0</u>	REGULATOR I.D. <u>3</u>

TIME	GAGE VACUUM, Inches Hg	COMMENTS
<u>1529</u>	<u>30⁺</u>	<u>FRAPU</u>
<u>1534</u>	<u>30</u>	<u>SAMPLE DRAWN</u>
<u>1539</u>	<u>29.5</u>	<u>FROM 6 FT 1/8" SS</u>
<u>1544</u>	<u>28.5</u>	<u>TUBING. TUBING ALSO</u>
<u>1549</u>	<u>27</u>	<u>USED SIMULTANEOUS</u>
<u>1554</u>	<u>25.5</u>	<u>WITH RUN #</u>
		<u>25-1-SI-B</u>
<u>1559</u>	<u>23.8</u>	<u>Part change</u>
<u>1645</u>	<u>23</u>	<u>Restart</u>
<u>1649</u>	<u>22.5</u>	
<u>1654</u>	<u>21</u>	
<u>1705</u>	<u>19.5</u>	
<u>1709</u>	<u>18.5</u>	
<u>1709</u>	<u>16.5</u>	

FIELD DATA SHEET

C-28

TERMINO FIELD DATA SHEET

C-29

TRAP FIELD DATA SHEET

FACILITY <u>G-P SPRING FELD</u>		SAMPLE LOCATION <u>SCRUBBER INLET</u>	
PROCESS TYPE <u>EPA-PLYWOOD</u>		OPERATOR <u>SDP</u>	
DATE <u>9 JUNE 81</u>		RUN NUMBER <u>25-1-SI-0</u>	
TRAP I.D. (s) <u>67</u>		TRAP I.D. (s) <u>H₂O-232</u> FILTER I.D. (s) <u>NA</u> <u>DRY-107</u>	

TRAP VACUUM, in Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	Ambient TEMPERATURE, °C
PRETEST (MANOMETER) <u>737</u> GAUGE <u>28.5</u> (in Hg) (in Hg)	<u>226</u>	<u>29.75</u>	<u>11°C/62°F</u>
<u>156+144</u> POST TEST (MANOMETER) <u>300</u> GAUGE <u>11.8</u> (in Hg) (in Hg)	<u>313</u>	<u>29.75</u>	<u>28°C/66°F</u>

LEAK RATE, in Hg/10 min.:	TRAP	TRAP	FLOW REGULATOR SETTING <u>51</u> cc/min.
	PRETEST	<u>0</u>	
	POST TEST	<u>X</u>	<u>0</u>

TIME	GAGE VACUUM, Inches Hg	COMMENTS
1529	29	
1534	27	
1539	25.3	
1544	23.8	
1549	22	
1554	21	
1559	20	Port change
1645	19.5	Restart
1649	18	
1654	16.5	
1659	15	
1704	13.8	
1709	11.5	

TURBO FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCRUBBER INLET</u>	
PROCESS TYPE <u>EPA PLYWOOD</u>		OPERATOR <u>SOP</u>	
DATE <u>10 JUN 81</u>		BOX NUMBER <u>25-2-SI-A</u>	
TANK I.D. (s) <u>4</u>		TRAP I.D. (s) <u>H₂O-31</u> <u>DRY-102</u>	
TANK VACUUM, in Hg		STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg
378+366 PRETEST (MANOMETER) <u>30+</u> (in Hg) (In. Hg)		311	29.71
170+159 POST TEST (MANOMETER) <u>4-5</u> (in Hg) (In. Hg)		317	29.71
LEAK RATE, in Hg/10 min.:		TANK	TRAP
PRETEST		0	0
POST TEST		X	0
		FLOW REGULATOR SETTING cc/min.	
		REGULATOR I.D. <u>3</u>	
TIME	GAGE VACUUM, Inches Hg	COMMENTS	
1418	Start	SAMPLE DRAWN FROM	
5	30+	COMMON 6 FT 1/2"	
10	29.2	SS, HEAT TRACED	
15	28	TUBING WITH RUN	
20	26.8	ID 25-2-SI-B	
25	25.2		
30	24	change Port	
1552	23.3	Restart	
35	22.5		
40	21		
45	19.8		
50	18.2		
55	17.3		
1622	16.3		

TRAP FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCAUBER INLET</u>	
PROCESS TYPE <u>EPA/PLYWOOD</u>		OPERATOR <u>SDP</u>	
DATE <u>10 JUNE 81</u>		RUN NUMBER <u>25-2-SI-B</u>	
TANK I.D. (s) <u>21</u>		TRAP I.D. (s) <u>H2O-218</u> <u>024-210</u>	
TANK VACUUM, in Hg		STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg
371+358 PRETEST (MANOMETER) <u>29.8</u> (in Hg) GAUGE (in Hg)		311	29.71
160+148 POST TEST (MANOMETER) <u>13.6</u> (in Hg) GAUGE (in Hg)		317	11
LEAK RATE, in Hg/10 min.:		TANK	TRAP
PRETEST		0	0
POST TEST		X	0
		FLOW REGULATOR SETTING <u>50</u> cc/min.	
		REGULATOR I.D. <u>4</u>	
TIME	GAGE VACUUM, Inches Hg	COMMENTS	
1418 Start	29.8	SAMPLE DRAWN FROM	
5	28.2	COMMON 6 FT' 1/2" SS	
10	26.5	HEAT TRACED TUBING	
15	25.2	WITH RUN 25-2-SI-A	
20	24		
25	23		
30	21.3	change Post	
1552	20.8	Restart	
35	20		
40	18.5		
45	17		
50	16		
55	14.8		
1622 60	13.5		

TENSIO FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCRUBBER INLET</u>	
PROCESS TYPE <u>EPA/PLYWOOD</u>		OPERATOR <u>SOP</u>	
DATE <u>10 JUNE 81</u>		RUN NUMBER <u>25-2-SF-C</u>	
TANK I.D. (s) <u>58</u>		TRAP I.D. (s) <u>H2O 101</u> <u>DRY 209</u>	
TANK VACUUM, in Hg		STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg
<u>378 + 366</u> PRETEST (MANOMETER) <u>744</u> GAUGE <u>29.8</u> (in Hg) (in Hg)		311	29.71
<u>212 + 200</u> POST TEST (MANOMETER) <u>412</u> GAUGE <u>16.8</u> (in Hg) (in Hg)		317	29.71
LEAK RATE, in Hg/10 min.:		TANK	TRAP
PRETEST		0	0
POST TEST		☒	0
		FLOW REGULATOR SETTING <u>50</u> cc/min.	
		REGULATOR I.D. <u>7</u>	

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
1418 Start	29	Start
5	28	
10	27	
15	25.8	
20	24.8	
25	23.8	
30	22.5	change Port
1552	22.5	Restart
35	21.5	
40	20.8	
45	19.8	
50	18.5	
55	17.5	
1622 60	16.8	

INNO FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCRUBBER INLET</u>	
PROCESS TYPE <u>EPA / PLYWOOD</u>		OPERATOR <u>SDP</u>	
DATE <u>10 JUNE 81</u>		RUN NUMBER <u>25-2-SI-D</u>	
TANK I.D. (s) <u>57</u>		TRAP I.D. (s) <u>H2O 27</u> <u>DRY 201</u>	
TANK VACUUM, in Hg		STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg
378+366 PRETEST (MANOMETER) <u>744</u> GAUGE <u>29.6</u> (in Hg) (in. Hg)		311	29.71
167+155 POST TEST (MANOMETER) <u>322</u> GAUGE <u>130</u> (in Hg) (in. Hg)		317	29.71
LEAK RATE, in Hg/10 min.:		TANK	FLOW REGULATOR SETTING
PRETEST		0	52 cc/min.
POST TEST		X -1	REGULATOR I.D. <u>8</u>
TIME	GAGE VACUUM, Inches Hg	COMMENTS	
1418	Start	29	
	5	27.5	
	10	25.6	
	15	24.7	
	20	23	
	25	21.8	
	30	20	change Port
1552		20	Restart
	35	19	
	40	17.5	
	45	16.5	
	50	15.2	
	55	14.2	
1622	60	13.1	

TEST FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>	SAMPLE LOCATION <u>SCRUBBER INLET</u>
PROCESS TYPE <u>EPA/PLYWOOD</u>	OPERATOR <u>SOP</u>
DATE <u>11 JUNE 81</u>	BOX NUMBER <u>825-3-SI-A</u>
TANK I.D. (s) <u>14</u>	TANK I.D. (s) <u>14.0 26</u> FILTER I.D. (s) <u>NA</u>
<u>DRY 225</u>	

TANK VACUUM, in Hg	SEICH TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	AMBIENT TEMPERATURE, °C
$\frac{378+365}{2}$ PRETEST (MANOMETER) <u>743</u> GAUGE (in Hg) <u>29.8</u>	<u>296</u>	<u>29.65</u>	<u>15°C / 59°F</u>
$\frac{198+185}{2}$ POST TEST (MANOMETER) <u>383</u> GAUGE (in Hg) <u>15.3</u>	<u>310</u>	<u>11</u>	<u>12°C / 71°F</u>

LEAK RATE, in Hg/10 min.:	TANK	SEICH	FLOW REGULATOR SETTING
PRETEST	<u>0</u>	<u>0</u>	<u>50</u> cc/min.
POST TEST	<u>X</u>	<u>0</u>	REGULATOR I.D. <u>7</u>

TIME	GAGE VACUUM, Inches Hg	COMMENTS
Start	<u>29.8</u>	
5	<u>28.4</u>	
10	<u>27.5</u>	
15	<u>26.3</u>	
20	<u>24.8</u>	
25	<u>24</u>	
30	<u>22.8</u>	change Port
Restart	<u>22.8</u>	
35	<u>21.8</u>	
40	<u>20.9</u>	
45	<u>19.9</u>	
50	<u>17.3</u>	
55	<u>16.5</u>	
60	<u>15.5</u>	

TRISO FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCRUBBER INLET</u>	
PROCESS TYPE <u>EPA/PLYWOOD</u>		OPERATOR <u>SOP</u>	
DATE <u>11 JUNE 81</u>		RUN NUMBER <u>25-3-SI-A</u>	
TANK I.D. (s) <u>19</u>		TRAP I.D. (s) <u>H₂O 15</u> <u>DRY 205</u>	
TANK VACUUM, in Hg		STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg
$\frac{378 + 365}{1000} = 0.743$ PRETEST (in Hg) <u>743</u> GAUGE <u>29.1</u> (in Hg) (in Hg)		<u>296</u>	<u>29.65</u>
$\frac{134 + 122}{1000} = 0.256$ POST TEST (in Hg) <u>256</u> GAUGE <u>10.0</u> (in Hg) (in Hg)		<u>310</u>	<u>11</u>
LEAK RATE, in Hg/10 min.:		TANK	12.4g TRAP
PRETEST		<u>0.1</u>	FLOW REGULATOR SETTING <u>50</u> cc/min.
POST TEST		<u>X</u>	REGULATOR I.D. <u>8</u>
TIME	GAS VACUUM, Inches Hg	COMMENTS	
Start	28.5		
5	27		
10	25.8		
15	24		
20	22.5		
25	21.2		
30	19.5	Change Port	
Restart	19.5		
35	18		
40	16.7		
45	15		
50	12.3		
55	11.3		
60	10.2		

1202

1353

1423

TRIM FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>	SAMPLE LOCATION <u>SCRUBBER INLET</u>
PROCESS TYPE <u>EPA-PLYWOOD</u>	OPERATOR <u>SOP</u>
DATE <u>11 JUNE 81</u>	BOX NUMBER <u>25-3-SF-C</u>
TANK I.D. (s) <u>71</u>	TRAP I.D. (s) <u>H₂O 213</u> <u>DRY 214</u>
	FILTER I.D. (s) <u>NA</u>

TANK VACUUM, in Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	AMBIENT TEMPERATURE, °C
<u>378 + 365</u> PRETEST (MANOMETER) <u>743</u> GAUGE <u>30+</u> (in Hg) (in Hg)	<u>296</u>	<u>29.65</u>	<u>15°C / 59°F</u>
<u>129 + 117</u> POST TEST (MANOMETER) <u>246</u> GAUGE <u>16</u> (in Hg) (in Hg)	<u>310</u>	<u>29.65</u>	<u>22°C / 71°F</u>

LEAK RATE, in Hg/10 min.:	TANK	TRAP	FLOW REGULATOR SETTING
PRETEST	<u>0</u>	<u>0</u>	<u>50</u> cc/min.
POST TEST	<u>X</u>	<u>0</u>	REGULATOR I.D. <u>4</u>

TIME	GAGE VACUUM, Inches Hg	COMMENTS
Start	<u>29.8</u>	TRAIN SHARES
5	<u>28.3</u>	COMMON GBT 1/8"
10	<u>27</u>	HEATED SS TUBING
15	<u>25.5</u>	WITH 25-3-SF-D
20	<u>23.8</u>	10 DRAW SAMPLE
25	<u>22.5</u>	
30	<u>21</u>	change Part
Restart	<u>20.8</u>	
35	<u>19.5</u>	
40	<u>17</u>	
45	<u>16.4</u>	
50	<u>13</u>	
55	<u>12</u>	
60	<u>11</u>	

1202

1353

1423

TRAP FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCRUBBER INLET</u>	
PROCESS TYPE <u>EPA/PLYWOOD</u>		OPERATOR <u>20P</u>	
DATE <u>11 JUNE 81</u>		RUN NUMBER <u>25-3-SI-D</u>	
TANK I.D. (s) <u>7</u>	TRAP I.D. (s) <u>420 217</u>	FILTER I.D. (s) <u>NA</u>	
<u>DRY 203</u>			

TANK VACUUM, in Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	AIR/VENT TEMPERATURE, °C
$\frac{379+365}{2}$ PRETEST (MANOMETER) <u>744</u> GAUGE <u>30</u> (in Hg) (in Hg)	<u>296</u>	<u>29.65</u>	<u>15°C/59°F</u>
$\frac{105+93}{2}$ POST TEST (MANOMETER) <u>198</u> GAUGE <u>11.3</u> (in Hg) (in Hg)	<u>310</u>	<u>29.65</u>	<u>22°C/71°F</u>

LEAK RATE, in Hg/10 min.:	TANK	TRAIN	FLOW REGULATOR SETTING
PRETEST	<u>0</u>	<u>0</u>	<u>50</u> cc/min.
POST TEST	<u>X</u>	<u>0</u>	REGULATOR I.D. <u>3</u>

TIME	GAGE VACUUM, Inches Hg	COMMENTS
<u>Start</u>	<u>30</u>	<u>TRAIN SHARES</u>
<u>5</u>	<u>28</u>	<u>COMMON GET 1/8" HEATED</u>
<u>10</u>	<u>26.8</u>	<u>SS TUBING WITH</u>
<u>15</u>	<u>25</u>	<u>25-3-SI-C 10</u>
<u>20</u>	<u>23</u>	<u>DRAW SAMPLE</u>
<u>25</u>	<u>21.9</u>	
<u>30</u>	<u>21</u>	<u>Change Port</u>
<u>Restart</u>	<u>20.5</u>	
<u>35</u>	<u>18.3</u>	
<u>40</u>	<u>17.8</u>	
<u>45</u>	<u>15.5</u>	
<u>50</u>	<u>13</u>	
<u>55</u>	<u>12</u>	
<u>60</u>	<u>11</u>	

1202

1353

1453

APPENDIX C.2.2
NCASI DATA

NMVOC DATA SHEET

Sample #810609-1

MILL GEORGIA PACIFIC DATE 6-9-81
 LOCATION SPRINGFIELD OR TIME _____
 SAMPLE SOURCE VENEER PLANT
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

F-23) BEFORE
 X-11) SCRAMBLER

CONNECTIONS AT 355°F - 0 MIN.

3.35 ml H₂O

TANKS USED FOR SAMPLING F AND X
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field _____ ml/min. Calculated _____ ml/min SAMPLE VOLUME _____

TANK F VOLUME 17.50 TRAP 23
 Barometric Pressure _____
 EVACUATED TO 15.43 Tank Temp. 23.0
14.12 Tank Pressure in Field _____
 Hg { Manometer: .53
 Barometric Pressure: 29.77
 Total Pressure: 0.22
 AFTER SAMPLING 2.04 Tank Temp 22.5
6.03 After Pressurization 6.21 Tank Temp 23.5
13.07 Barometric Pressure 30.06 Barometric Pressure
 Hg { Manometer: 29.96
 Gauge: 16.74 Total Pressure 40.97

Vessel 7 VOLUME 3.998 BAROMETRIC PRESSURE _____
 EVACUATED TO _____ Temp _____
 Hg { Manometer: _____
 Gauge: _____
 After Pressurization 13.55 Vessel Temp 23.5
 Barometric Pressure 11.88
 Total Pressure 30.06
55.49

NMVOC DATA SHEET

Sample # 810609

MILL GEORGIA PACIFIC DATE 6-9-81
 LOCATION SPRINGFIELD OR TIME _____
 SAMPLE SOURCE JENNER PLANT
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

X-21
F-28 } B

3.35 H₂O

TANKS USED FOR SAMPLING F AND X
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field _____ ml/min. Calculated _____ ml/min SAMPLE VOLUME _____

TANK X VOLUME 17.46 TRAP 11
 Barometric Pressure _____
 EVACUATED TO 15.45 Tank Temp. 23.0 Tank Pressure in Field _____
14.15
 #Hg { Manometer: .60
 Gauge Pres: 29.77
 Total Pres. 0.17
 AFTER SAMPLING 7.02 Tank Temp 22.5 After Pressurization 6.04 Tank Temp 22.5
6.03
 #Hg { Manometer: 13.05 Barometric Pres 30.16 Barometric Pres 30.16
 Gauge 29.86 Total Pressure 40.78
 Total Pressure 16.81

Vessel 8 VOLUME 4.007 BAROMETRIC PRESSURE _____
 EVACUATED TO _____ Temp _____ After Pressurization 13.49 Vessel Temp 22.5
 #Hg { Manometer: _____ Barometric Pres 11.95
 Gauge _____ Total Pressure 30.16
 Total Pressure 55.50

NMVOC DATA SHEET

Sample # 87-06-10-25

MILL Georgia Pacific DATE 6/10/81
 LOCATION Springfield TIME _____
 SAMPLE SOURCE Combined Vessel Dryer Emissions, Before Scrubber
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

H-12 > BEFORE
 C-12

4.1 ml H₂O

TANKS USED FOR SAMPLING C AND H
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES 10hr
 FLOW RATE, Field 90 ml/min. Calculated _____ ml/min SAMPLE VOLUME _____

TANK H VOLUME 16.79 TRAP 12
 Barometric Pressure _____
 EVACUATED TO 15.52 Tank 22.0 Tank Pressure in Field _____
14.24 Temp. _____
 #Hg { Manometer: 29.97
 Barometric Pres: _____
 Total Pres. 0.99
 AFTER SAMPLING 6.33 Tank 24C AFTER 5.68 Tank 20.0
5.36 Temp _____ Pressurization 4.35 Temp _____
11.69 Barometric Pres 29.16 Barometric Pres _____
 #Hg { Manometer: _____
 Barometric Pres 29.88 Total Pressure 40.09
 Gauge _____
 Total Pressure 18.19

Vessel 5 VOLUME 4.010 BAROMETRIC PRESSURE _____
 EVACUATED TO _____ Temp _____ AFTER 10.04 Vessel 24
 Pressurization 8.46 Temp _____
 Barometric Pres 29.88
 #Hg { Manometer: _____
 Gauge _____ Total Pressure 48.36

NMVOC DATA SHEET

Sample # 810610

MILL Georgia Pacific DATE 6-10-81
 LOCATION Springfield OR TIME _____
 SAMPLE SOURCE Veneer Dryer (After)^s
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

H-12 > BEFORE
 C-17

START OUR 25'S 3 MIN.
 INTO RUN BECAUSE OF C-C-
 IN QUICK CONNECT. & PROBE

3.7 ml H₂O

TANKS USED FOR SAMPLING C AND H
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field ml/min Calculated _____ ml/min SAMPLE VOLUME _____

TANK C VOLUME 17.25 TRAP 17
 Barometric Pressure _____
 EVACUATED TO 15.35 Tank Temp. 22.0 Tank Pressure in field _____
Hg { Manometer: 29.91
 Barometric Press: 29.97
 Total Press. 0.156
 AFTER SAMPLING 6.12 Tank Temp 23 After Pressurization 5.32 Tank Temp 20.0
5.13 Barometric Press 29.97 Barometric Press 29.97
11.25 Total Pressure 18.63 Total Pressure 40.21

Vessel 6 VOLUME 3.997 BAROMETRIC PRESSURE _____
 EVACUATED TO _____ Temp _____ After Pressurization 9.73 Vessel Temp 24
Hg { Manometer: _____ Barometric Press 29.48
 Gauge: _____ Total Press. 47.71

NMVOC DATA SHEET

Sample # 810611-1

MILL Georgia Pacific DATE 6-11-81
 LOCATION Springfield OR TIME _____
 SAMPLE SOURCE Veneer Dryer (Before Scrubber)
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

L - 22 > BEFORE
 I - 24

LITTLE STOP/C GREASE
 ON ALL BALL/SOCKET JOINTS
 IN ENTIRE ASSEMBLY

3.9 ml H₂O

TANKS USED FOR SAMPLING L AND I
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field _____ ml/min. Calculated _____ ml/min SAMPLE VOLUME _____

TANK L VOLUME 17.60 TRAP 22
 Barometric Pressure _____
 EVACUATED 29.66
 TO 15.50 Tank Temp. 24.0
14.16 Tank Pressure on Field OK
 Hg { Manometer: 27.88
 Gauge Pressure: _____
 Total Press. 6.22
 AFTER SAMPLING 4.48 Tank Temp 18.0
3.05 Tank Pressure _____
 Hg { Manometer: _____
 Gauge Pressure: 30.17
 Total Pressure 22.02
 After Pressurization 13.14 Tank Temp 21.5
 Barometric Press 30.00 Barometric Press _____
 Total Pressure 54.62

Vessel 2 VOLUME 4.005 BAROMETRIC PRESSURE _____
 EVACUATED _____
 TO _____ Temp _____
 Hg { Manometer: _____
 Gauge: _____
 After Pressurization 11.52 Vessel Temp 21.5
 Barometric Press 30.03
 Total Press. 54.73

NMVOC DATA SHEET

Sample # 8106112

MILL Georgia Pacific DATE 6-11-81
 LOCATION Springfield OR TIME _____
 SAMPLE SOURCE Veneer Dryer (Before Scrubber)
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

L-22 > BEFORE
 I-24 >

3.75 ml H₂O

TANKS USED FOR SAMPLING L AND I
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field _____ ml/min. Calculated _____ ml/min SAMPLE VOLUME _____

TANK I VOLUME 16.90 TRAP 24
 Barometric Pressure _____
 EVACUATED TO 15.47 Tank Temp. 24°C Tank Pressure in Field OK
14.13
 #Hg { Manometer: 6.8
 Gauge Pres: 29.95
 Total Pres. 0.28
 AFTER SAMPLING 5.18 Tank Temp 18.0
4.29
 #Hg { Manometer: 30.17
 Barometric Pressure 30.17
 Gauge 6.8
 Total Pressure 20.72
 After Pressurization 5.93 Tank Temp 22.0
4.46
 Barometric Pres 30.03 Barometric Preso _____
 Total Pressure 40.42

Vessel 10 VOLUME 3.993 BAROMETRIC PRESSURE _____
 EVACUATED TO _____ Temp _____
 #Hg { Manometer: _____
 Gauge _____
 After Pressurization 12.86 Vessel Temp 22.5
11.18
 Barometric Pres 30.06
 Total Preso. 54.10

APPENDIX C.3
EPA METHOD 25 - SCRUBBER OUTLET

APPENDIX C.3.1
TRC DATA

TRIMED FIELD DATA SHEET

C-45

TESTED FIELD DATA SHEET

C-46

TUNED FIELD DATA SHEET

FACILITY <u>GP SPRINGFIELD</u>		SAMPLE LOCATION <u>SCRAUBER OUTLET</u>	
PROCESS TYPE <u>EPA-PLYWOOD</u>		OPERATOR <u>30P</u>	
DATE <u>9-JUNE 81</u>		RUN NUMBER <u>25-1-50-C</u>	
TANK I.D. (s) <u>72</u>		TRAP I.D. (s) <u>H2O-115</u> <u>024-104</u>	
TANK VACUUM, in Hg		STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg
PRETEST (MANOMETER) <u>743</u> ^{29.8} (in Hg) (in. Hg)		<u>165</u>	<u>29.75</u>
POST TEST (MANOMETER) <u>354</u> ^{14.4} (in Hg) (in. Hg)		<u>165</u>	<u>29.75</u>
LEAK RATE, in Hg/10 min.:		TANK	FLOW REGULATOR SETTING
		PRETEST	<u>50</u> cc/min.
		POST TEST	REGULATOR I.D. <u>7</u>
N	GAGE VACUUM, inches Hg	COMMENTS	
1400	29.4	START	
1402	28.9	STOP	
1522	28.9	START	
1531	27.5		
1541	25		
1556	21.1	STOP PORT CHANGE	
1645	21.1	START	
1651	19.7		
1657	16		
1704	17		
1715	14.1	STOP	

MEMO FIELD DATA SHEET

FACILITY <u>G P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCAUBBER OUTLET</u>	
PROCESS TYPE <u>EPA-PLYWOOD</u>		OPERATOR <u>SOP</u>	
DATE <u>9-JUNE-81</u>		RUN NUMBER <u>25-1-50-0</u>	
INLET I.D. (s) <u>2</u>	TRAP I.D. (s) <u>H2O-114</u>	FILTER I.D. (s) <u>N/A</u>	
		<u>DRY-108</u>	

INLET VACUUM, mm Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, mm Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) <u>743</u> ^{29.4} (mm Hg) GAUGE (in. Hg)	<u>165</u>	<u>29.75</u>	<u>11°C / 62°F</u>
¹⁴⁴⁺¹³² POST TEST (MANOMETER) <u>276</u> ^{11.5} (mm Hg) GAUGE (in. Hg)	<u>165</u>	<u>29.75</u>	<u>22°C / 66°F</u>

LEAK RATE, mm Hg/10 min.:	INLET	TRAP	FLOW REGULATOR SETTING
PRETEST	<u>0</u>	<u>0</u>	<u>52</u> cc/min.
POST TEST	<u>X</u>	<u>0</u>	REGULATOR I.D. <u>8</u>

TIME	GAUGE VACUUM, Inches Hg	COMMENTS
<u>1400</u>	<u>28.9</u>	<u>TEST START</u>
<u>1402</u>	<u>28.3</u>	<u>STOP</u>
<u>1522</u>	<u>28.3</u>	<u>START</u>
<u>1531</u>	<u>26.8</u>	
<u>1541</u>	<u>24.9</u>	
<u>1556</u>	<u>19.9</u>	<u>STOP PORT CHANGE</u>
<u>1645</u>	<u>19.9</u>	<u>START</u>
<u>1651</u>	<u>19.1</u>	
<u>1657</u>	<u>18.1</u>	
<u>1703</u>	<u>14.5</u>	
<u>1715</u>	<u>11.5</u>	<u>STOP</u>

WIND FIELD DATA SHEET

C-49

GROUND FIELD DATA SHEET

[illegible]

NAME FIELD DATA SHEET

[illegible]

TURKISH FIELD DATA SHEET

C-52

TESTING FIELD DATA SHEET

C-53

TRISO FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCRUBBER OUTLET</u>	
PROCESS TYPE <u>EPA-PLYWOOD</u>		OPERATOR <u>SOP</u>	
DATE <u>11 JUNE 81</u>		RUN NUMBER <u>25-3-50-B</u>	
TANK I.D. (s) <u>57</u>		TRAP I.D. (s) <u>H₂O 212</u> FILTER I.D. (s) <u>NA</u> <u>DRY 234</u>	
TANK VACUUM, in Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	AMBIENT TEMPERATURE, °C
<u>379+365</u> PRETEST (MANOMETER) <u>744</u> GAUGE <u>30+</u> (in Hg) (in Hg)	<u>168</u>	<u>29.65</u>	<u>15°C/59°F</u>
<u>139+127</u> POST TEST (MANOMETER) <u>266</u> GAUGE <u>12.1</u> (in Hg) (in Hg)	<u>170</u>	<u>11</u>	<u>22°C/71°F</u>
LEAK RATE, in Hg/10 min.:	TANK	IN. Hg LEAK	FLOW REGULATOR SETTING
PRETEST	<u>0</u>	<u>0</u>	<u>50</u> cc/min.
POST TEST	<u>X</u>	<u>+1</u>	REGULATOR I.D. <u>5</u>
TIME	GAGE VACUUM, Inches Hg	COMMENTS	
<u>1200</u>	<u>30+</u>	<u>START TEST</u>	
<u>1207</u>	<u>28.5</u>		
<u>1214</u>	<u>26.3</u>		
<u>1223</u>	<u>23.1</u>	<u>STOP CHANGE PORTS</u>	
<u>1230</u>	<u>21.1</u>	<u>↓ ↓</u>	
<u>1352</u>	<u>21.1</u>		
<u>1403</u>	<u>17.8</u>		
<u>1412</u>	<u>14.8</u>	<u>STOP</u>	
<u>1417</u>	<u>14.8</u>	<u>RESTART</u>	
<u>1424</u>	<u>13.1</u>		
<u>1428</u>	<u>12.0</u>	<u>STOP TEST</u>	

WISNO FIELD DATA SHEET

0.55

FORM NO. 104-100

C-56

APPENDIX C.3.2
NCASI DATA

NMVOC DATA SHEET

Sample # 810609-3

MILL GEORGIA PACIFIC DATE 6-9-81
 LOCATION SPRINGFIELD OR TIME _____
 SAMPLE SOURCE VENEER PLANT
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

6-21
 J-18 > AFTER

4.45 ml H₂O

TANKS USED FOR SAMPLING _____ AND _____
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field _____ ml/min. Calculated _____ ml/min SAMPLE VOLUME _____

TANK G VOLUME 17.28 TRAP 01
 Barometric Pressure _____
 EVACUATED TO 15.44 Tank Temp. 23.0
14.13 Tank Pressure in Field _____
 Hg { Manometer: 0.57
 Barometric Pres: 29.77
 Total Pres: 0.20
 AFTER SAMPLING 4.21 Tank Temp 22.5
3.28 Tank Pressure in Field _____
2.49
 Hg { Manometer: _____
 Barometric Pres: 29.86
 Gauge _____
 Total Pressure 22.32
 After Pressurization 5.69 Tank Temp 20.5
2.22 Tank Pressure in Field _____
 Barometric Pres 30.16 Barometric Pres _____
 Total Pressure 40.12 Pres _____

Vessel 9 VOLUME 3.993 BAROMETRIC PRESSURE _____
 EVACUATED TO _____ Temp _____
 Hg { Manometer: _____
 Gauge _____
 After Pressurization 14.39 Vessel Temp 21.0
12.75 Vessel Pressure in Field _____
 Barometric Pres 30.16 Barometric Pres _____
 Total Pres. 57.30 Pres _____

NMVOC DATA SHEET

Sample # 810609

MILL GEORGIA PACIFIC DATE 6-9-81
 LOCATION SPRINGFIELD OR TIME _____
 SAMPLE SOURCE VENEER PLANT
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

6-21
J-18 > AFTER

4.7 ml H₂O

TANKS USED FOR SAMPLING _____ AND _____
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field ml/min Calculated _____ ml/min SAMPLE VOLUME _____

TANK J VOLUME 16.72 TRAP 18
 Barometric Pressure _____
 EVACUATED TO 15.44 Tank Temp. 23.0 Tank Pressure in Field _____
Hg { Manometer: 14.13
 Gauge Pres: 0.57
 Total Pres. 0.20
 AFTER SAMPLING 3.86 Tank Temp 22.5 After Pressurization 5.83 Tank Temp 20.5
Hg { Manometer: 6.64 Barometric Pres 29.86 Barometric Pres 29.11
 Gauge: 29.86 Total Pressure 40.40
 Total Pressure 23.22

Vessel 10 VOLUME 3.993 BAROMETRIC PRESSURE _____
 EVACUATED TO _____ Temp _____ After Pressurization 12.04 Vessel Temp 19.5
Hg { Manometer: _____ Barometric Pres 10.4
 Gauge: _____ Total Pressure 52.61

NMVOC DATA SHEET

Sample # 810610-3

MILL Georgia Pacific DATE 6-10-81
 LOCATION Springfield Ore TIME _____
 SAMPLE SOURCE Various Drives after Scrubler
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

K-24 > AFTER
R-22

NEW QUICK-CONNECT/MALE
CONTAMINATION FROM FIRST RUN
DAY BEFORE.

2.0ml H₂O

TANKS USED FOR SAMPLING R AND K
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field _____ ml/min. Calculated _____ ml/min SAMPLE VOLUME _____

TANK R VOLUME 17.65 TRAP 22
 Barometric Pressure _____
 EVACUATED TO _____ Tank Temp. 22.0 Tank Pressure in Field ✓
Hg { Manometer: 15.51
 Barometric Pres: 14.20
 Total Pres.: 0.26
 AFTER SAMPLING 10.42 Tank Temp 23.0
 9.33
Hg { Manometer: 19.80
 Barometric Pres: 29.88
 Gauge: _____
 Total Pressure 10.08
 After Pressurization 5.47 Tank Temp 22.5
 4.05
 Barometric Pres 29.12 Barometric Pres _____
 Total Pressure 39.68 Total Pressure _____

Vessel 4 VOLUME 4.005 BAROMETRIC PRESSURE _____
 EVACUATED TO _____ Temp _____
Hg { Manometer: _____
 Gauge: _____
 After Pressurization 822 Vessel Temp 21
 6.65
 Barometric Pres 17.88
 Total Pres.: 44.75

NMVOC DATA SHEET

Sample # 810610 ⁴⁸

MILL Georgica Pascal DATE 6-10-81
 LOCATION Springfield Ore TIME _____
 SAMPLE SOURCE Unassn Dryer after scrubber
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

K-24
 R-22 > AFTER

3.1 ml H₂O

TANKS USED FOR SAMPLING K AND R
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field _____ ml/min. Calculated _____ ml/min SAMPLE VOLUME _____

TANK K VOLUME 16.80 TRAP 24
 Barometric Pressure _____
 EVACUATED TO 15.46 Tank Temp. 22.0 Tank Pressure in field ☒
14.15
 Hg { Manometer: .61
 Gauge Pres: 29.97
 Total Pres. 0.36
 AFTER SAMPLING 4.59 Tank Temp 23.0
3.60
 Hg { Manometer: 8.19
 Barometric Pres: 29.28
 Gauge 6.19
 Total Pressure 21.69
 After Pressurization 6.74 Tank Temp 22.5
5.23
 Barometric Pres 30.11 Barometric Pres 30.11
 Total Pressure 42.13

Vessel _____ VOLUME 4 005 BAROMETRIC PRESSURE _____
 EVACUATED TO _____ Temp _____
 Hg { Manometer: _____
 Gauge _____
 After 8.90 8.22
7.30 6.65 Vessel Temp 22.0
 Pressurization 17.08
 Barometric Pres 42.08
 Total Pres. _____

NMVOC DATA SHEET

Sample # 8106113

MILL Georgia Pacific DATE 6-11-81
 LOCATION Springfield OR TIME _____
 SAMPLE SOURCE Veneer Dryer (After Scrubber)
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

A-17 > AFTER
B-12 > AFTER

5.10 H_2O

TANKS USED FOR SAMPLING A AND B
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field ml/min Calculated _____ ml/min SAMPLE VOLUME _____

TANK B VOLUME 16.76 TRAP 10
 Barometric Pressure _____
 EVACUATED 15.57
 TO 14.18 Tank Temp. 24.0 Tank Pressure in field OK
 H_2 { Manometer: 69
 Gauge Pres: 29.88
 Total Pres. 0.19
 AFTER SAMPLING 5.00 Tank Temp 18.0
2.98
 H_2 { Manometer: 9.98
 Barometric Pres: 30.13
 Gauge Pres: _____
 Total Pressure 20.19
 After Pressurization 6.22 Tank Temp 23.0
4.72
 Barometric Pres 30.09 Barometric Pres _____
 Total Pressure 41.03 Pres _____

Vessel 9 VOLUME 3.993 BAROMETRIC PRESSURE _____
 EVACUATED _____
 TO _____ Temp _____
 AFTER Pressurization 14.12 Vessel Temp 23.0
12.46
 H_2 { Manometer: _____
 Gauge _____
 Barometric Pres 30.09
 Total Pres. 56.67

NMVOC DATA SHEET

Sample # 810611-4

MILL Georgia Pacific DATE 6-11-81
 LOCATION Springfield OR TIME _____
 SAMPLE SOURCE Veneer Dryer (After Scrubber)
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

A-12 > AFTER
 B-12 > AFTER

5.15 ml H₂O

TANKS USED FOR SAMPLING _____ AND _____
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field _____ ml/min. Calculated _____ ml/min SAMPLE VOLUME _____

TANK A VOLUME 17.10 TRAP 17
 Barometric Pressure _____
 EVACUATED TO 29.67 Tank Temp. 24°C Tank Pressure in Field OK
15.50
14.17
 Manometer: 29.88
 Gauge Pres: _____
 Total Pres. 0.21
 AFTER SAMPLING 4.22 Tank Temp 19.0 After Pressurization 7.45 Tank Temp 21.5
3.75
 Manometer: 7.52
 Barometric Pres: 30.18
 Gauge: 30.18
 Total Pressure 22.65
 Barometric Pres 30.18
 Total Pressure 43.57

Vessel 8 VOLUME 4.007 BAROMETRIC PRESSURE _____
 EVACUATED TO _____ Temp _____ After Pressurization 9.83 Vessel Temp 20.5
11.47
 Manometer: _____ Barometric Pres 30.18
 Gauge: _____ Total Pressure 51.43

NMVOC DATA SHEET

Sample #810611-2X

MILL C.P. DATE 6-11-81
 LOCATION Springfield OR TIME _____
 SAMPLE SOURCE LINE FEED ^{Heated} Sample BOX to Tee ²⁵⁵
 AMBIENT TEMPERATURE _____ BAROMETRIC PRESSURE _____
 STACK TEMPERATURE _____ STACK FLOW _____
 MOISTURE, % _____

Comments

This line appeared to burn as high a sample lines on traps.

TANKS USED FOR SAMPLING _____ AND _____
 TIME OF SAMPLING, FROM _____ TO _____ TOTAL MINUTES _____
 FLOW RATE, Field ml/min. Calculated _____ ml/min SAMPLE VOLUME _____

TANK _____	VOLUME _____	TRAP _____
EVALUATED TO _____		Barometric Pressure _____
Tank Temp. _____		Tank Pressure in Field _____
Hg { Manometer: _____ { Barometric Pressure: _____ Total Press. _____		
AFTER SAMPLING _____	Tank Temp _____	After Pressurization _____ Tank Temp _____
Hg { Manometer: _____ { Barometric Pressure: _____ Gauge _____ Total Pressure _____		Barometric Press _____ Barometric Press _____ Total Pressure _____

Vessel 7 VOLUME 3.998 BAROMETRIC PRESSURE _____
 EVACUATED TO _____ Temp _____
 Hg { Manometer: _____
 { Gauge: _____
 After Pressurization 8.02 Vessel Temp 22.0
 Barometric Press 36.18
 Total Press. 44.70

APPENDIX C.4
PRESSURE DROP MEASUREMENTS AND
SCRUBBER SOLUTION SAMPLE COLLECTION

PRESSURE DROP MEASUREMENTS

Firm: George Pacific Spill Oregon

Date: 6/9/81

Sampling Location: Famling Scrubber

Tester: SMR

Static Pressure ~~Drop~~, " H₂O

[illegible]

PRESSURE DROP MEASUREMENTS

Firm: Georgia Pacific

Date: 10 June 81

Sampling Location: Scrubber

Tester: SMR

Static Pressure Drop, " H₂O

Scrubber				TOTAL ΔP	
Time	FAN DIS	FAN IN	Scrub IN		
~~1245~~ 1300	+11.3	-5.4	-2.0	14.7	
1400	+11.4	-5.4	-2.0	14.8	
1430	+11.3	-5.7	-2.0	15.0	
1500	+11.4	-5.4	-2.0	14.8	
1530	+11.7	-5.5	-2.0	15.2	
1600	+11.4	-6.0	-2.0	15.4	
1630	+11.4	-5.9	-2.0	15.3	

PRESSURE DROP MEASUREMENTS

Firm: George Packer-Spalding/EPA-Plywood

Date: June 11, 1981

Sampling Location: Saunder

Tester: S.M. Rana

Static Pressure Drop, " H₂O

[illegible]

Scrubber Solution Sample Collection

Plant: Georgia Pacific Spfld Ore
Date: Jun 29, 1981
Sample Collection Point: BOARDING TANK
Sampler: SMR
Volume Collected: 100 ml / 30 min

COMMENTS:

[illegible]

Scrubber Solution Sample Collection

Plant: Georgia Pacific
Date: 10 June 81
Sample Collection Point: Holding Tank
Sampler: SMR
Volume Collected: 100 ml per 1/2 hour

COMMENTS:

[illegible]

Scrubber Solution Sample Collection

Plant: Geococcyx pacificus - Soft / 12 / EPA Plywood

Date: August 11 1984

Sample Collection Point: Boiling Tank

Sampler: Sim. Bag; holdn

Volume Collected: 100 mL / 30 min

COMMENTS:

[illegible]

APPENDIX D

SAMPLING LOGS

- D.1 Daily Summary Log
- D.2 Sampling Task Log
- D.3 Method 5X - Sample I.D. Log
- D.4 Chain of Custody Forms For Method 5X and Method 25 - Samples
- D.5 Crew Chief Field Operations Log
- D.6 Field Laboratory Log
 - D.6.1 EPA Method 5X
 - D.6.2 EPA Method 25
- D.7 Method 5X - Operators Field Log

APPENDIX D.1
DAILY SUMMARY LOG

TABLE D-1
DAILY SAMPLING LOG

Georgia-Pacific Plywood Plant, Springfield, Oregon

Date	Clock Time (hours)	Method 5X		Method 25		Scrubber		Ambient	
		Inlet	Outlet	Inlet	Outlet	Pressure Drop (in. H ₂ O)	Solution Sample	Temperature (°F)	Relative Humidity (%)
June 8, 1981	1610	Preliminary							
	1641	M & V							
	1730	Preliminary							
	1810	M & V							
June 9, 1981	1400	Start		Start		12.5		Mid 60s	
	1430	Start		Start		13.0		Taken	
	1431	Stop		Stop (Power Out)					
	1530	Restart		Restart		14.8		Taken	
	1600	----- Stop - Changed Ports -----		-----		14.5		Taken	
	1630					14.7		Taken	
	1642	Restart		Restart					
	1700					15.1		Taken	
	1712	Stop		Stop					
	1730					15.2		Taken	
	1800	----- Sample Recovery -----		-----					
June 10, 1981	1400	Start		Start		14.8		Taken	
	1418	Start		Start				65-70	
	1430					15.0		Taken	
	1448	----- Stop - Changed Ports -----		-----					
	1500					14.8		Taken	
	1530					15.2		Taken	
	1552	Restart		Restart					
	1600					15.4		Taken	
	1622	Stop		Stop					
	1630					15.3		Taken	
	1640								
	1700	----- Sample Recovery -----		-----					
June 11, 1981	1144	Start						54-66	
	1145					13.8		Taken	
	1202	Start		Start					
	1215					14.5		Taken	
	1232	----- Stop - Changed Ports -----		-----					
	1245					14.0		Taken	
	1315					13.9		Taken	
	1345					13.0		Taken	
	1353	Restart		Restart					
	1413	Stop		Stop					
	1415					14.2		Taken	
	1418	Restart		Restart					
	1428								
	1430	Stop		Stop					
	1445					12.9		Taken	
	1446								
	1500	----- Sample Recovery -----		-----					

APPENDIX D.2
SAMPLING TASK LOG

SAMPLING TASK LOG

Plant Georgia Pacific
Date 6/9/81

Plant Location Springfield Oregon
Recorded by FDA

[illegible]

SAMPLING .ASK LOG

Plant Georgia Pacific
Date 6/2/81

[illegible]

SAMPLING. ASK LOG

Plant Georgia Pacific Springfield Oregon
Date 6/1/61

Plant Location Springfield Oregon
Recorded by EDA

[illegible]

SAMPLING ASK LOG

Plant	Georgia-Pacific	Plant Location	Springfield
Date	March 10, 1961	Recorded by	DR

Comments	Run	Sampling Location (Port)	Pollutant	Clock Time Began	Elapsed Time (min)	Sample Nos.
Port 1 Started Test #2, Seablaar Collet	N	Outlet	VOC/PAH	1400	—	
Finished Port #1		"	VOC/PAH	1448	48	
Started Port #2	W	"	VOC/PAH	1552		
Finished Port #2		"	VOC/PAH	1640	48	
			TOTAL		96	

Plant Georgia Pacific
Date 6/11/81

Plant Location Springfield Oregon
Recorded by ESA

Comments	Run	Sampling Location (Port)	Pollutant	Clock Time Began	Elapsed Time (min)	Sample Nos.
Test #3 on Inlet Start	3	1	Part/VOC	1159		
Change Ports	"	1 → 2	" "			
Start Port V02 - did back checks	"	2		1350	30	
Shut down Pump could not pull flow needed oil				1410	20	
Start again	3	2		1415		
Shut down end of Test Run Saving extra		2		1430	15	
				TOTAL	65	

SAMPLII ASK LOG

Plant Georgia Pacific
Date June 11, 1981

Plant Location Springfield Oregon
Recorded by BDE

Sampling location
(Port)

Comments

Sample
Nos.

Clock Time
Began Ended Time (min)

Pollutant
VOC, particulate
undesirable organic

Run

Started Test #3, Port 1
Switched filters, broke back, moved to Port #2
Started Test #3, Port 2

Outlet

"

"

1144

1232

48

1315

1352

1440

48

Total

96

APPENDIX D.3
METHOD 5X - SAMPLE I.D. LOG

SAMPLE IDENTIFICATION LOG

Location 6-8-81 Pacific - Philippines
Springfield, CT
 Project No. 1460-ERC

Collected and Recorded by SM Raynolds, MA Algon & EDC
 Technical Record Book No. _____
 Page 1 of 3

	Date	Sam No.	Sample Description	Remarks
1	6-8-81	5X-0-I-2	DI H ₂ O RINSE of Probe & Front of filter	
2		5X-0-I-3	ACETONE RINSE of " "	
3		5X-0-I-4	Impinger Catch & DI H ₂ O RINSE & ^{AND LINE RINSE} FILTER	
4		5X-0-I-5	ACETONE RINSE of IMPINGERS & ^{AMP LINE RINSE} BACK of FILTER	
5		5X-0-0-2	DI H ₂ O Probe RINSE & FILTER FRONT	
6		5X-0-0-3	ACETONE " "	
7		5X-0-0-4	Impinger Catch & DI H ₂ O LINE RINSE & [*] FILTER BACK	LINE WAS RINSED ONCE WITH ACETONE
8		5X-0-0-5	ACETONE LINE RINSE IMPINGER RINSE & ^{BACK} FILTER	
9	6-9-81	5X-1-I-1	2 1/2" FILTER FROM HEATER BOX (#3)	
10		5X-1-I-2	DI H ₂ O - PROBE RINSE & FILTER FRONT	
11		5X-1-I-3	ACETONE RINSE - " "	
12		5X-1-I-4	Impinger Catch & DI H ₂ O RINSE	SAMPLE IS IN 2 JARS
13			- Impingers FILTER BACK & LINE	
14		5X-1-I-5	ACETONE RINSE - IMPINGERS, LINE	
15			AND BACK of FILTER	
16		5X-1-I-6	2 1/2" FILTER FROM IMPINGERS (#1)	
17		5X-1-I-7	SILICA GEL	NO ANALYSIS REQUIRED
18		5X-1-0-1	4 1/2" FILTER FROM HEATER BOX (#3)	
19		5X-1-0-2	DI H ₂ O RINSE - PROBE & FILTER FRONT	
20		5X-1-0-3	ACETONE RINSE - " "	
21		5X-1-0-4	Impinger Catch & H ₂ O RINSE of	SAMPLE IS IN 2 JARS.
22			- Impingers LINE AND FILTER BACK	
23		5X-1-0-5	ACETONE RINSE - IMPINGERS LINE	
24			AND BACK of FILTER	

SAMPLE IDENTIFICATION LOG

Line Gemini Pacific - Plumbwood
 Location Springfield Ore
 Project No. 1460-ERO

Collected and Recorded by SMB, MAA, EDA
 Technical Record Book No. _____
 Page 2 of 3

No.	Date	Run No.	Sample Description	Remarks
21	6-9-81	~~5X-1-0-6~~ ~~6-9-81~~	2 1/2" FILTER FROM IMPINGERS (#2)	
22	6-9-81	5X-1-0-7	SILICA GEL	No Analysis Required
23	6-10-81	5X-2-I-1	2 1/2" FILTER FROM HEATER BOX (#5)	
24		5X-2-I-2	DI H ₂ O RINSE - Probe & FILTER FRONT	
25		5X-2-I-3	ACETONE RINSE - " "	
26		5X-2-I-4	IMPINGER CATCH + DI H ₂ O RINSE - FILTER BACK, LINE, IMPINGERS	SAMPLE IS IN 2 JARS
27		5X-2-I-5	ACETONE RINSE - IMPINGERS LINE & FILTER BACK	
28		5X-2-I-6	2 1/2" FILTER FROM IMPINGERS (#4)	
29		5X-2-I-7	SILICA GEL	No Analysis Required
30		5X-2-0-1	2 1/2" FILTER FROM HEATER BOX (#6)	
31		5X-2-0-2	DI H ₂ O RINSE - PROBE & FILTER FRONT	
32		5X-2-0-3	ACETONE RINSE - " "	
33		5X-2-0-4	IMPINGER CATCH & DI H ₂ O RINSE - LINE, Impingers & Filter BACK	SAMPLE IS IN 2 JARS
34		5X-2-0-5	ACETONE RINSE - IMPINGERS LINE & Filter BACK	
35		5X-2-0-6	2 1/2" Filter From Impingers (#7)	
36	✓	5X-2-0-7	SILICA GEL	
37	6-11-81	~~5X-3-I-1~~	4 1/2" FILTER FROM HEATER BOX (#15)	
38		5X-3-I-2	DI H ₂ O RINSE - 1/2" PROBE & Filter FRONT	
39	✓	5X-3-I-3	ACETONE RINSE - " " "	
		~~EX~~		

SAMPLE IDENTIFICATION LOG

Location Geopline Pacific - EPA Plume
Springfield Oregon
 Project No. 1460-E80

Collected and Recorded by SMR Byrd & MA Davis
 Technical Record Book No. _____
 Page 3 of 3

No.	Date	Run No.	Sample Description	Remarks
40	6-11-81	5X-I-3-4	H ₂ O RINSE & IMPINGER CATCH - IMPINGERS LINE & FILTER BACK	2 SARS
41		5X-I-3-5	ACETONE RINSE - IMPINGERS LINE & FILTER FRONT	
42		5X-3-I-6	2 1/2" Filter From Impingers (#8)	
43		5X-3-I-7	Silica Gel	
44		5X-3-O-1	4 1/2" Filter From HEATER BOX (144) (#146)	filter holder broken in the middle
45		5X-3-O-2	DI H ₂ O RINSE - NO ₂ , PORE & FILTER FRONT	of the test
46		5X-2-O-3	ACETONE RINSE - " " "	
47		5X-3-O-4	IMPINGER CATCH & H ₂ O RINSE - IMPINGERS, LINE & FILTER BACK	2 SARS
48		5X-3-O-5	ACETONE RINSE - IMPINGERS LINE & FILTER BACK	
49		5X-3-O-6	2 1/2" Filter From Impingers (#9)	
50		5X-3-O-7	Silica Gel	
51	6-9-81	1-S	Scrubber liquid	2 SARS
52	6-10-81	2-S	Scrubber liquid	2 SARS
53	6-11-81	3-S	Scrubber liquid	1 SAR
54	—		TRC 4 1/2" Filter Blank	#149
55	—		CH ₂ MILL 4 1/2" Filter Blank	#9
56			" 2 1/2" " "	#10
57			ACETONE Blank	
58			DI H ₂ O Blank	

APPENDIX D.4
CHAIN OF CUSTODY FORMS FOR METHOD 5X AND METHOD 25 - SAMPLES

CHAIN OF CUSTODY

Plant: Georgia-Pacific

Plant Location Springfield

Unit Tested Scrubber

TRC Project No. 1460-880

Types of Samples EPA Method 25

SAMPLES RECOVERY

Run Number	Date Sampled	Container Code	Description	Date of Recovery	Time of Recovery	Location of Recovery	Signature	Title
25-1 IA	6/9	215	Trap					
		111	Trap					
		5	Tank					
25-1 IB	6/9	219	Trap					
		220	Trap					
		1	Tank					
25-1 SOB	6/9	229	Trap					
		233	Trap					
		68	Tank					
25-1 SOB	6/9	221	Trap					
		235	Trap					
		9	Tank					

RECIPIENTS OF SAMPLES, other than recovery person(s):

Signature _____ Title _____ Date & Time _____

LABORATORY PERSON(S) RECEIVING SAMPLES:

Signature SWH/h/1 Title _____ Date & Time 6/14/88

CHAIN OF CUSTODY

Plant Georgia-Pacific - Springfield Plant Location _____
 Unit Tested Scrubber TRC Project No. 1460-ES0
 Types of Samples EPA Method 25

SAMPLES RECOVERY

Run Number	Date Sampled	Container Code	Description	Date of Recovery	Time of Recovery	Location of Recovery	Signature	Title
5-1- 50C	6/9	115 104 72	Trap Trap Tank					
5-1- 50D	6/9	114 108 2	Trap Trap Tank					
5-1- I-C	6/9	207 227 8	Trap Trap Tank					
5-1- I-D	6/9	232 107 67	Trap Trap Tank					

RECIPIENTS OF SAMPLES, other than recovery person(s):

Signature Kevin Beggs/PCS Title Chemist Date & Time 6/15 12:30

LABORATORY PERSON(S) RECEIVING SAMPLES:

Signature David Robinson/PCS Title Group Leader Date & Time 6/15 : 2:30 pm
Kevin Beggs/PCS chemist 6/15 16:00

CHAIN OF CUSTODY

Plant - Georgia-Pacific

Plant Location Springfield

Unit Tested Scrubber

TRC Project No. 1460-E80

Types of Samples EPA Method 25

SAMPLES RECOVERY

Run Number	Date Sampled	Container Code	Description	Date of Recovery	Time of Recovery	Location of Recovery	Signature	Title
5-2 IA	6/10	31 (ow) 102 4	Trap Trap Tank					
5-2 IB	6/10	218 210 21	Trap Trap Tank					
5-2 50A	6/10	226 222 23	Trap Trap Tank					
5-2 50B	6/10	230 109 60	Trap Trap Tank					

RECIPIENTS OF SAMPLES, other than recovery person(s):

Signature _____ Title _____ Date & Time _____

LABORATORY PERSON(S) RECEIVING SAMPLES:

Signature Sherry/L... Title _____ Date & Time 6/1/80

CHAIN OF CUSTODYPlant Georgia-PacificPlant Location SpringfieldUnit Tested ScrubberTRC Project No. 1460-E80Types of Samples EPA Method 25SAMPLES RECOVERY

Run Number	Date Sampled	Container Code	Description	Date of Recovery	Time of Recovery	Location of Recovery	Signature	Title
5-2- SI-C	6/10	101	Trap					
		209	Trap					
		58	Tank					
5-2- SI-D	6/10	27	Trap					
		201	Trap					
		51	Tank					
5-2- O-C	6/10	106	Trap					
		112	Trap					
		61	Tank					
5-2- SO-D	6/10	231	Trap					
		103	Trap					
		13	Tank					

RECIPIENTS OF SAMPLES, other than recovery person(s):Signature Kevin Beggs / PCS Title Chemist Date & Time 6/15 12:30LABORATORY PERSON(S) RECEIVING SAMPLES:Signature David Robinson / PCS Title Group Leader Date & Time 6/15 : 14:2
Signature Kevin Beggs / PCS Title Chemist Date & Time 6/15 : 16:00

CHAIN OF CUSTODY

Plant- Georgia - Pacific Plant Location Springfield
Unit Tested Scrubber TRC Project No. 1460-880
Types of Samples EPA Method 25

SAMPLES RECOVERY

Run Number	Date Sampled	Container Code	Description	Date of Recovery	Time of Recovery	Location of Recovery	Signature	Title
5-3 I-A	6/11	26 225 14	Trap (old) Trap Tank					
5-3 I-B	6/11	15 205 19	Trap (old) Trap Tank					
5-3 I-C	6/11	105 204 24	Trap Trap Tank					
5-3 I-D	6/11	212 234 57	Trap Trap Tank					

RECIPIENTS OF SAMPLES, other than recovery person(s):

Signature _____ Title _____ Date & Time _____

LABORATORY PERSON(S) RECEIVING SAMPLES:

Signature [Signature] Title _____ Date & Time 6/11

CHAIN OF CUSTODY

Plant Georgia Pacific Plant Location Springfield, Ore
 Unit Tested Scrubber TBC Project No. 1460-ESD
 Types of Samples EPA Method 25

SAMPLES RECOVERY

Run Number	Date Sampled	Container Code	Description	Date of Recovery	Time of Recovery	Location of Recovery	Signature	Title
15-3- SL-C	6/11	213 214 71	Trap Trap Tank					
15-3- SL-D	6/11	217 203 7	Trap Trap Tank					
15-3- O-D	6/11	223 202 53	Trap Trap Tank					
15-3- O-C	6/11	6 113 54	Trap Trap Tank					

RECIPIENTS OF SAMPLES, other than recovery person(s):

Signature Kevin Beggs/PCS Title Chemist Date & Time 6/15 : 12:30

LABORATORY PERSON(S) RECEIVING SAMPLES:

Signature David Robinson/PCS Title Shop Leader Date & Time 6/15 : 14:20
 Signature Kevin Beggs/PCS Title Chemist Date & Time 6/15 16:00

CHAIN OF CUSTODY

Plant Georgia Pacific-Plywood

Plant Location Springfield Oregon

Unit Tested Scrubber

TRC Project No. 1460-E80

Types of Samples Particulate & Condensable Organics

SAMPLES RECOVERY

Run Number	Date Sampled	Container Code	Description	Date of Recovery	Time of Recovery	Location of Recovery	Signature	Title
D-1	6-8-81	5X-0-I-2	SEE ATTACHED SHEET	6-8-81		GP - LAB AREA	S. McReynolds	TRAINMAN
↓	↓	5X-0-I-3		↓				
↓	↓	5X-0-I-4		↓				
↓	↓	5X-0-I-5		↓				
0-0	↓	5X-0-0-2		↓				
↓	↓	5X-0-0-3		↓				
↓	↓	5X-0-0-4		↓				
↓	↓	5X-0-0-5		↓				

RECIPIENTS OF SAMPLES, other than recovery person(s):

Signature _____ Title _____ Date & Time _____

LABORATORY PERSON(S) RECEIVING SAMPLES:

Signature Wark Goedye Title Analyst Date & Time June 12, 1981

CHAIN OF CUSTODY

Plant Georgia Pacific - Plywood

Plant Location Springfield Oregon

Unit Tested Scrubber

TRC Project No. 1460-E8C

Types of Samples Particulate & Condensable Organics

SAMPLES RECOVERY

Run Number	Date Sampled	Container Code	Description	Date of Recovery	Time of Recovery	Location of Recovery	Signature	Title
1-I	6-9-81	5X-1-I-1	SEE ATTACHED SHEET	6-9-81	1800	G.P. LAB AREA	G.M. Reynolds	Technician
		5X-1-I-2						
		5X-1-I-3						
		5X-1-I-4						
		5X-1-I-5						
		5X-1-I-6						
		5X-1-I-7						
1-O		5X-1-O-1			1830			
		5X-1-O-2						
		5X-1-O-3						
		5X-1-O-4						
		5X-1-O-5						
		5X-1-O-6						
		5X-1-O-7						

RECIPIENTS OF SAMPLES, other than recovery person(s):

Signature _____ Title _____ Date & Time _____

LABORATORY PERSON(S) RECEIVING SAMPLES:

Signature Mark Goodglen Title Analyst Date & Time June 12, 1981

CHAIN OF CUSTODYPlant Georgia PacificPlant Location Springfield, OreUnit Tested ScrubberTRC Project No. 1460-E80Types of Samples Particulate / Cond OrgSAMPLES RECOVERY

Run Number	Date Sampled	Container Code	Description	Date of Recovery	Time of Recovery	Location of Recovery	Signature	Title
I-2	6/10	SX-2-I-1 SX-2-I-2 SX-2-I-3 SX-2-I-4 SX-2-I-5 SX-2-I-6 SX-2-I-7	See attached sheet	6/10	pm	GP Lab	<i>Susan M Reynolds</i>	Tech Spec
O-2	6/10	SX-2-O-1 SX-2-O-2 SX-2-O-3 SX-2-O-4 SX-2-O-5 SX-2-O-6 SX-2-O-7						

RECIPIENTS OF SAMPLES, other than recovery person(s):

Signature _____ Title _____ Date & Time _____

LABORATORY PERSON(S) RECEIVING SAMPLES:Signature Clark Boehlheimer Title Analyst Date & Time June 12, 1981

CHAIN OF CUSTODY

Plant Georgia Pacific - Plywood

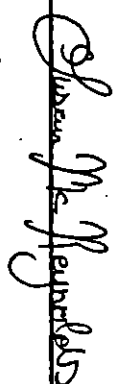
Plant Location Springfield Ore.

Unit Tested Scrubber

TRC Project No. 1460-ES0

Types of Samples Particulate & Condensable Organics

SAMPLES RECOVERY

Rm Number	Date Sampled	Container Code	Description	Date of Recovery	Time of Recovery	Location of Recovery	Signature	Title
3-I	6-11-81	5X-3-I-1	See ATTACHED SHEET	6-11-81	1500	GP LAB AREA		TECHNICIAN
↓	↓	5X-3-I-2		↓	↓			
↓	↓	5X-3-I-3		↓	↓			
↓	↓	5X-3-I-4		↓	↓			
↓	↓	5X-3-I-5		↓	↓			
↓	↓	5X-3-I-6		↓	↓			
↓	↓	5X-3-I-7		↓	↓			
3-O	6-11-81	5X-3-O-1	↓	↓	1530			
↓	↓	5X-3-O-2		↓	↓			
↓	↓	5X-3-O-3		↓	↓			
↓	↓	5X-3-O-4		↓	↓			
↓	↓	5X-3-O-5		↓	↓			
↓	↓	5X-3-O-6		↓	↓			
↓	↓	5X-3-O-7		↓	↓			

RECIPIENTS OF SAMPLES, other than recovery person(s):

Signature _____ Title _____ Date & Time _____

LABORATORY PERSON(S) RECEIVING SAMPLES:

Signature Paul Boehgle Title Analyst Date & Time June 12, 1981

CHAIN OF CUSTODY

Plant: Georgia Pacific

Plant Location: Springfield

Unit Tested: Scrubber

TRC Project No.: 1460 E-80

Types of Samples: Scrubber Liquor

(analyze for TOC)

SAMPLES RECOVERY

Run Number	Date Sampled	Container Code	Description	Date of Recovery	Time of Recovery	Location of Recovery	Signature	Title
1-S	6/9	51a,b	2 Jars	6/9			<i>James M. Reynolds</i>	TECHNICIAN
2-S	6/10	52a,b	2 Jars	6/10				
3-S	6/11	53	1 Jar	6/11				
1-B	6/12	54	INDIA TAC 4 1/2" Filter Blank	6/12				
2-B		55	CHAMBLISS 4 1/2" Filter Blank					
3-B		56	" 2 1/2" Filter Blank					
4-B		57	ACETONE BLANK					
5-B		58	DI-H ₂ O BLANK					

RECIPIENTS OF SAMPLES, other than recovery person(s):

Signature _____ Title _____ Date & Time _____

LABORATORY PERSON(S) RECEIVING SAMPLES:

Signature David Goodglein Title Analyst Date & Time June 12, 1981

APPENDIX D.5
CREW CHIEF
FIELD OPERATIONS LOG

TITLE Georgia-Pacific Springfield

Book No.

1

From Page No. —

6 June 81

0700 EDT Arrive Apt (BDL)

0725 Depart BDL → KC - SFO

1200 PDT Arrive SF → Hotel (Sheraton-Burington)

7 June 81

0800 Arrive SF Apt

0830 Depart SFO → Eugene

1000 Arrive EUG - Raining

1220 Arrive G.P. Springfield - Mack Steffensen, Pete Fetter (GP)
Bert Chassin (RTI), Paul Willhite (DELC)
EAB, JP, EDA, SDP, DDE, SMR, MAA

Inspect Equipment - 22 pieces arrived

Handle Broken Off Probe Case 8

Everything else looks OK

Inspect Sampling Platforms - Hell of a job - All steel + Nic
Much more than requested
Ports off center - railings must be c
Will hold cons.

Resin is noticed on outside of abort stacks

Pete will provide labor w/ cutting torch (railings)
/ drill (fan holes)

Meeting set for 0800 w/ EPA, RTI, DGA, NCASI, TRC, ETC 8 JUNE

Pete promises better weather

It's still raining, about 50F

1400 Depart G.P. - RETURN to Hotel - B.W. New Oregon Motel
1655 Franklin Blvd
Eugene, Ore 97401
503/683-3669

To Page N

Witnessed & Understood by me,

Date

Invented by

Date

D-22

Recorded by

From Page No. _____

8 JUNE 81

Work PlanPlume not
feasibleT₀ = 66T_w = 59

RH ≈ 75%

0830 - Arrive Plant

0900 - Meeting w/ GP, EDA, RTI, DGA, NLAS, TRC, ETC

1000 - EDA, SDP, DDL, SMR, MAA - Tour Plant

EAB, JP - Drive to CH₂M Hill

1100 - EDA, ... MAA - Prep sample recovery area

Prep sampling area

1230-1300 Lunch

1400 EAB, JP - Back From CH₂M Hill

EDA, SMR, MAA - Clean-up evaluations (2 trans)

DDL, SDP - Preliminary Moisture + Flowrate @ Inlet + Outlet

1600 Should be done

0830 Meeting - MS, PF, CER, Geni Welman, TRC, Bert Chessin, Paul Winkler, Vic De
Morning Briefings @ 08301000 Go to CH₂M Hill EAB, JP
(As per work plan)
1415 Back

1610 Begin OUTLET Preliminary Moisture + Velocity

1641 Finish OUTLET

1730 Begin Inlet Prelim M + V

1810 Finish Inlet

1830 To hotel

To Page No. _____

Witnessed & Understood by me, _____

Date

D-23

Invented by _____

Date

TITLE _____

From Page No. _____

9 June 81

0800 Arrive Plant

0830 MEETING

- Prep for tests

1000 Begin TESTS

0830

Meeting

Inlet - 19.4% H₂O~~1150~~ 65 fpm

183° F

3900 fpm

To check 3

Outlet 15.8% H₂O

300 fpm

164° F

0930

Sampling Platforms not ready

1030

Sampling trains prep'd

1100

Evacuate S.O. platform for renovations

1400

Begin S.O. sampling, Begin DP & Scrub Soln

1330 - S.O. Platform In

1430

Begin S.I. sampling

Circuit blows - NCASI plugged in our circuit

1431

Halt testing

- Fugitives from above stacks - 3, 2, 1

1530

Restart (I+O)

1600

Change Pores (I+O)

1642

Resume testing

1712

Finish testing @ Inlet

1730

" " @ Outlet

1800

Sample Recovery

To Page _____

Witnessed & Understood by me, _____

Date _____

Invented by _____

Date _____

D-24

Recorded by _____

From Page No. _____

10 June 81

0830 Meeting - Moistures can be reasonable - Sap wood
vs. Heart Wood

Inlet 32% H_2O
30900 ACFM
14400 DSCFM
116.6% ISO

Outlet 38.3% H_2O
29100 ACFM
15000 DSCFM
124% ISO

Should monitor wet/dry bulb

Normal Production on 6/9

★ Pitch will plasticize rubbers (TFE?)

NCASI - grease
spit
probe heat uneven

0830 Sampling train prep

1015 Chessin - dryer problems
delay start of test till 1200

1230 Process ready

1245 Inlet $T_w = 710^\circ F$ 35% H_2O (vol)
 $T_d = 310^\circ F$
Outlet $T_w = 162^\circ F$ 100% RH w 35% by volume
 $T_d = 162^\circ F$

DOWNPOUR

To Page No _____

Witnessed & Understood by me, _____

Date

D-25

Invented by _____

Date _____

TITLE _____

From Page No. _____

1300 - Outlet - Filter Leak - replace w/ 2 1/2"
Inlet - Bad T.C.

1345 - Outlet - Leak - OK
Inlet - New TC from Pete
Wait for temps

1400 Begin Outlet - SX

1418 Begin Inlet SX + 25

" Outlet 25

1448 STOP - Change Ports
Nose on outlet HB break S

1538 Ready + waiting for temps

1552 Resume Testing Tw@inlet = 170°F

1622 End 25 tests

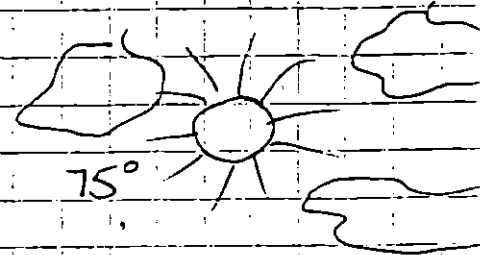
" SX inlet (Leak - OK)

1615 Scrubber Liquor Filter Changed

1640 Finish SX @ Outlet (Leak - OK)

1700 Sample Recovery

1830 Finish



To Page

Witnessed & Understood by me,

Date

Invented by

Date

D-26

Recorded by

From Page No. _____

11 June 81

0830 Meeting

Inlet33.8% H₂O

4000 gpm

31500 ACFM

14000 DSCFM

112% ISO

Ps - Fan Dis +11.5

Fin In - 5.6

Scrub In - 2.0

6/10 →

Outlet37.5% H₂O

525 gpm

33400 ACFM

17500 DSCFM

102% ISO

Production 15,000 ft²/hr (3/8") D-4
 ~ 35,000 ft²/hr total
 same as 6/9

NCASI - 1.2 lbs / 10⁶ ft²

from traps only ~ 1000 ppm
 usually catch 90-95% nitro

0830

Sampling Train Prep

1000

All equipment on roof

1030

Check Nomographs - Inlet OK

Outlet OK

1045

Two - Inlet

170° F

Outlet

160° F

1055

Leak Ck In - OK

Out OK

Wait for temps

10' probe read slow (~ 325° TOP)

1144

Start Outlet 5X

1202

Start Inlet 5X

Both 2.5

1232

STOP - Change Ports

Outlet 4 1/2" joint holder broken when monorail falls @ end of rail

Replace w/ #146

Leak Ck - OK

To Page N

Witnessed & Understood by me,

Date

D-27

Invented by

Date

TITLE _____

From Page No. _____ CALL AIR FREIGHT

1315 - Lunch

1353 - Resume Testing

1413 - Stop Outlet

~~1415~~ - Stop Inlet - Charge Pump Oil

1418 - Resume Testing

~~1428~~ End Inlet 5X+25

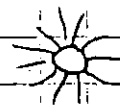
1428 End Outlet - 25

1433 End Inlet 5X+25 — 65 min run

1446 End Outlet 5X

1500 Sample Recovery

1630 Done



75°

Winds - W

To Page

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Date

Invented by

Date

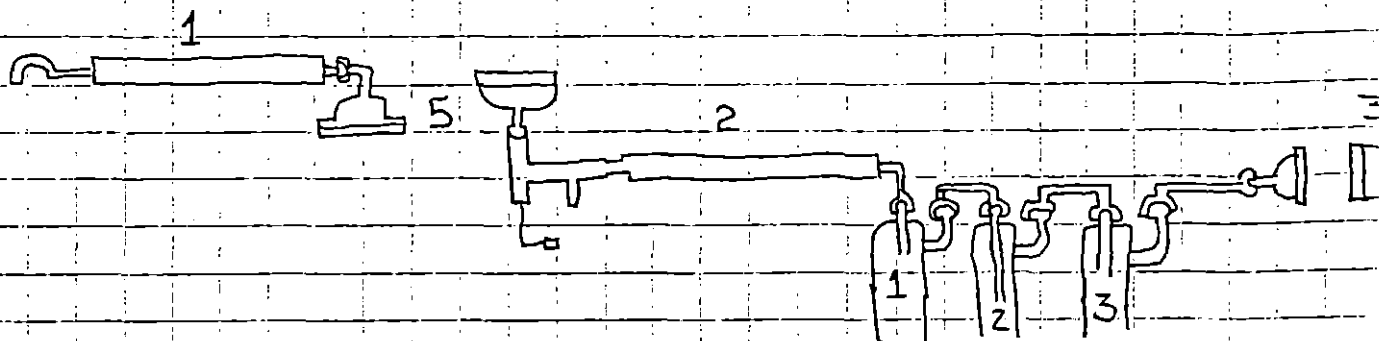
Recorded by

D-28

APPENDIX D.6
FIELD LABORATORY LOG

APPENDIX D.6.1
EPA METHOD 5X

From Page No. 1



Container NO.1 4 1/2 filter petri dishes

Container NO.6 2 1/2 filter petri dishes

Container NO.2 D.I. H₂O wash of NO.1

Container NO.3 Acetone wash of NO.1

Container NO.4 Impiner Solutions and
D.I. water rinse of NO.2

Container NO.5 Acetone wash of Impiners NO.2

Position

0	1	2	3	4
TYPE OF Test	Test NO	LOCATION	Sample Container	liquid C

5X clean up - 0 - I, 0 - 1-7 - D.I., ACE
IC, SC

1

2

3

4

To Page No.

Witnessed & Understood by me,

Date

D-29

Invented by

Date

Recorded by

From Page No. _____

TRAIN NO	IMPINGER 1			IMPINGER 2		
	AFTER	BEFORE	DIFF	AFTER	BEFORE	DIFF
0-I	563.5	563.5	0	567.6	567.6	0
0-O	580.7	580.7	0	586.0	586.0	0
1-I	822.0	568	254	762.7	573.8	= 188.9
1-O	827.5	580	247.5	743.0	569.4	= 173.6
2-I	867.5	581.8	= 285.7	726.7	569.5	= 157.2
2-O	930.0	568.0	= 362	661.1	572.8	= 88.3
3-I	897.9	581.6	= 316.3	663.0	570.5	= 92.5
3-O	885.9	568.5	= 317.4	766.3	573.0	= 193.3

To Page _____

Witnessed & Understood by me,

Date

D-30

Invented by

Date

TITLE Georgia Pacific - Plywood - Springfield OreFrom Page No. 5

TRAIN NO	IMPINGER 3			IMPINGER 4				Total
	AFTER	BEFORE	DIFF	AFTER	BEFORE	DIFF		Imp
0-J	468.1	468.1	0	682.7	682.7	0		C
		~~495.0~~			~~693.3~~			
0-0	495.0	495.0	0	693.3	693.3	0		C
1-I	498.6	495.8	= 2.8	695.0	689.8	= 5.2	495.7	45.6
	~~508.8~~							
1-0	~~498.6~~	469.3	= 39.5	712.3	667.7	= 44.6	460.6	5.1
2-II	474.9	469.6	= 5.3	680.0	662.9	= 12.1	448.2	
2-0	505.1	496.6	= 8.5	706.3	690.1	= 16.2	458.8	
		~~469.8~~						
3-I	471.6	469.8	= 1.8	677.4	668.0	= 9.4	410.6	
3-0	~~498.3~~	496.6	= 1.7	698.8	690.5	= 8.3	512.4	

To Page

Witnessed & Understood by me,

Date

Invented by

Date

D-31

Recorded by

Project No. 460-E80Book No. 1TITLE Georgia Pacific - Plywood Springfield OrePage No.

ST No TEST No.

IMPINGER FILTERHEATER BOX FILTER2 1/2" filter4 1/2" filter

I 1-I #1

#2 #3*

* 4 1/2" filters could

-O 1-O #2

#3*

not be used
because they
were slightly

2-I 2-I #4

#5*

Bigger than
the gaskets on
the filter holders

2-O 2-O #7

#4 or #6

this cause a
leak in the
train

3-I 3-I #8

#145

3-O 3-O #9

#146 & #144

To Page No.

Inspected & Understood by me,

Date

Invented by

Date

D-32

Recorded by

From Page No.

Method 5x Testing

6/8/81

Test # 0 - Clean up advaluation

INLET

5x-0-I-2-DI

5x-0-I-3-ACE

5x-0-I-4-DI + IC

5x-0-I-5-ACE

Test # 0 - Clean up advaluation

OUTLET

5x-0-0-2-DI

5x-0-0-3-ACE

5x-0-0-4-DI + IC + ACE*

Acetone: has one rinse from the
teflon line

5x-0-0-5-ACE

TEST # 1 INLET

5x-1-I-1-HB filter (2 1/2") #3

5x-1-I-2-DI

5x-1-I-3-ACE

5x-1-I-4-IC & DI → Split Sample, 2 JARS ^{1 bag} _{1 sm}

5x-1-I-5-ACE

5x-1-I-6-Imp Filter (2 1/2") #1

5x-1-I-7-SG

TEST # 2 Outlet

5x-1-0-1-HB filter (4 1/2") #3

5x-1-0-2-DI

5x-1-0-3-ACE

5x-1-0-4-IC & DI → Split Sample, 2 JARS ^{FLC} _{1 sm}

5x-1-0-5-ACE

5x-1-0-6-Imp filter (2 1/2") #2

To Page

Witnessed & Understood by me,

Date

Invented by

Date

D-33

Recorded by

Page No. _____

TEST #1 Outlet

5X-1-0-7-SG

TEST #2 Inlet

5X-2-I-1-HEATER BOX FILTER (#5-2 1/2")

5X-2-I-2-DI

5X-2-I-3-ACE

5X-2-I-4-IC & DI → Split Sample 2 JARS 1 LRG 1 SML

5X-2-I-5-ACE

5X-2-I-6-Impinger filter

5X-2-I-7-SG (#4-2 1/2")

TEST #2 OUTLET

5X-2-0-1-HEATER BOX FILTER (#6-2 1/2")

5X-2-0-2-DI

5X-2-0-3-ACE

5X-2-0-4-IC & DI → Split Sample 2 JARS 1 LRG 1 SML

5X-2-0-5-ACE

5X-2-0-6-Impinger filter (#7-2 1/2")

5X-2-0-7-SG

Test #3 Inlet

5X-3-I-1 Heater Box Filter (#145-4 1/2")

5X-3-I-2-DI

5X-3-I-3-ACE

5X-3-I-4-IC & DI → Split Sample 2 JARS

5X-3-I-5-ACE

5X-3-I-6-Impinger filter (#8-2 1/2")

5X-3-I-7-SG

TEST #3 OUTLET

5X-3-0-1 Heater Box filters (2 - #144 & #146) (4 1/2")

5X-3-0-2-DI

5X-3-0-3-ACE

5X-3-0-4-IC & DI → Split Sample 2 JARS

5X-3-0-5-ACE

5X-3-0-6-Impinger Filter (2 1/2" #9)

5X-3-0-7-SG

To Page No. _____

nessed & Understood by me,

Date

Invented by

Date

D-34

Recorded by

APPENDIX D.6.2
EPA METHOD 25

From Page No. 0

TGNMO SAMPLE TRAIN ID'S FOR 9 JUNE 1981

EXAMPLE TRAIN ID NUMBER:

EPA METHOD NUMBER → 25-1-SI-B
 RUN NUMBER → 25-1-SI-B
 TRAIN ID → 25-1-SI-B
 SAMPLE LOCATION
 SI = SCRUBBER INLET
 SO = SCRUBBER OUTLET

TRAIN ID	TANK ID	H ₂ O ICE TRAP ID	DRY ICE TRAP ID	FLOW REG ID	CAGE
25-1-SI-A ①	5	215	111	3	TRC
25-1-SI-B ①	1	219	220	4	TRC
25-1-SI-C } SADDLE	8	207	227	1	PCS
25-1-SI-D } BAGS	67	232	107	2	PCS
25-1-SO-A	68	229	233	5	TRC
25-1-SO-B	9	221	235	6	TRC
25-1-SO-C } SADDLE	72	115	104	7	PCS
25-1-SO-D } BAGS	2	114	108	8	PCS

① TGNMO TRAIN USING 16 FT 1/8" SS TUBING EXTENSION
 FOR SAMPLING

COMMON HEAT TRACE?

To Page N.

Witnessed & Understood by me,

Date

D 35
9 JUN 81

Invented by

D. PEIERCE

Date

9-JUN-81

Recorded by

From Page No. 2

1. AFTER LEAK CHECKS WERE PERFORMED ~~TRAIN~~ THE TRAPS WERE DISCONNECTED FROM THE TANKS UNTIL ~~THE~~ JUST PRIOR TO THE RUN STARTING ≈ 10 MIN. THE INITIAL TEST START VAC. GAUGE READING IS THEN RECORDED ON THE TGNMO DATA SHEETS AFTER THE TRAINS WERE REASSEMBLED

THE TOTAL TIME TO ASSEMBLE A LEAK CHECK THE 8 TRAINS NEEDED FOR RUN #1 9 JUN 81 WAS ≈ 2 MAN HOURS

SCRUBBER INLET TRAINS WERE NOT ASSEMBLED ≈ 10 MIN PRIOR TO SAMPLING, BUT WERE ASSEMBLED ≈ 1.5 HRS PRIOR TO SAMPLING TO EASE INSTALLATION ONTO PROBE

≈ 2 MAN HRS USED FOR POST TEST TGNMO TRAIN PREPARATION

POST TEST TGNMO TRAIN LEAK CHECK

REG #	VAC. GAUGE ≈ 10 MIN AFTER VALUE OPENED	VAC GAUGE AFTER 10 MIN
1	13.2	13.2
2	11.8	11.8
3	16.2	16.2
4	13.2	13.2
5	11.4	11.4
X 6	11.2	11.0
X 7	14.5	14.4
8	11.5	11.5

To Page

Witnessed & Understood by me,

Date

Invented by
D. PEIRCE

Date

9 JUN 81

Recorded by

D-37

Page No. 4

TRAIN
TGMNO PRE-TEST LEAK CHECK

REG ID	GAUGE READING 2 MIN AFTER VALVE OPENED	GAUGE READING AFTER 10 MIN
1	28.8	28.8
2	29	29
3	30+	30+
4	29.8	29.8
5	30+	30+
6	30+	30+
7	29.7	29.7
8	29.4	29.4

TRAIN ID	TANK ID	H ₂ O ICE TRAP ID	DRY ICE TRAP ID	FLOW REG ID	LAB	
✓ 25-2-SI-A ①	4	31 ④	102	3	TRC	
✓ 25-2-SI-B ②	21	218	210	4	TRC	
✓ 25-2-SI-C	SADDLE BAGS {	58	101	209	7	PCS
✓ 25-2-SI-D		51	27 ②	201	8	PCS
✓ 25-2-SO-A	23	226	~~221~~ 222	5	TRC	
✓ 25-2-SO-B	60	230	109	6	TRC	
✓ 25-2-SO-C	SADDLE BAGS {	61	106	112	2	PCS
✓ 25-2-SO-D		13	231	103	1	PCS

HEAT TRACED

- ① TRAINS USING COMMON 1/8" SS TUBING TO DRAW SAMPLE
② OLD TRC TRAPS, ALL OTHERS FROM NU-TECH

To Page No. 6

Witnessed & Understood by me,

Date

Invented by D. PEIRCE

Date

10 JUNE 81

D-39

Recorded by

Project No. 1460-E00

EPA/PLYWOOD

Book No. _____

TITLE TGPMO SAMPLE TRAIN

GP

6

No. 5TRAIN
POST-TEST 1 LEAK CHECK

REG ID	GAGE AFTER 5 MIN AFTER VALVE OPENED	VAC GAGE AFTER 10 MIN

1	~~15.7~~ 14.7	14.7

2	12.6	12.6 ✓

3	16.5	16.5 ✓

4	13.6	13.6 ✓

5	14.2	14.2 ✓

6	~~16.0~~ 16.0	16.0 ✓

7	16.8	~~16.8~~ 16.8 ✓

8	13.1	~~13.1~~ 13.0 ✓

To Page No. 6

ed & Understood by me,

Date

D.40

Invented by D. PEIRCE

Date

10 JUNE 81

From Page No. 6

SAMPLE TRAIN INFO FOR 11 JUNE, 1981
FOR GP, SPRINGFIELD, OR

TGNMO TRAINS WERE ASSEMBLED AND LEAK CHECKED PRIOR TO SAMPLING
ACCORDING TO EPA METHOD 25 EXCEPT DURING THE PRE AND
POST TEST TRAIN LEAK CHECK THE SAMPLE FLOW VALVE WAS
OPENED AND IN THE TRAIN 2 MIN THE INITIAL VAC. GAUGE

AMBIENT TEMP DURING INITIAL ^{TANK} MANOMETER READING =
11 PRESS 11 11 11 11

TRAIN ID	TANK ID	H ₂ O ICE TRAP ID	DRY ICE TRAP ID	REG	C
25-3-SI-A	14	26 ^②	225	7	TR
25-3-SI-B		15 ^②	205	8	TR
25-3-SI-C	71	213	214	4	PC
25-3-SI-D	7	217	203	3	PC
25-3-SO-A	24	105	204	6	PC
25-3-SO-B	57	212	234	5	PC
25-3-SO-C	54	6 ^②	113	1	TR
25-3-SO-D	53	223	202	2	TR

① TRAINS USING COMMON 6 FT 1/8" HEATED SS TUBING TO DRAW SAMPLE

② OLD TRC TRAPS, ALL OTHERS FROM NU-TECH

To Page

Witnessed & Understood by me,

Date

Invented by D. PEIRCE

Date

D-41

Recorded by

11 JUN 81

Project No. 1460-EB0

EPA / PLYWOOD

Book No. _____

TITLE 16MM TRAINS

GP

8

No. 7

TRAIN

PRE-TEST LEAK CHECK

REG ID	VAC AFTER 2 MIN AFTER SAMPLE VALVE OPENED	VAC AFTER 10 MIN
1	28.8	28.8
2	28.8	28.8
3	30+	30+
4	30+	30+
5	30+	30+
6	30+	30+
7	29.8	29.8
8	29.0	28.9

POST-TEST TRAIN LEAK CHECK

REG ID	VAC 2 MIN AFTER SAMPLE VALVE OPENED	VAC AFTER 10 MIN
1	10.9	11.0
2	9.2	9.21
3	11.3	11.3
4	11.0	11.0
5	12.0	12.1
6	12.4	12.1
7	15.3	15.3
8	10.0	10.0

To Page No. 8

ed & Understood by me,

Date

D-42

Invented by D. PEIRCE

Date

11 JUNE 81

Recorded by

APPENDIX D.7
METHOD 5X - OPERATORS FIELD LOG

From Page No. 1

6/9/81

INLET

0845 Started to get up both sets of trains

1425 ~~At~~ to start test NO 1 on the inlet to the scrubber

~1425 bot power to method # 5x

1510 regained power to probe and heater box
Mark is taking pressure reading off the TGNMO TRAINS

Waiting for probes and heater box to come back up to temp

1525 heaters are up to heat

1524 Start Test NO 1 on port NO 1 of Inlet

1559 Finish with port NO 1 and changing to port NO 2
we at this time performed a leak check before entering
the TGNMO system. leak check was good

1645 Start port NO 2

1715 finish test NO 1 on the inlet to the system
did a final leak check at -12" in and the check was
started to tear down the train for clean up.

To Page

Witnessed & Understood by me.

Date

D-43

Invented by

Recorded by EDA

Date

6/9/81

INLET

ie No. 2

7/8/81

lbmograph

$$\Delta H_2 = 1.83$$

$$\gamma = 0.99$$

$$\text{Ave } \Delta P = 0.95$$

$$\text{max } \Delta P = 1.10$$

$$\text{bw } \Delta P = 0.35$$

$$T_b = 303^\circ\text{F}$$

$$\% \text{ Moisture} = 30\% \text{ morning}$$

$$T_m = 65^\circ\text{F}$$

1257 alet Gr testing leak checked at $-12''\text{Hg}$ at 0.015 cfm Setting moisture 32% (CER) at the inlet to the scrubber system

all heaters are up to temperature and process is go

1300 - had to change TC, stock TC connections pulled apart, Browned ^{ed} Peter's TC off his probe1418 Start Test NO 2 on Inlet to Scrubber unit
Sh Started at Port NO 11448 Stop test NO 2 to change ports
leak check at $-13''\text{Hg}$ at 0.016 cfm 1515 Already for port NO 2 start up waiting for Davis train to be repaired and heat block up to $350 \pm 25^\circ\text{F}$ The initial leak check was -12 at 0.014 cfm for the start of Port #2

To Page No. _____

ed & Understood by me,

Date

D-44

Invented by

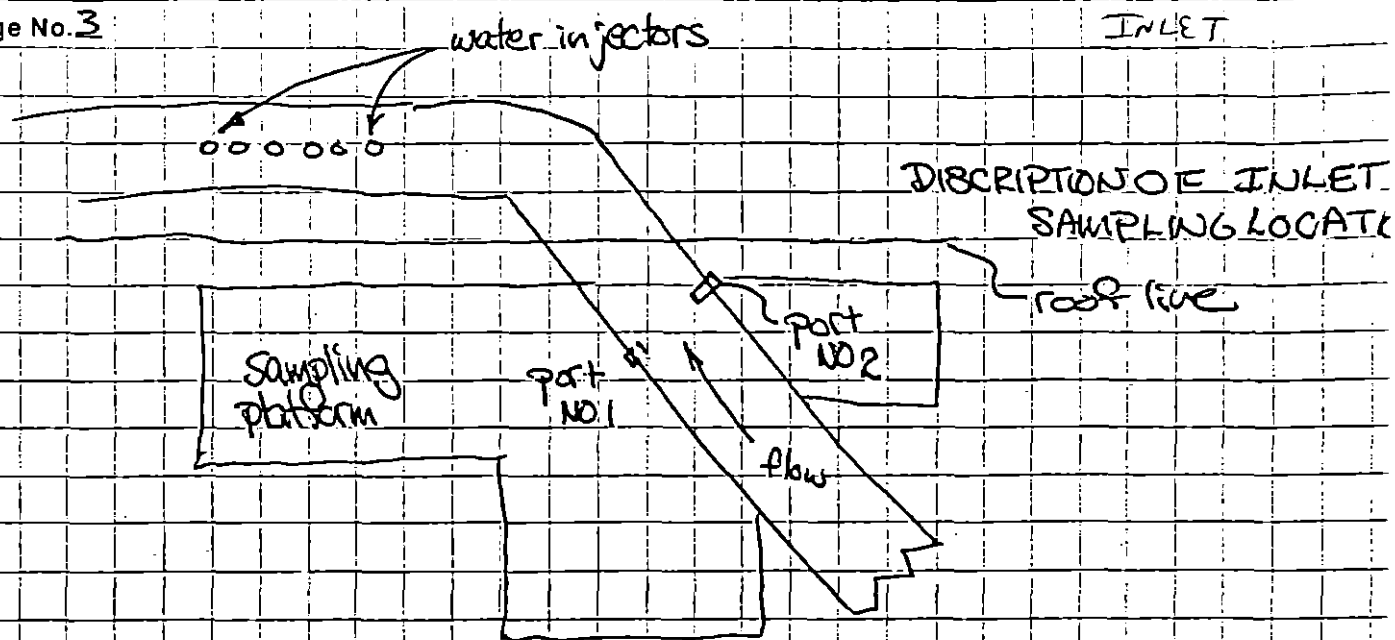
Recorded by F DA

Date

6/10/81

From Page No. 3

INLET



Start Port NO. 2 at 1551

1621 Stop test NO. 2 on Scrubber Inlet

there was a problem with the monograph of misalignment But is
 correct for today
 0927

6/11/81 Alset on train except for TANKS and doing leak check
 and heating up system

1102 Alset for testing heaters are up temp wet bulb temp 170°F

1159 Started Test NO. 3 on inlet to scrubber unit

1229 End of Port NO. 1 and change to port NO. 2
 leak check at 12" Hg = 0.006 cfm

1247 Port NO. 2 leak check was
 -9" Hg = 0.004 cfm
 now just waiting for Dave to replace filter and
 heat up

Second day of run

To Page

Witnessed & Understood by me,

Date

Invented by

Date

D-45

6/10/81

Recorded by EDA

Project No. 1460-880

Book No. _____

TITLE Georgia Pacific

4

ge No. _____

INLET

nomograph

$$T_m = 75^{\circ}F$$

$$T_s = 310^{\circ}F$$

$$P_s = 0.20$$

$$P_{bar} =$$

$$Max \Delta P_{avg} = 1.10 "H_2O$$

$$\Delta P_{avg} = 0.90 "H_2O$$

$$\% Moisture = 33\% CER$$

$$T_{atm} = 60$$

To Page No. _____

Used & Understood by me,

Date

6/11/81

Invented by

Date

Recorded by

EDA

D-46

TITLE Scrubber Outlet GP

Book No.

1

From Page No. —

OUTLET

June 9, 1981

★ 0800-0930 Method 25 prep.
tank evacuation
trap construction

1015

Finish tarp construction
waiting for shelf and platform
@ outlet location

1100

Set-up for method 5X + method 25

1115

Breakdown for wood shelf installation

1400

Test #1 start

1402

Shutdown ^{SH} manometer sticking

1410

Test #1 restart

1426

Shutdown, scrubber inlet lost power

Restart, TGNMO system started.

1522

Restart

1540

Some problem maintaining 325°F probe and fl
outlet temp. probably due to windy conditions.

1556

Finished Port 1

1615

Changed Ports second leak check w/ TGNMO
0.01 cfm

continued

★ all times approximate

To Page No.

Witnessed & Understood by me,

Date

Invented by

Date

D-47

Recorded by

TITLE

Scrubber Outlet

GP

Project No. 1460-E80

Book No.

2

From Page No. _____

OUTLET

June 9, 1981

1630 Ready to start port 2

1645 started on test 1 port 2

1714 JGNMO portion of test over

1732 Test over, leak checked @ < 0.01 cfm

1810 During probe wash, small residual deposit on nozzle discarded, due to scrape off from port.

To Page 3

Witnessed & Understood by me.

Date

D-48

Invented by

Date

Recorded by

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: 1/25/82

Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

SUBJECT: Source Test Report

FROM: J. E. McCarley, Chief, Field Testing Section,
Emission Measurement Branch, ESED (MD-13)

TO: See Below

The enclosed final source test report is submitted for your information. Any questions regarding the test should be directed to the Project Officer (telephone: 8/629-5543). Additional copies of this report are available from the ERC Library, Research Triangle Park, North Carolina 27711.

Industry: Plywood/Veneer

Process:

Company: Georgia-Pacific

Location: Springfield Plant, Springfield, Oregon

Project Report Number: 81-PLY-4

Project Officer: George W. Walsh

Enclosure

Addressees:

Ken Knapp, ESRL (MD-46)

✓ Arch MacQueen, MDAD (MD-14)

Rodney Midgett, EMSL (MD-77)

Mark S. Siegler, DSSE (MD-EN-341)

Director, Air & Hazardous Materials Division, Region X

(copy enclosed for State agency)

Bob Kilgore, EPA Library Services (MD-35)

TITLE

Scrubber Outlet

6P

Project No.

Book No.

3

From Page No.

OUTLET

June 10, 1981

★

Due to high isokinetics from previous days test nomograph was reset using 35% moisture instead of 16%.

1115 - Leak checked method 5X train < 0.01 cfm

①

1330 - Total train leak-checked, < 0.005 cfm.

1400 - Started Scrubber Outlet Test #2

1420 - Started TGMNO samples, pt. 10 on method 5X test

1450 - Finished Port 1, heater box broken replaced and moved to port two, leak-checked @ < 0.01 cfm.

1540 - Regan Port 2, held up with broken heater box.

1620 - Finished Port 2, recovered method 25 apparatus and transported method 5X equipment to recovery area.

① Changed from 4 1/2 to 2 1/2 inch filter

★

All times approximate

To Page

Witnessed & Understood by me,

Date

Invented by

Date

D-49

Recorded by

TITLE

George Pacific

Project No. 1460-60

Book No.

4

From Page No.

June 11, 1981

1045- Method SX and TRC method 25's in place, wait
for NCSI's equipment to hook-up prior to leak-check

1144- Probe finally up to heat, start test #3

1315- changed filters between ports, new filter #164
rope holding monorail frayed and broke, breaking filter w/
10 seconds remaining on port 1
New leak check = < 0.01 cfm.

1352- Started sampling port #2

1413- Shutdown for Scrubber Inlet pump repair

1452- Test over

To Page N

Witnessed & Understood by me.

Date

Invented by

Date

D-50

Recorded by

APPENDIX E

CALIBRATION DATA

- E.1 Summary of Equipment Used During Testing
- E.2 Orifices, Dry Gas Meters and DGM Thermocouples
- E.3 Pitot Tubes
- E.4 Nozzles
- E.5 EPA Method 25 - Flow Control Regulators
- E.6 Calibration Gases

APPENDIX E.1
SUMMARY OF EQUIPMENT USED DURING TESTING

TABLE E-1

TRC Equipment Used During Georgia-Pacific Testing

<u>Date</u>	<u>Run No.</u>	<u>Location</u>	<u>Probe/Pitot</u>	<u>Nozzle</u>	<u>Orifice</u>	<u>M25 Regulator</u>			
						<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
6-9-81	1	Inlet	501/A	4-2	T-2	3	4	1	2
		Outlet	1001/D	2-4	T-1	5	6	7	8
6-10-81	2	Inlet	501/A	4-2	T-2	3	4	7	8
		Outlet	1001/D	2-4	T-1	5	6	2	1
6-11-81	3	Inlet	501/A	4-2	T-2	7	8	4	3
		Outlet	1001/D	2-4	T-1	6	5	1	2

APPENDIX E.2
ORIFICES, DRY GAS METERS AND DGM THERMOCOUPLES

Heater Box Love Control OK
Module Cleaned /
Probe Heater Love Control OK

APPENDIX E.3
PITOT TUBES

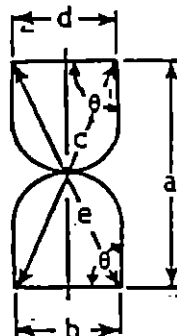
S-TYPE PITOT GEOMETRIC CALIBRATION
PART 2 - PITOT ALIGNMENT

TRC Probe Identification 501
Technical Specialist Ed Aste
Date 4/16/81

Pitot Identification A

A.

Transverse
Tube Axis



a 1.112
b 0.376
c 1.155
d 0.380
e 1.166
theta 87
theta' 88

$$\frac{a^2 + b^2 - c^2}{2ab} = \cos \theta$$

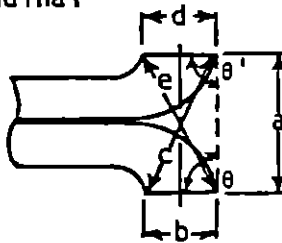
$$\frac{a^2 + d^2 - e^2}{2ad} = \cos \theta'$$

$$(80^\circ < \theta < 100^\circ)$$

$$(80^\circ < \theta' < 100^\circ)$$

B.

Longitudinal
Tube Axis



a 1.111
b 0.550
c 1.235
d 0.543
e 1.213
theta 89
theta' 87

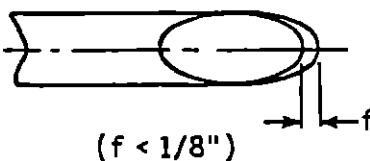
$$\frac{a^2 + b^2 - c^2}{2ab} = \cos \theta$$

$$\frac{a^2 + d^2 - e^2}{2ad} = \cos \theta'$$

$$(85^\circ < \theta < 95^\circ)$$

$$(85^\circ < \theta' < 95^\circ)$$

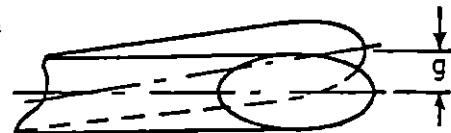
C.



f 0

(f < 1/8")

D.



g

(g < 1/32")

NOTE: values in parentheses are EPA Method 2 specifications.

PROBE THERMOCOUPLE CALIBRATION

Tolerances

Expected Stack Temperature (T_s) °R

Mercury Thermometer (T_{ref}) °R

Thermocouple Readout °R

Probe Identification

Technician Date

(T_s ± 10%)

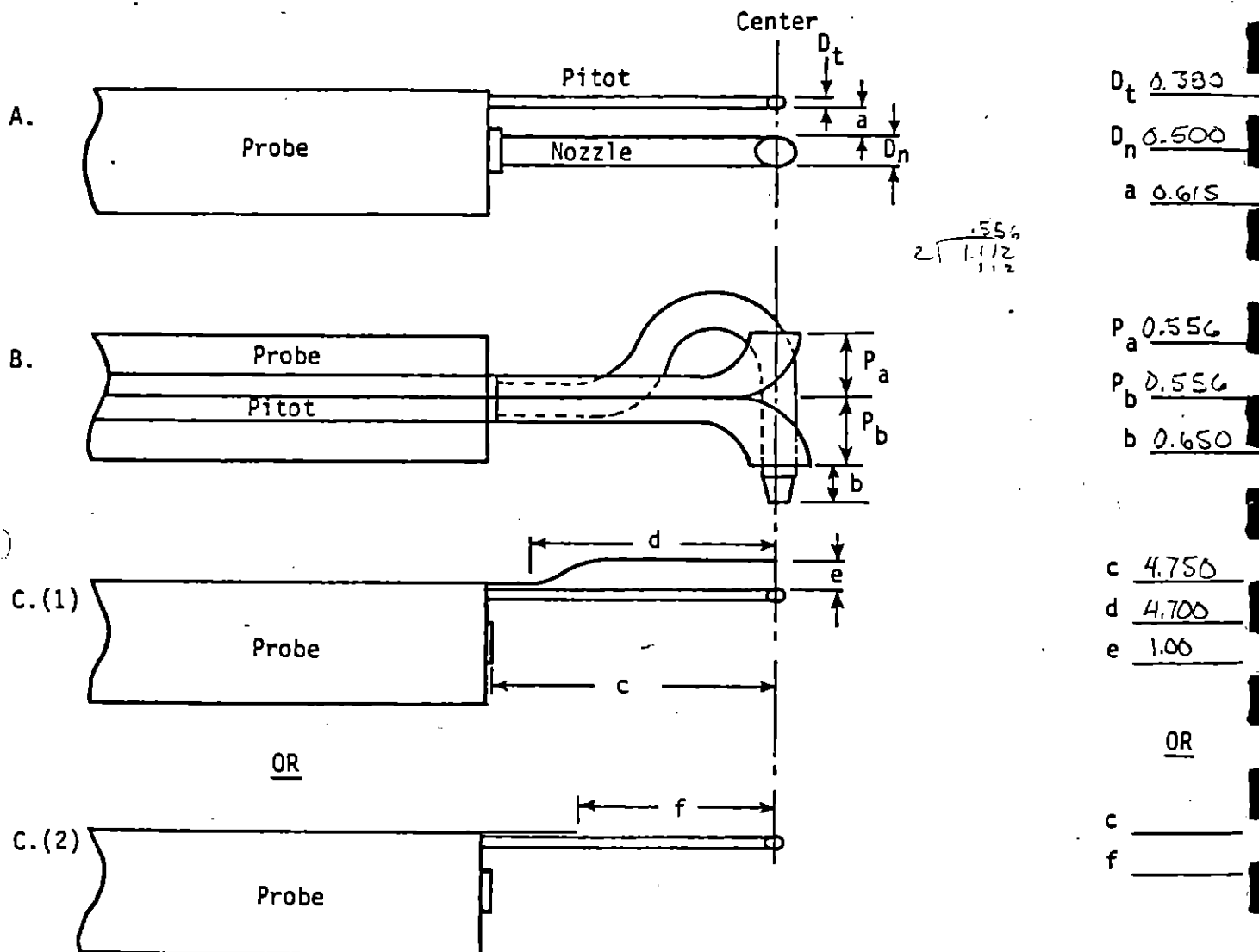
(T_{ref} ± 1.5%)

S-TYPE PITOT GEOMETRIC CALIBRATION
PART 1 - PROBE CONFIGURATION

Procedure No. T/S-811
Revision No. 1
Date December 9, 1981
Page of

TRC Probe Identification 501
Technical Specialist Ed Astle
Date 4/16/81

Pitot Identification A



Specifications (EPA Method 2)

$D_t = 3/16"$ to $3/8"$	$c \geq 3"$	$P_a = P_b$
$D_n = 1/2"$	$d \geq 3"$	
$a \geq 3/4"$	$e \geq 3/4"$	$1.05 D_t \leq P \leq 1.50 D_t$
$b \geq 0$	$f \geq 2"$	

If these specifications are met, proceed with Part 2 Pitot alignment.

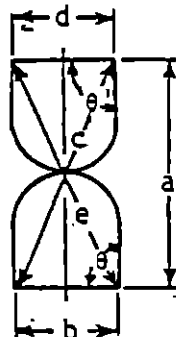
S-TYPE PITOT GEOMETRIC CALIBRATION
PART 2 - PITOT ALIGNMENT

TRC Probe Identification 1001
Technical Specialist Ed Astie
Date 4/16/81

Pitot Identification D

A.

Transverse
Tube Axis



a 1.132

b 0.377

c 1.190

d 0.378

e 1.185

θ 89.5

θ' 88.6

$$\frac{a^2 + b^2 - c^2}{2ab} = \cos \theta$$

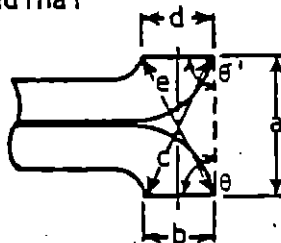
$$\frac{a^2 + d^2 - e^2}{2ad} = \cos \theta'$$

$$(80^\circ < \theta < 100^\circ)$$

$$(80^\circ < \theta' < 100^\circ)$$

B.

Longitudinal
Tube
Axis



a 1.128

b 0.540

c 1.263

d 0.514

e 1.232

θ 91.5

θ' 89.1

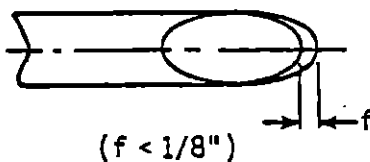
$$\frac{a^2 + b^2 - c^2}{2ab} = \cos \theta$$

$$\frac{a^2 + d^2 - e^2}{2ad} = \cos \theta'$$

$$(85^\circ < \theta < 95^\circ)$$

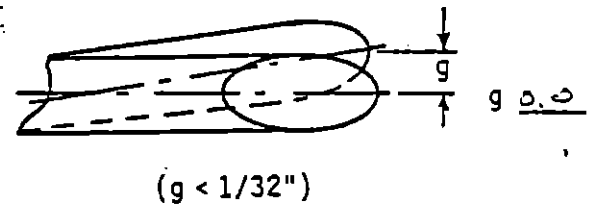
$$(85^\circ < \theta' < 95^\circ)$$

C.



f 0.0

D.



g 0.0

NOTE: values in parentheses are EPA Method 2 specifications.

PROBE THERMOCOUPLE CALIBRATION

Tolerances

Expected Stack Temperature (T_s) °R

Mercury Thermometer (T_{ref}) °R

Thermocouple Readout °R

Probe Identification

Technician

Date

$$(T_s \pm 10\%)$$

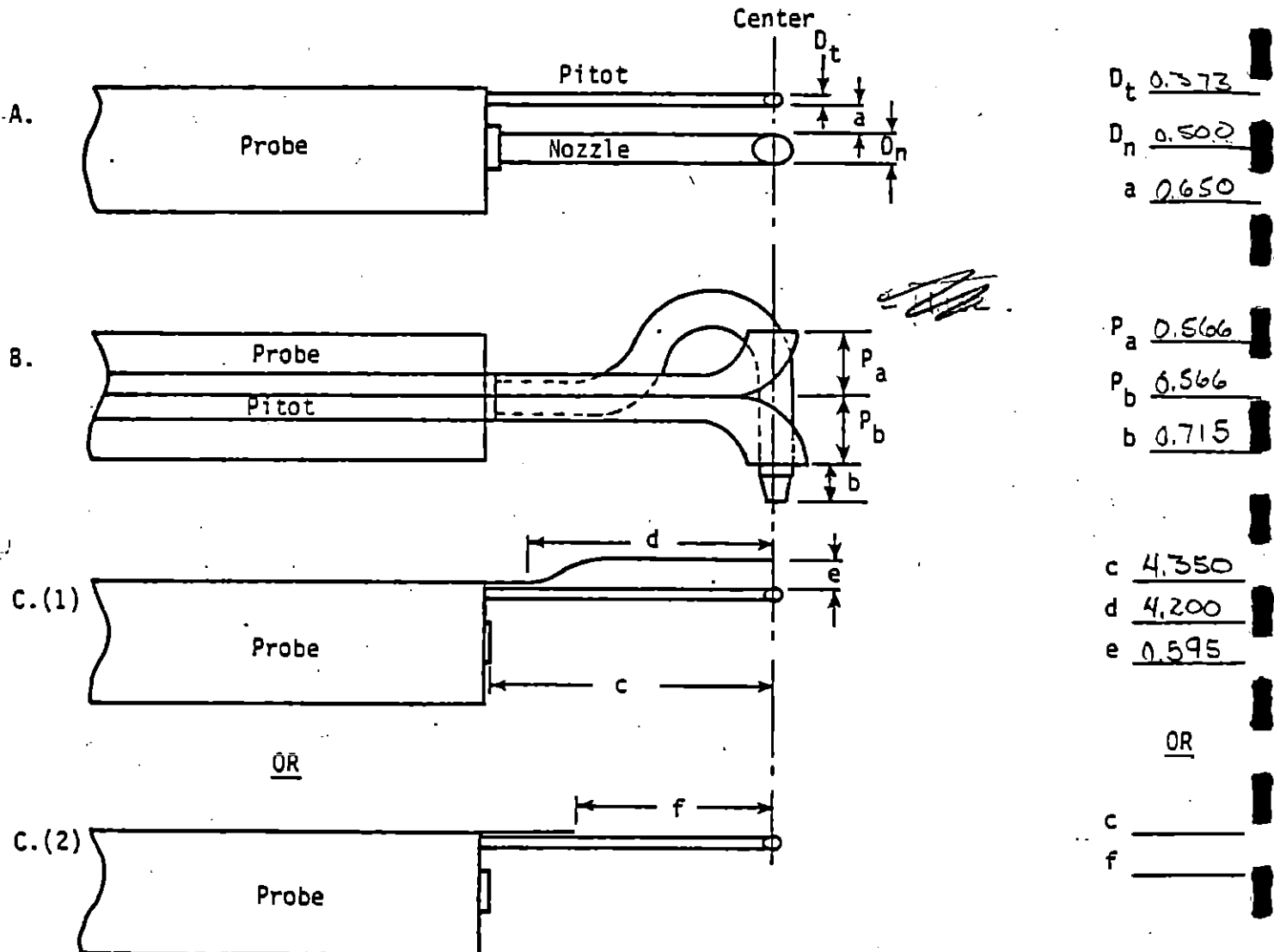
$$(T_{ref} \pm 1.5\%)$$

S-TYPE PITOT GEOMETRIC CALIBRATION
PART 1 - PROBE CONFIGURATION

Procedure No. T/S-811
 Revision No. 1
 Date December 9, 1981
 Page of

TRC Probe Identification 1001
 Technical Specialist ED ASRE
 Date 4/13/81

Pitot Identification D



Specifications (EPA Method 2)

$D_t = 3/16"$ to $3/8"$	$c \geq 3"$	$P_a = P_b$
$D_n = 1/2"$	$d \geq 3"$	
$a \geq 3/4"$	$e \geq 3/4"$	$1.05 D_t \leq P \leq 1.50 D_t$
$b \geq 0$	$f \geq 2"$	

If these specifications are met, proceed with Part 2 Pitot alignment.

APPENDIX E.4
NOZZLES

NOZZLE CALIBRATION DATA

Nozzle Set No. 2

Date

5/14/81

Tech.

JP



Nozzle No.	Diameter* -	a	b	c	average**
2-1		.184	.185	.185	.185
2-2		.260	.261	.261	.261
2-3		.375	.376	.377	.376
2-4		.502	.505	.506	.504
2-8		.311	.311	.311	.311
2-5		.123	.122	.123	.123
2-6		.934	.935	.935	.935
2-7		.749	.750	.749	.749

*measure to nearest .001"

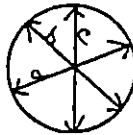
**three measurements must be within .004" of each other

NOZZLE CALIBRATION DATA

Nozzle Set No. 4

Date 5/14/81

Tech. JP



Nozzle No.	Diameter* -	a	b	c	average**
4-1		.184	.185	.185	.185
4-2		.255	.255	.255	.255
4-3		.383	.383	.383	.383
4-4		.500	.501	.502	.501
4-5		.128	.128	.128	.128
4-6		.750	.750	.750	.750
4-7		.938	.938	.938	.938
4-8		.316	.316	.317	.316

*measure to nearest .001"

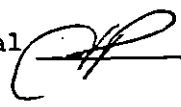
**three measurements must be within .004" of each other

APPENDIX E.5
EPA METHOD 25 - FLOW CONTROL REGULATORS

TGNMO - METHOD 25
FLOW CONTROL REGULATOR CALIBRATION

Regulator # 1
Date 6-1-81
P_B (MM) 758
Temperature (°C) 25
Technician D. PERACE

Leak Check OK
Leak Rate 0

Approval 

Time (Minutes)	Vacuum (" Hg)	Seconds/50 cc	Flowrate
0 14:20:00	23.1 - .5	59.32	50.57
2 14:22:00	22.6	59.48	50.44
4 14:24:00	21.9 - .7	59.42	50.49
6 14:26:00	21.2 - .7	59.56	50.37
8 14:28:00	20.7 - .5 ~~20.7~~	59.57	50.36
10 14:30:00	- .6 20.1	59.81	50.16
Average			

Special Sampling Conditions: TWO TGNMO TRAPS PER TRAIN

TGNMO - METHOD 25
FLOW CONTROL REGULATOR CALIBRATION

Regulator # 2
Date 6-1-81
P_B (MM) 758
Temperature (°C) _____
Technician D. PERCCE

Leak Check OK
Leak Rate 0

Approval [Signature]

Time (Minutes)	Vacuum (" Hg)	Seconds/50 cc	Flowrate
0 12:51:00	22.4 -.7	58.33	51.43
2 12:53:00	21.7 -.7	58.40	51.37
4 12:55:00	21.0 -.6	58.54	51.25
6 12:57:00	20.4 -.6	58.61	51.19
8 12:59:00	19.8 -.7	58.68	51.12
10 13:01:00	19.1	58.91	50.93
Average	~ 15% chg		~ 1% chg

Special Sampling Conditions: TWO TGNMO TRAPS PER TRAIN

TGNMO - METHOD 25
FLOW CONTROL REGULATOR CALIBRATION

Regulator # 3
Date 6-1-81
P_B (MM) 759
Temperature (°C) 25
Technician D. PEIRCE

Leak Check OK
Leak Rate 0

Approval [Signature]

Time (Minutes)	Vacuum (" Hg)	Seconds/50 cc	Flowrate
0 16:05:00	29.8 -.7	59.21	50.67
2 16:07:00	29.1 -.7	59.19	50.68
4 16:09:00	28.4 -.6	59.41	50.50
6 16:11:00	27.8 -.7	59.45	50.46
8 16:13:00	27.1	59.37	50.53
10 16:15:00	26.5	59.50	50.42
Average			

Special Sampling Conditions: TWO TGNMO TRAPS PER TRAIN

TGNMO - METHOD 25
FLOW CONTROL REGULATOR CALIBRATION

Regulator # #4
Date 6-1-81
P_B (MM) 758
Temperature (°C) _____
Technician D. PEIRCE

Leak Check OK
Leak Rate 0

Approval [Signature]

Time (Minutes)	Vacuum (" Hg)	Seconds/50 cc	Flowrate
0 16:22:00	29.3 -.6	58.78	51.04
2 16:24:00	28.7 -.7	58.95	50.89
4 16:26:00	28.0 -.6	59.33	50.56
6 16:28:00	27.4 -.6	59.42	50.49
8 16:30:00	26.8 -.7	59.44	50.47
10 16:32:00	26.1	59.55	50.38
Average			

Special Sampling Conditions: TWO TGNMO TRAPS PER TRAIN

TGNMO - METHOD 25
FLOW CONTROL REGULATOR CALIBRATION

Regulator # #5 Leak Check OK
 Date 6-1-81 Leak Rate 0
 P_B (MM) 758
 Temperature (°C) _____
 Technician D. PEIRCE Approval [Signature]

Time (Minutes)	Vacuum (" Hg)	Seconds/50 cc	Flowrate
0 14:52:00	29.1 -.6	59.83	50.14
2 14:54:00	28.5 -.6	59.60	50.33
4 14:56:00	27.9 -.6	59.43	50.48
6 14:58:00	27.3 -.7	59.38	50.52
8 15:00:00	26.6 -.7	59.33	50.56
10 15:02:00	25.9 -.7	59.19	50.68
Average			

Special Sampling Conditions: TWO TGNMO TRAPS PER TRAIN

TGNMO - METHOD 25
FLOW CONTROL REGULATOR CALIBRATION

Regulator # 76
Date 6-1-81
P_B (MM) 758
Temperature (°C) 25
Technician D. PEIRCE

Leak Check OK
Leak Rate 0
Approval [Signature]

Time (Minutes)	Vacuum (" Hg)	Seconds/50 cc	Flowrate
0 15:26:00	29.6 - .5	59.34	50.56
2 15:28:00	29.1 - .6	59.40	50.51
4 15:30:00	28.5 - .7	59.52	50.40
6 15:32:00	27.8 - .6	59.70	50.25
8 15:34:00	27.2 - .6	59.66	50.28
10 15:36:00	26.6 - .6	59.70	50.25
Average			

Special Sampling Conditions: TWO TGNMO TRAPS PER TRAIN

TGNMO - METHOD 25
FLOW CONTROL REGULATOR CALIBRATION

Regulator # 7
Date 6-1-81
P_B (MM) 758
Temperature (°C) 25.0
Technician D. PEIRCE

Leak Check OK
Leak Rate 0
Approval [Signature]

Time (Minutes)	Vacuum (" Hg)	Seconds/50 cc	Flowrate
0 13:31:00	27.8	59.55	50.38
2 13:33:00	27.1	59.60	50.34
4 13:35:00	26.5	~~24~~ 59.87	50.11
6 13:37:00	25.7	60.01	49.99
8 13:39:00	25.1	60.05	49.96
10 13:41:00	24.5	60.14	49.88
Average			

Special Sampling Conditions:

TGNMO - METHOD 25
FLOW CONTROL REGULATOR CALIBRATION

Regulator # 8
Date 6-1-81
P_B (MM) 778
Temperature (°C) 25
Technician D. PEIRCE

Leak Check OK
Leak Rate 0

Approval [Signature]

Time (Minutes)	Vacuum (" Hg)	Seconds/50 cc	Flowrate
0 13:55:00	~~28.3~~ ~~28.03~~ - .8	58.02	51.71
2 13:57:00	27.5 - .6	57.89	51.82
4 13:59:00	26.9 - .6	58.00	51.72
6 14:01:00	~~26.3~~ 25.6 - .7	58.03	51.70
8 14:03:00	25.6 - .6	57.97	51.75
10 14:05:00	25.0	57.99	
Average			

Special Sampling Conditions:

APPENDIX E.6
CALIBRATION GASES



SCIENTIFIC GAS PRODUCTS INC.

2330 HAMILTON BLVD., SOUTH PLAINFIELD, NJ 07080

3325 WESTSIDE DRIVE, PASADENA, TX 77504

LAKESIDE OFFICE BLDG., NORTH AVE., WAKEFIELD, MA 01880

500 WEAVER PARK RD., LONGMONT, CO 80501

3395 DE LA CRUZ BLVD., SANTA CLARA, CA 95050

(201) 754-7700

(713) 947-2222

(617) 245-8707

(303) 442-4700

(408) 988-3600

2772

T.R.C. Inc.

125 Silas Deane Highway

Wethersfield, Conn. 06109

Date June 11, 1981

Cust. P.O. 8202

Inv. No. 151210

Q.C. No. F091 EMA

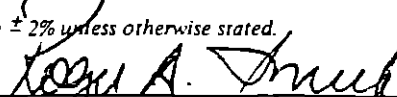
CERTIFICATION

<u>CYLINDER NO.</u>	<u>COMPONENT</u>	<u>REQUESTED</u>	<u>ACTUAL</u>
1A-3917	Carbon Dioxide Air/Z-1	50PPM Balance	51PPM Balance
1A-4435	Carbon Dioxide Air/Z-1	500PPM Balance	492PPM Balance
1A-9860	Carbon Dioxide Air/Z-1	1% Balance	1.00% Balance

All values reported in Mole percent unless otherwise noted.

Accuracy/tolerance on all values greater than 100 ppm within $\pm 2\%$ unless otherwise stated.


Michael M. Hollander ANALYST


Roger A. Smith SUPERVISOR

APPENDIX F

SAMPLING AND ANALYTICAL PROCEDURES

- F.1 EPA Methods 1, 2, 4, 5 and 5X
- F.2 EPA Method 25 as used by TRC
- F.3 EPA Method 25 as used by NCASI
- F.4 Scrubber Solution Analysis
- F.5 EPA Method 22 - Fugitive Emissions

APPENDIX F.1
EPA METHODS 1, 2, 4, 5 and 5X

EPA METHOD 1
SAMPLE AND VELOCITY TRAVERSES
FOR STATIONARY SOURCES

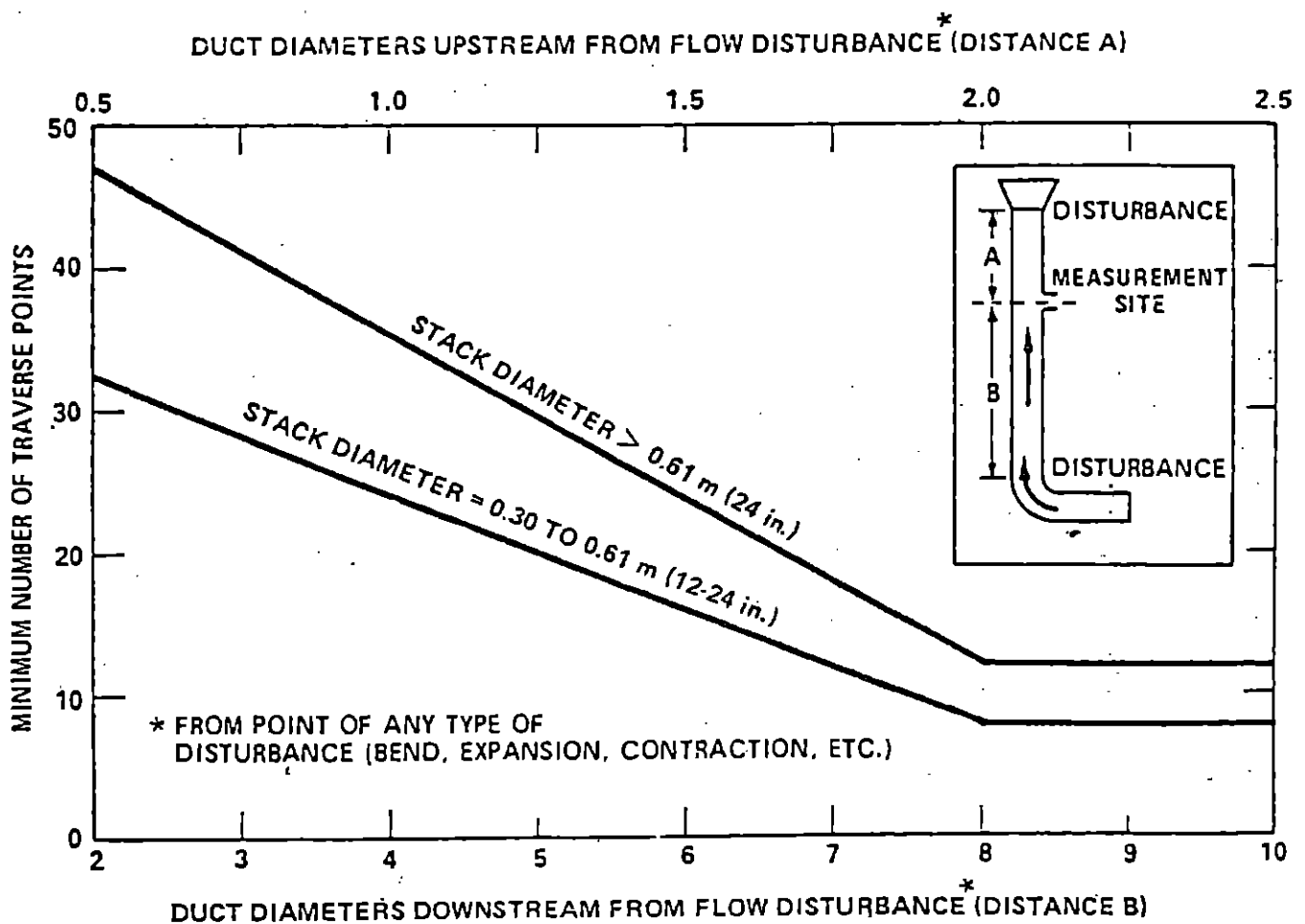


Figure 1-1. Minimum number of traverse points for particulate traverses.

EPA METHOD #1

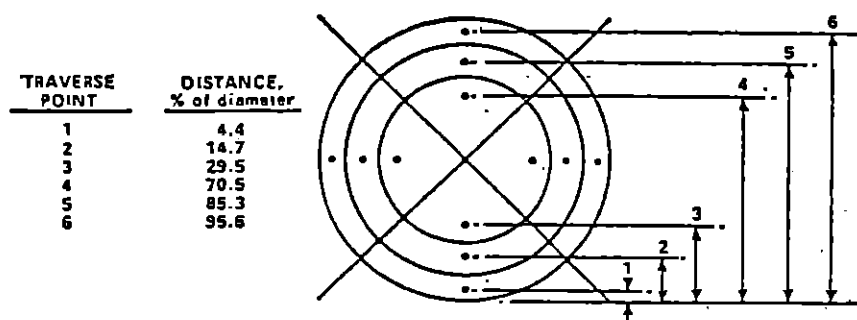


Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points indicated.

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 #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.

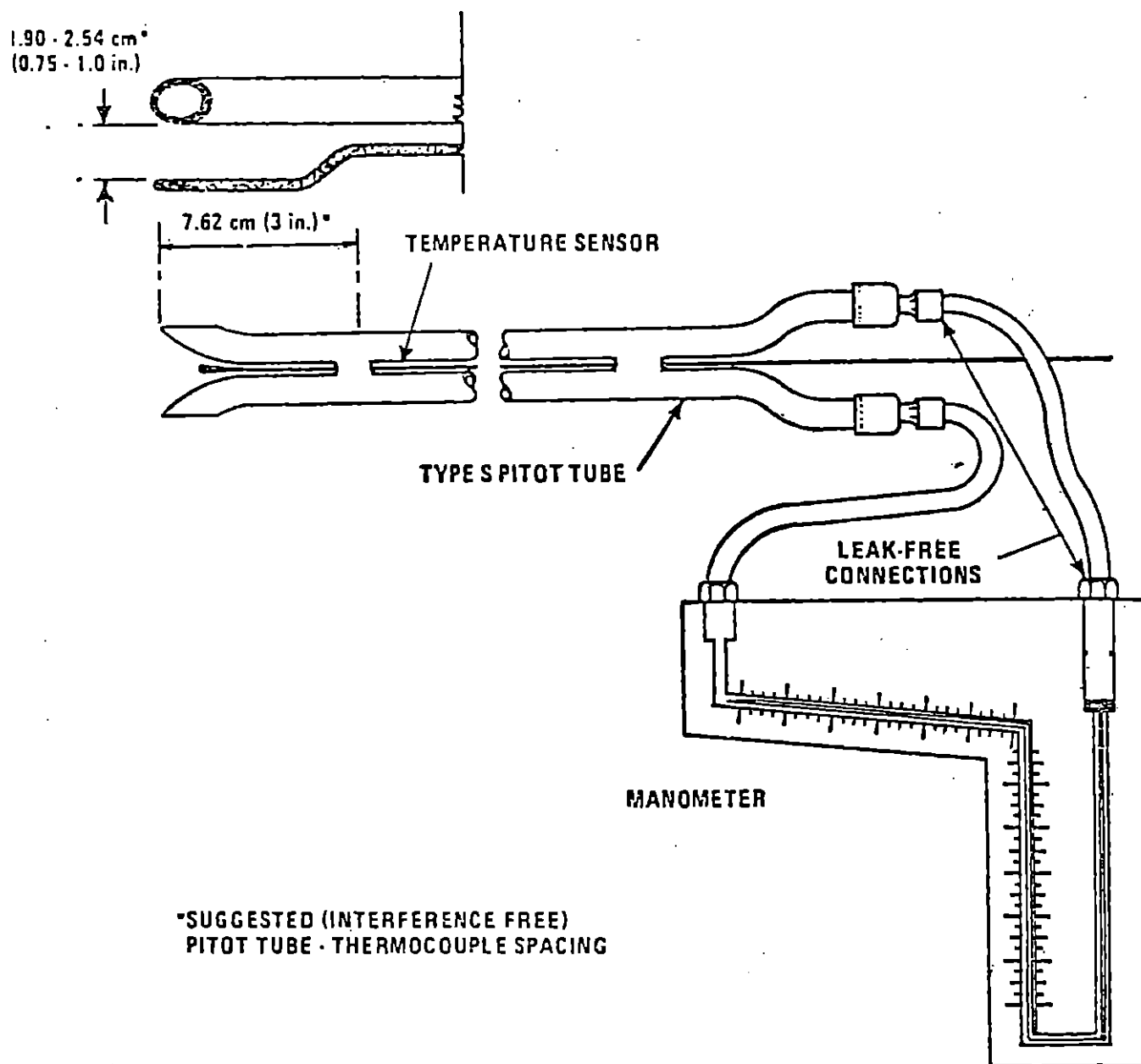


Figure 2-1. Type S pitot tube manometer assembly.

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.

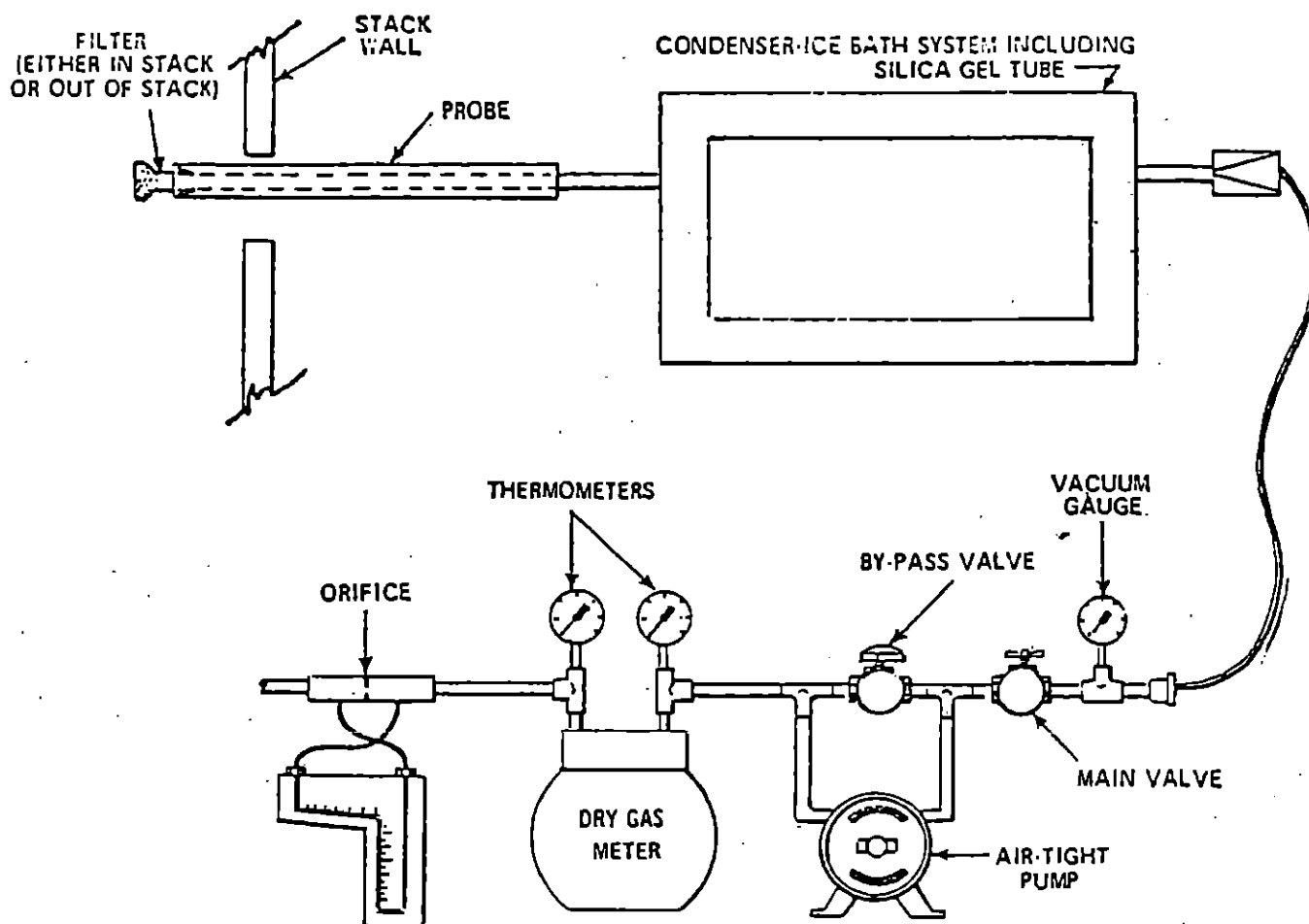


Figure 4-1. Moisture sampling train-reference method.

3.2.2 Connect the probe, insert it into the stack, and sample at a constant rate of 2 lpm (0.071 cfm). Continue sampling until the dry gas meter registers about 30 liters (1.1 ft³) or until visible liquid droplets are carried over from the first impinger to the second. Record temperature, pressure, and dry gas meter readings as required by Figure 4-3.

3.2.3 After collecting the sample, combine the contents of the two impingers and measure the volume to the nearest 0.5 ml.

3.3 Calculations. The calculation method presented is designed to estimate the moisture in the stack gas; therefore, other data, which are only necessary for accurate moisture determinations, are not collected. The following equations adequately estimate the moisture content, for the purpose of determining isokinetic sampling rate settings.

3.3.1 Nomenclature.

- B_w = Approximate proportion, by volume, of water vapor in the gas stream leaving the second impinger, 0.025.
 B_m = Water vapor in the gas stream, proportion by volume.
 M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).
 P_a = Absolute pressure (for this method, same as barometric pressure) at the dry gas meter.
 P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
 R = Ideal gas constant, 0.08206 (mm Hg) (m³)/(g-mole) (°K) for metric units and 21.85 (in. Hg) (ft³)/(lb-mole) (°R) for English units.
 T_m = Absolute temperature at meter, °K (°R).
 T_{std} = Standard absolute temperature, 293° K (528° R).
 V_f = Final volume of impinger contents, ml.
 V_i = Initial volume of impinger contents, ml.
 V_m = Dry gas volume measured by dry gas meter, dcm (dcf).
 V_{mstd} = Dry gas volume measured by dry gas meter, corrected to standard conditions, dcm (dcf).
 V_{wstd} = Volume of water vapor condensed, corrected to standard conditions, scm (scf).
 ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).
 Y = Dry gas meter calibration factor.

3.3.2 Volume of water vapor collected.

$$V_{wstd} = \frac{(V_f - V_i) \rho_w R T_{std}}{P_{std} M_w} = K_1 (V_f - V_i)$$

Equation 4-5

where:

$K_1 = 0.001333$ m³/ml for metric units
 $= 0.04707$ ft³/ml for English units.

$$V_{mstd} = V_m \left(\frac{P_a}{P_{std}} \right) \left(\frac{T_{std}}{T_m} \right) = V_m \frac{P_a T_{std}}{P_{std} T_m}$$

Equation 4-6

where:

$K_2 = 0.3859$ °K/mm Hg for metric units
 $= 17.94$ °R/in. Hg for English units

3.3.4 Approximate moisture content.

$$B_w = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.025 = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} \quad (0.025)$$

Equation 4-7

4. Calibration

4.1 For the reference method, calibrate equipment as specified in the following sections of Method 5: Section 3.3 (metering system); Section 3.5 (temperature gauges); and Section 3.7 (barometer). The recommended leak check of the metering system (Section 3.6 of Method 5) also applies to the reference method. For the approximation method, use the procedures outlined in Section 4.1.1 of Method 6 to calibrate the metering system, and the procedure of Method 5, Section 3.7 to calibrate the barometer.

5. Bibliography

1. Air Pollution Engineering Manual (Second Edition). Danielson, J. A. (ed.). U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C. Publication No. AP-40, 1973.
2. Devorkin, Howard, et al. Air Pollution Source Testing Manual. Air Pollution Control District, Los Angeles, Calif. November, 1963.
3. Methods for Determination of Velocity, Volume, Dux and Mix Content of Gases. Western Precipitation Division of Joy Manufacturing Co., Los Angeles, Calif. Bulletin WP-60, 1968.

METHOD 5—DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES

1. Principle and Applicability

1.1 Principle. Particulate matter is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120±14° C (248±25° F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator, U.S. Environmental Protection Agency, for a particular application. The particulate mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of particulate emissions from stationary sources.

2. Apparatus

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in Section 7); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in Section 7). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

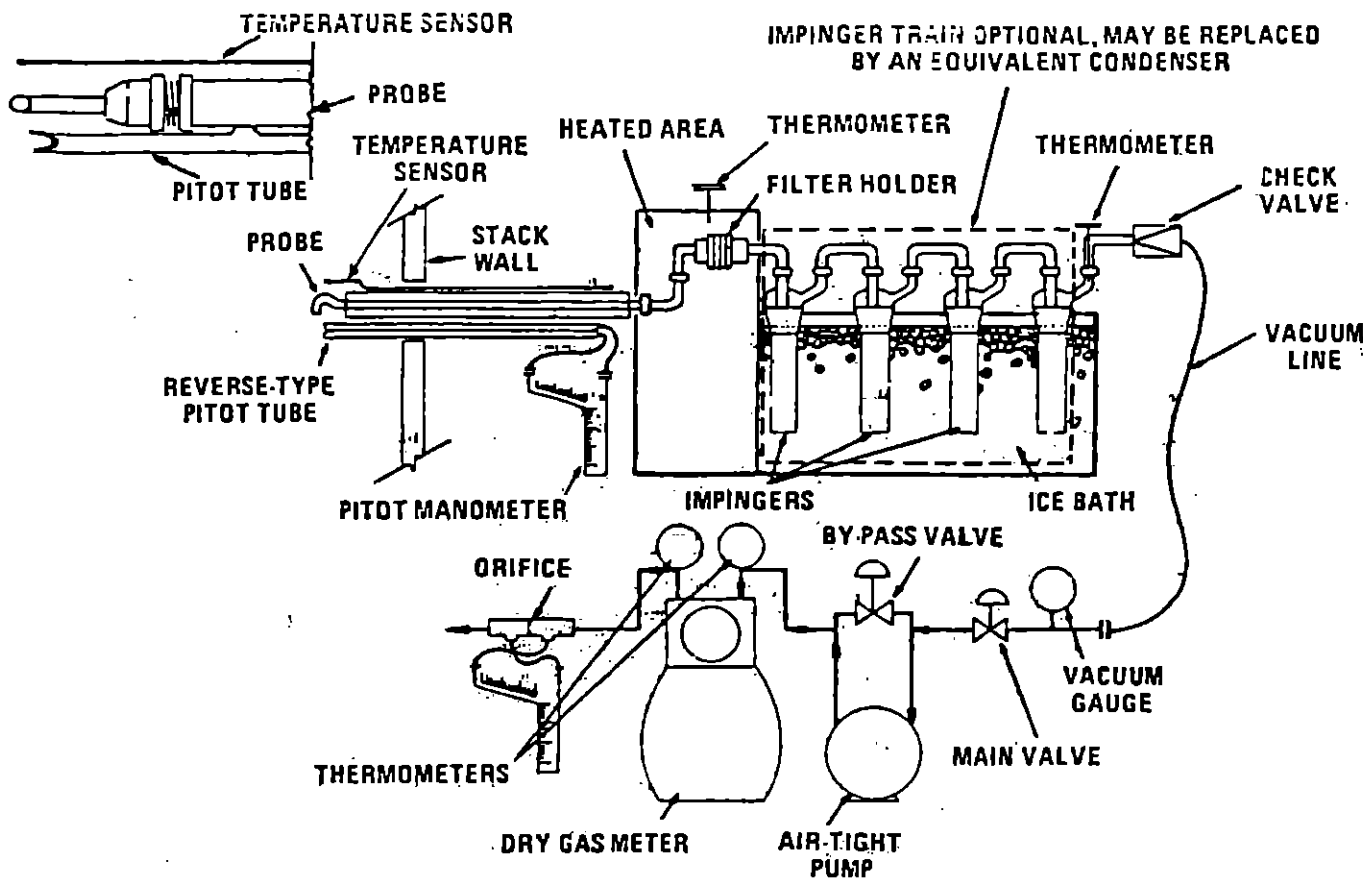


Figure 5 1. Particulate-sampling train.

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be $\leq 30^\circ$ and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (5/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 3.

2.1.2 Probe Liner. Borosilicate or quartz glass tubing with a heating system capable of maintaining a gas temperature at the exit end during sampling of $120 \pm 14^\circ \text{C}$ ($248 \pm 25^\circ \text{F}$), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. (The user may opt to operate the equipment at a temperature lower than that specified.) Since the actual temperature at the outlet of the probe is not usually monitored during sampling, probes constructed according to APTD-0581 and utilizing the calibration curves of APTD-0576 (or calibrated according to the procedure outlined in APTD-0576) will be considered acceptable.

Either borosilicate or quartz glass probe liners may be used for stack temperatures up to about 480°C (900°F); quartz liners shall be used for temperatures between 480 and 900°C (900 and $1,650^\circ \text{F}$). Both types of liners may be used at higher temperatures than specified for short periods of time, subject to the approval of the Administrator. The softening temperature for borosilicate is 820°C ($1,508^\circ \text{F}$), and for quartz it is $1,530^\circ \text{C}$ ($2,732^\circ \text{F}$).

Whenever practical, every effort should be made to use borosilicate or quartz glass probe liners. Alternatively, metal liners (e.g., 316 stainless steel, Incoloy 823, or other corrosion resistant metals) made of seamless tubing may be used, subject to the approval of the Administrator.

2.1.3 Pitot Tube. Type S, as described in Section 2.1 of Method 2, or other device approved by the Administrator. The pitot tube shall be attached to the probe (as shown in Figure 5-1) to allow constant monitoring of the stack gas velocity. The impact (stagnation) opening

plane of the pitot tube shall be even with or above the nozzle entry plane (see Method 2, Figure 2-5b) during sampling. The Type S pitot tube assembly shall have a known coefficient, determined as outlined in Section 4 of Method 2.

2.1.4 Differential Pressure Gauge. Inclined manometer or equivalent device (two), as described in Section 2.2 of Method 2. One manometer shall be used for velocity head (Δp) readings, and the other, for orifice differential pressure readings.

2.1.5 Filter Holder. Borosilicate glass, with a glass frit filter support and a silicone rubber gasket. Other materials of construction (e.g., stainless steel, Teflon, Viton) may be used, subject to approval of the Administrator. The holder design shall provide a positive seal against leakage from the outside or around the filter. The holder shall be attached immediately at the outlet of the probe (or cyclone, if used).

2.1.6 Filter Heating System. Any heating system capable of maintaining a temperature around the filter holder during sampling of $120 \pm 14^\circ \text{C}$ ($248 \pm 25^\circ \text{F}$), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. Alternatively, the user may opt to operate the equipment at a temperature lower than that specified. A thermometer gauge capable of measuring temperature to within 1°C (5.4°F) shall be installed so that the temperature around the filter holder can be regulated and monitored during sampling. Heating systems other than the one shown in APTD-0581 may be used.

2.1.7 Condenser. The following system shall be used to determine the stack gas moisture content: Four impingers connected in series with leak-free ground glass fittings or any similar leak-free non-contaminating fittings. The first, third, and fourth impingers shall be of the Greenburg-Smith design, modified by replacing the tip with 1.3 cm (1/2 in.) ID glass tube extending to about 1.3 cm (1/2 in.) from the bottom of the flask. The second impinger shall be of the Greenburg-Smith design with the standard tip. Modifications (e.g., using flexible connections between the impingers, using materials other than glass, or using flexible vacuum lines to connect the filter holder to the condenser) may be used, subject to the approval of the Administrator. The first and second impingers shall contain known quantities of water (Section 4.1.3), the third shall be empty, and the fourth shall contain a known weight of silica gel, or equivalent desiccant. A thermometer, capable of measuring

temperature to within 1°C (2°F) shall be placed at the outlet of the fourth impinger for monitoring purposes.

Alternatively, any system that cools the sample gas stream and allows measurement of the water condensed and moisture leaving the condenser, each to within 1 ml or 1 g may be used, subject to the approval of the Administrator. Acceptable means are to measure the condensed water either gravimetrically or volumetrically and to measure the moisture leaving the condenser by: (1) monitoring the temperature and pressure at the exit of the condenser and using Dalton's law of partial pressures; or (2) passing the sample gas stream through a tared silica gel (or equivalent desiccant) trap with exit gases kept below 20°C (68°F) and determining the weight gain.

If means other than silica gel are used to determine the amount of moisture leaving the condenser, it is recommended that silica gel (or equivalent) still be used between the condenser system and pump to prevent moisture condensation in the pump and metering devices and to avoid the need to make corrections for moisture in the metered volume.

NOTE.—If a determination of the particulate matter collected in the impingers is desired in addition to moisture content, the impinger system described above shall be used, without modification. Individual States or control agencies requiring this information shall be contacted as to the sample recovery and analysis of the impinger contents.

2.1.8 Metering System. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 1°C (5.4°F), dry gas meter capable of measuring volume to within 2 percent, and related equipment, as shown in Figure 5-1. Other metering systems capable of maintaining sampling rates within 10 percent of isokinetic and of determining sample volumes to within 2 percent may be used, subject to the approval of the Administrator. When the metering system is used in conjunction with a pitot tube, the system shall enable checks of isokinetic rates.

Sampling trains utilizing metering systems designed for higher flow rates than that described in APTD-0581 or APTD-0576 may be used provided that the specifications of this method are met.

2.1.9 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg). In many cases, the barometric reading may be obtained from a nearby national weather service station, in which case the station value (which is

* Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

the absolute (barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and sampling point shall be applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice versa for elevation decrease.

2.1.10 Gas Density Determination Equipment. Temperature sensor and pressure gauge, as described in Sections 2.1 and 2.4 of Method 2, and gas analyzer, if necessary, as described in Method 3. The temperature sensor shall, preferably, be permanently attached to the pilot tube or sampling probe in a fixed configuration, such that the tip of the sensor extends beyond the leading edge of the probe sheath and does not touch any metal. Alternatively, the sensor may be attached just prior to use in the field. Note, however, that if the temperature sensor is attached in the field, the sensor must be placed in an interference-free arrangement with respect to the Type 8 pilot tube openings (see Method 2, Figure 2-7). As a second alternative, if a difference of not more than 1 percent in the average velocity measurement is to be introduced, the temperature gauge need not be attached to the probe or pilot tube. (This alternative is subject to the approval of the Administrator.)

2.2 Sample Recovery. The following items are needed:

2.2.1 Probe-Liner and Probe-Nozzle Brushes. Nylon bristle brushes with stainless steel wire handles. The probe brush shall have extensions (at least as long as the probe) of stainless steel, Nylon, Teflon, or similarly inert material. The brushes shall be properly sized and shaped to brush out the probe liner and nozzle.

2.2.2 Wash Bottles—Two. Glass wash bottles are recommended; polyethylene wash bottles may be used at the option of the tester. It is recommended that acetone not be stored in polyethylene bottles for longer than a month.

2.2.3 Glass Sample Storage Containers. Chemically resistant, hermetic glass bottles, for acetone washes, 500 ml or 1000 ml. Screw cap liners shall either be rubber-backed Teflon or shall be constructed so as to be leak-free and resistant to chemical attack by acetone. (Narrow mouth glass bottles have been found to be less prone to leakage.) Alternatively, polyethylene bottles may be used.

2.2.4 Petri Dishes. For filter sampler, glass or polyethylene, unless otherwise specified by the Administrator.

2.2.5 Graduated Cylinder and/or Balance. To measure condensed water to within 1 ml or 1 g. Graduated cylinders shall have subdivisions no greater than 2 ml. Most laboratory balances are capable of weighing to the nearest 0.5 g or less. Any of these balances is suitable for use here and in Section 2.3.4.

2.2.6 Plastic Storage Containers. Air-tight containers to store silica gel.

2.2.7 Funnel and Rubber Plunger. To aid in transfer of silica gel to container; not necessary if silica gel is weighed in the field.

2.2.8 Funnel. Glass or polyethylene, to aid in sample recovery.

2.3 Analysis. For analysis, the following equipment is needed:

2.3.1 Glass Weighing Dishes.

2.3.2 Desiccator.

2.3.3 Analytical Balance. To measure to within 0.1 mg.

2.3.4 Balance. To measure to within 0.5 g.

2.3.5 Beakers. 250 ml.

2.3.6 Hygrometer. To measure the relative humidity of the laboratory environment.

2.3.7 Temperature Gauge. To measure the temperature of the laboratory environment.

3. Reagents

3.1 Sampling. The reagents used in sampling are as follows:

3.1.1 Filters. Glass fiber filters, without organic binder, exhibiting at least 99.95 percent efficiency (50.0 percent penetration) on 0.3-micron direct platinum smoke particles. The filter efficiency test shall be conducted in accordance with ASTM standard method D 286-71. Test data from this supplier's quality control program are sufficient for this purpose.

3.1.2 Silica Gel, Indicating type. 8 to 16 mesh. If previously used, dry at 175° C (350° F) for 2 hours. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used, subject to the approval of the Administrator.

3.1.3 Water. When analysis of the material caught in the impingers is required, distilled water shall be used. Run blanks prior to field use to eliminate a high blank on test samples.

3.1.4 Crushed Ice.

3.1.5 Stopcock Grease. Acetone-insoluble, heat-stable silicone grease. This is not necessary if screw-on connectors with Teflon sleeves, or similar, are used. Alternatively, other types of stopcock grease may be used, subject to the approval of the Administrator.

3.2 Sample Recovery. Acetone—reagent grade, ≤ 0.001 percent residue. In glass bottles—is required. Acetone from metal containers generally has a high residue blank and should not be used. Sometimes, suppliers transfer acetone to glass bottles from metal containers; thus, acetone blanks shall be run prior to field use and only acetone with low blank values (≤ 0.001 percent) shall be used. In no case shall a blank value of greater than 0.001 percent of the weight of acetone used be subtracted from the sample weight.

3.3 Analysis. Two reagents are required for the analysis:

3.3.1 Acetone. Same as 3.2.

3.3.2 Desiccant. Anhydrous calcium sulfate, indicating type. Alternatively, other types of desiccants may be used, subject to the approval of the Administrator.

4. Procedure

4.1 Sampling. The complexity of this method is such that, in order to obtain reliable results, testers should be trained and experienced with the test procedures.

4.1.1 Pretest Preparation. All the components shall be maintained and calibrated according to the procedure described in APTD-0576, unless otherwise specified herein.

Weigh several 200 to 300 g portions of silica gel in air-tight containers to the nearest 0.5 g. Record the total weight of the silica gel plus container, on each container. As an alternative, the silica gel need not be preweighed, but may be weighed directly in its impinger or sampling holder just prior to train assembly.

Check filters visually against light for irregularities and flaws or pinhole leaks. Label filters of the proper diameter on the back side near the edge using numbering machine ink. As an alternative, label the shipping containers (glass or plastic petri dishes) and keep the filters in these containers at all times except during sampling and weighing.

Desiccate the filters at $20 \pm 5.0^\circ$ C ($68 \pm 10^\circ$ F) and ambient pressure for at least 24 hours and weigh at intervals of at least 6 hours to a constant weight, i.e., <0.5 mg change from previous weighing; record results to the nearest 0.1 mg. During each weighing the filter must not be exposed to the laboratory atmosphere for a period greater than 2 minutes and a relative humidity above 50 percent. Alternatively (unless otherwise specified by the Administrator), the filters may be oven dried at 165° C (350° F) for 2 to 3 hours, desiccated for 2 hours, and weighed. Procedures other than those described, which account for relative humidity effects, may be used, subject to the approval of the Administrator.

4.1.2 Preliminary Determinations. Select the sampling site and the minimum number of sampling points according to Method 1 or as specified by the Administrator. Determine the stack pressure, temperature, and the range of velocity heads using Method 2; it is recommended that a leak-check of the pilot lines (see Method 2, Section 4.1) be performed. Determine the moisture content using Approximation Method 4 or its alternatives for the purpose of making isokinetic sampling rate settings. Determine the stack gas dry molecular weight, as described in Method 2, Section 3.4; if Integrated Method 3 sampling is used for molecular weight determination, the integrated bag sample shall be taken simultaneously with, and for the same total length of time as, the particulate sample run.

Select a nozzle size based on the range of velocity heads, such that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates. During the run, do not change the nozzle size. Ensure that the proper differential pressure gauge is chosen for the range of velocity heads encountered (see Section 2.2 of Method 2).

Select a suitable probe liner and probe length such that all traverse points can be sampled. For large stacks, consider sampling from opposite sides of the stack to reduce the length of probe.

Select a total sampling time greater than or equal to the minimum total sampling time specified in the test procedures for the specific industry such that (1) the sampling time per point is not less than 2 min for some greater time interval as specified by the Administrator, and (2) the sample volume taken (corrected to standard conditions) will exceed the required minimum total gas sample volume. The latter is based on an approximate average sampling rate.

It is recommended that the number of minutes sampled at each point be an integer or an integer plus one-half minute, in order to avoid timekeeping errors. The sampling time at each point shall be the same.

In some circumstances, e.g., batch cycles, it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas sample volumes. In these cases, the Administrator's approval must first be obtained.

4.1.3 Preparation of Collection Train. During preparation and assembly of the sampling train, keep all openings where contamination can occur covered until just prior to assembly or until sampling is about to begin.

Place 800 ml of water in each of the first two impingers, leave the third impinger empty, and transfer approximately 200 to 300 g of preweighed silica gel from its container to the fourth impinger. More silica gel may be used, but care should be taken to ensure that it is not entrained and carried out from the impinger during sampling. Place the container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

Using a tweezer or clean disposable surgical gloves, place a labeled (identified) and weighed filter in the filter holder. Be sure that the filter is properly centered and the gasket properly placed so as to prevent the sample gas stream from circumventing the filter. Check the filter for tears after assembly is completed.

When glass liners are used, install the selected nozzle using a Viton A O-ring when stack temperatures are less than 200° C (400° F) and an asbestos string gasket when temperatures are higher. See APTD-0576 for

details. Other connecting systems using either 316 stainless steel or Teflon ferrules may be used. When inert liners are used, install the nozzle as above or by a leak-free direct mechanical connection. Mark the probe with heat resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

Set up the train as in Figure 5-1, using (if necessary) a very light coat of silicone grease on all ground glass joints, greasing only the outer portion (see APTD-0576) to avoid possibility of contamination by the silicone grease. Subject to the approval of the Administrator, a glass cyclone may be used between the probe and filter holder when the total particulate catch is expected to exceed 100 mg or when water droplets are present in the stack gas.

Place crushed ice around the impingers.

4.1.4 Leak-Check Procedures.

4.1.4.1 Pretest Leak-Check. A pretest leak-check is recommended, but not required. If the tester opts to conduct the pretest leak-check, the following procedure shall be used.

After the sampling train has been assembled, turn on and set the filter and probe heating systems at the desired operating temperatures. Allow time for the temperatures to stabilize. If a Viton A O-ring or other leak-free connection is used in assembling the probe nozzle to the probe liner, leak-check the train at the sampling site by plugging the nozzle and pulling a 380 mm Hg (15 in. Hg) vacuum.

NOTE—A lower vacuum may be used, provided that it is not exceeded during the test.

If an asbestos string is used, do not connect the probe to the train during the leak-check. Instead, leak-check the train by first plugging the inlet to the filter holder (cyclone, if applicable) and pulling a 380 mm Hg (15 in. Hg) vacuum (see Note immediately above). Then connect the probe to the train and leak-check at about 25 mm Hg (1 in. Hg) vacuum; alternatively, the probe may be leak-checked with the rest of the sampling train, in one step, at 380 mm Hg (15 in. Hg) vacuum. Leakage rates in excess of 4 percent of the average sampling rate or 0.00057 m³/min (0.002 cfm), whichever is less, are unacceptable.

The following leak-check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with bypass valve fully open and coarse adjust valve completely closed. Partially open the coarse adjust valve and slowly close the bypass valve until the desired vacuum is reached. Do not reverse direction of bypass valve; this will cause water to back up into the filter holder. If the desired vacuum is exceeded, either leak-check at this higher vacuum or end the leak-check as shown below and start over.

When the leak-check is completed, first slowly remove the plug from the inlet to the probe, filter holder, or cyclone (if applicable) and immediately turn off the vacuum pump. This prevents the water in the impingers from being forced backward into the filter holder and silica gel from being entrained backward into the third impinger.

4.1.4.2 Leak-Checks During Sample Run. If, during the sampling run, a component (e.g., filter assembly or impinger) change becomes necessary, a leak-check shall be conducted immediately before the change is made. The leak-check shall be done according to the procedure outlined in Section 4.1.4.1 above, except that it shall be done at a vacuum equal to or greater than the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m³/min (0.002 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction will need to be applied to the total volume of dry gas metered; if, however, a higher leakage rate is obtained, the tester shall either record the leakage rate and plan to correct the sample volume as shown in Section 6.3 of this method, or shall void the sampling run.

Immediately after component changes, leak-checks are optional; if such leak-checks are done, the procedure outlined in Section 4.1.4.1 above shall be used.

4.1.4.3 Post-test Leak-Check. A leak-check is mandatory at the conclusion of each sampling run. The leak-check shall be done in accordance with the procedures outlined in Section 4.1.4.1, except that it shall be conducted at a vacuum equal to or greater than the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.00057 m³/min (0.002 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction need be applied to the total volume of dry gas metered. If, however, a higher leakage rate is obtained, the tester shall either record the leakage rate and correct the sample volume as shown in Section 6.3 of this method, or shall void the sampling run.

4.1.5 Particulate Train Operation. During the sampling run, maintain an isokinetic sampling rate (within 10 percent of true isokinetic unless otherwise specified by the Administrator) and a temperature around the filter of $120 \pm 14^\circ$ C ($248 \pm 25^\circ$ F), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator.

For each run, record the data required on a data sheet such as the one shown in Figure 5-2. Be sure to record the initial dry gas meter reading. Record the dry gas meter readings at the beginning and end of each sampling time increment, when change in flow rates are made, before and after each leak check, and when sampling is halted.

fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank and follow the Administrator's directions on analysis. Perform the acetone rinses as follows:

Carefully remove the probe nozzle and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polychloroethylene) may be used to aid in transferring liquid wastes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter which is brushed from the probe. Run the brush through the probe three times or more until no visible particulate matter is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped. Rinse the brush with acetone, and quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people be used to clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contaminations.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether or not leakage occurred during transport. Label the container to clearly identify its contents.

Container No. 3. Note the color of the indicating silica gel to determine if it has been completely spent and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid which is in the first three impingers to within ± 1 ml by using a graduated cylinder or by weighing it to within ± 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see Note, Section 2.1.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 Analysis. Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose particulate from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight and report the results to the nearest 0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Plant _____

Date _____

Run No. _____

Filter No. _____

Amount liquid lost during transport _____

Acetone blank volume, ml _____

Acetone wash volume, ml _____

Acetone blank concentration, mg/mg (equation 5-4) _____

Acetone wash blank, mg (equation 5-5) _____

CONTAINER NUMBER	WEIGHT OF PARTICULATE COLLECTED, mg		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
1			
2			
TOTAL			
Less acetone blank			
Weight of particulate matter			

	VOLUME OF LIQUID WATER COLLECTED	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL		
INITIAL		
LIQUID COLLECTED		
TOTAL VOLUME COLLECTED		g* ml

* CONVERT WEIGHT OF WATER TO VOLUME BY DIVIDING TOTAL WEIGHT INCREASE BY DENSITY OF WATER (1g/ml):

$$\frac{\text{INCREASE, g}}{1 \text{ g/ml}} = \text{VOLUME WATER, ml}$$

Figure 5-3. Analytical data.

Alternatively, the sample may be oven dried at 105° C (220° F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105° C (220° F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 4. Note the level of liquid in the container confirm on the analysis sheet whether or not leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ± 1 ml or gravimetrically to ± 0.5 g. Transfer the contents to a tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE.—At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

6. Calibration

Maintain a laboratory log of all calibrations.

6.1 Probe Nozzle. Probe nozzles shall be calibrated before their initial use in the field. Using a micrometer, measure the inside diameter of the nozzle to the nearest

0.025 mm (0.001 in.). Make three separate measurements using different diameters each time, and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in.). When nozzles become nicked, dented, or corroded, they shall be reshaped, sharpened, and recalibrated before use. Each nozzle shall be permanently and uniquely identified.

6.2 Pitot Tube. The Type S pitot tube assembly shall be calibrated according to the procedure outlined in Section 4 of Method 2.

6.3 Metering System. Before its initial use in the field, the metering system shall be calibrated according to the procedure outlined in APTD-0576. Instead of physically adjusting the dry gas meter dial readings to correspond to the wet test meter readings, calibration factors may be used to mathematically correct the gas meter dial readings to the proper values. Before calibrating the metering system, it is suggested that a leak-check be conducted. For metering systems having diaphragm pumps, the normal leak-check procedure will not detect leakages within the pump. For these cases the following leak-check procedure is suggested: make a 10-minute calibration run at 0.00057 m³/min (0.02 cfm); at the end of the run, take the difference of the measured wet test meter and dry gas meter volumes; divide the difference by 10, to get the leak rate. The leak rate should not exceed 0.00057 m³/min (0.02 cfm).

After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single, intermediate orifice setting (based on the previous field test), with the vacuum set at the maximum vacuum reached during the test series. To adjust the vacuum, insert a valve between the wet test meter and the inlet of the metering system. Calculate the average value of the calibration factor. If the calibration has changed by more than 5 percent, recalibrate the meter over the full range of orifice settings, as outlined in APTD-0576.

Alternative procedures, e.g., using the orifice meter coefficients, may be used, subject to the approval of the Administrator.

NOTE.—If the dry gas meter coefficient values obtained before and after a test series differ by more than 5 percent, the test series shall either be voided, or calculations for the test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

6.4 Probe Heater Calibration. The probe heating system shall be calibrated before its initial use in the field according to the procedure outlined in APTD-0576. Probes constructed according to APTD-0581 need not be calibrated if the calibration curves in APTD-0576 are used.

6.5 Temperature Gauge. Use the procedure in Section 4.3 of Method 2 to calibrate in-stack temperature gauges. Dial thermometers, such as are used for the dry gas meter and condenser outlet, shall be calibrated against mercury-in-glass thermometers.

6.6 Leak Check of Metering System Shown in Figure 5-1. That portion of the sampling train from the pump to the orifice meter should be leak checked prior to initial use and after each shipment. Leakage after the pump will result in less volume being recorded than is actually sampled. The following procedure is suggested (see Figure 5-4): Close the main valve on the meter box. Insert a one-hole rubber stopper with rubber tubing attached into the orifice exhaust pipe. Disconnect and vent the low side of the orifice manometer. Close off the low side orifice tap. Pressurize the system to 13 to 15 cm (5 to 7 in.) water column by blowing into the rubber tubing. Pinch off the tubing and observe the manometer for one minute. A loss of pressure on the manometer indicates a leak in the meter box; leaks, if present, must be corrected.

6.7 Barometer. Calibrate against a mercury barometer.

6. Calculations

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation. Other forms of the equations may be used as long as they give equivalent results.

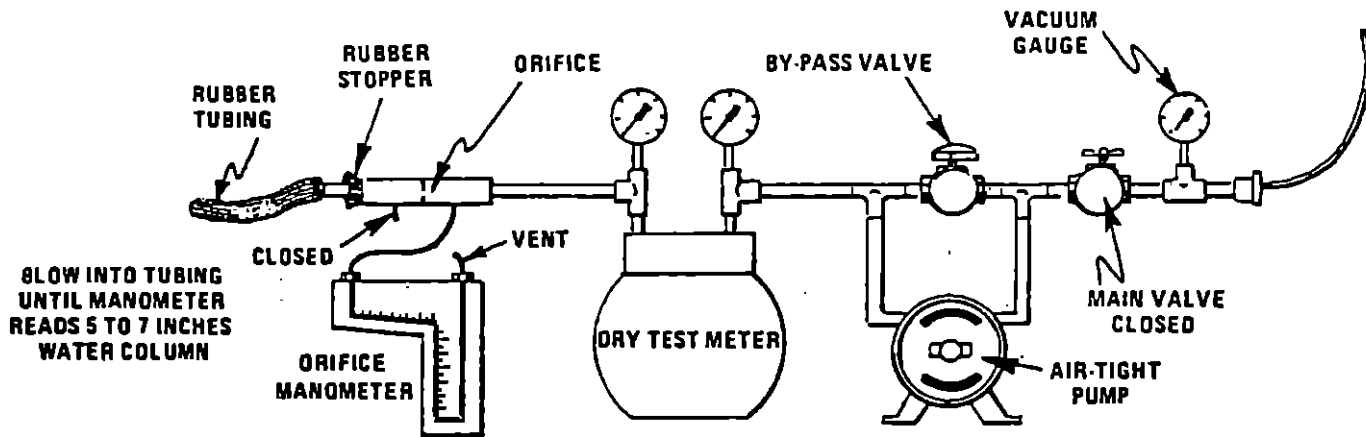


Figure 5-4. Leak check of meter box.

6.1 Nomenclature

- A_n = Cross-sectional area of nozzle, m² (ft²).
- B_m = Water vapor in the gas stream, proportion by volume.
- C_n = Acetone blank-residue concentration, mg/g.
- C_p = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (g/dscf).
- I = Percent of isokinetic sampling.
- L_n = Maximum acceptable leakage rate for either a pretest leak check or for a leak check following a component change; equal to 0.00057 m³/min (0.02 cfm) or 4 percent of the average sampling rate, whichever is less.
- L_i = Individual leakage rate observed during the leak check conducted prior to the "i" component change (i=1, 2, 3, ..., n), m³/min (cfm).
- L_p = Leakage rate observed during the post-test leak check, m³/min (cfm).
- m_n = Total amount of particulate matter collected, mg.
- M_n = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).
- m_n = Mass of residue of acetone after evaporation, mg.
- P_{atm} = Barometric pressure at the sampling site, mm Hg (in. Hg).
- P_n = Absolute stack gas pressure, mm Hg (in. Hg).
- P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

- R = Ideal gas constant, 0.06236 mm Hg-m³/K-g-mole (21.85 in. Hg-ft³/R-lb-mole).
- T_n = Absolute average dry gas meter temperature (see Figure 5-2), °K (°R).
- T_p = Absolute average stack gas temperature (see Figure 5-2), °K (°R).
- T_{std} = Standard absolute temperature, 293° K (528° R).
- V_n = Volume of acetone blank, ml.
- V_{wa} = Volume of acetone used in wash, ml.
- V_{wa} = Total volume of liquid collected in impingers and silica gel (see Figure 5-3), ml.
- V_n = Volume of gas sample as measured by dry gas meter, dcm (dscf).
- $V_{n(std)}$ = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).
- $V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).
- V_n = Stack gas velocity, calculated by Method 2, Equation 2-9, using data obtained from Method 5, m/sec (ft/sec).
- W_n = Weight of residue in acetone wash, mg.
- Y = Dry gas meter calibration factor.
- ΔH = Average pressure differential across the orifice meter (see Figure 5-2), mm H₂O (in. H₂O).
- ρ_n = Density of acetone, mg/ml (see label on bottle).
- ρ_n = Density of water, 0.9982 g/ml (0.002201 lb/ml).
- t = Total sampling time, min.

- t_i = Sampling time interval, from the beginning of a run until the first component change, min.
- t_{ij} = Sampling time interval, between two successive component changes, beginning with the interval between the first and second changes, min.
- t_p = Sampling time interval, from the final (nth) component change until the end of the sampling run, min.
- 13.6 = Specific gravity of mercury.
- 60 = Sec/min.
- 100 = Conversion to percent.

6.2 Average dry gas meter temperature and average orifice pressure drop. See data sheet (Figure 5-2).

6.3 Dry Gas Volume. Correct the sample volume measured by the dry gas meter to standard conditions (20° C, 760 mm Hg or 68° F, 29.92 in. Hg) by using Equation 5-1.

$$V_{n(std)} = V_n \left(\frac{T_{std}}{T_n} \right) \left[\frac{P_{std} + \frac{\Delta H}{13.6}}{P_n} \right] = K_1 V_n Y \frac{P_{std} + (\Delta H/13.6)}{T_n}$$

Equation 5-1

where:

 $K_1 = 0.3858 \text{ } ^\circ\text{K}/\text{mm Hg for metric units}$
 $= 17.64 \text{ } ^\circ\text{R}/\text{in. Hg for English units}$

NOTE.—Equation 5-1 can be used as written unless the leakage rate observed during any of the mandatory leak checks (i.e., the post-test leak check or leak checks conducted prior to component changes) exceeds L_p . If L_p or i exceeds L_p , Equation 5-1 must be modified as follows:

(a) Case I. No component changes made during sampling run. In this case, replace V_m in Equation 5-1 with the expression:

$$V_m - (L_p - L_a)\theta$$

(b) Case II. One or more component changes made during the sampling run. In this case, replace V_m in Equation 5-1 by the expression:

$$[V_m - (L_1 - L_a)\theta]$$

$$- \sum_{i=2}^n (L_i - L_a)\theta - (L_p - L_a)\theta_p]$$

and substitute only for those leakage rates (L_i or L_p) which exceed L_p .

6.4 Volume of water vapor.

Equation 5-2

$$V_w (\text{sd}) = V_{1c} \left(\frac{p_w}{M_w} \right) \left(\frac{RT_{\text{sd}}}{P_{\text{sd}}} \right) = K_2 V_{1c}$$

where:

 $K_2 = 0.00133 \text{ m}^3/\text{ml for metric units}$
 $= 0.04707 \text{ ft}^3/\text{ml for English units}$

6.5 Moisture Content.

$$B_{ws} = \frac{V_w (\text{sd})}{V_m (\text{sd}) + V_w (\text{sd})}$$

Equation 5-3

NOTE.—In saturated or water droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one from the impinger analysis (Equation 5-3), and a second from the assumption of saturated conditions. The lower of the two values of B_{ws} shall be considered correct. The procedure for determining the moisture content based upon assumption of saturated conditions is given in the Note of Section 1.2 of Method 4. For the purposes of this method, the average stack gas temperature from Figure 5-2 may be used to make this determination, provided that the accuracy of the in-stack temperature sensor is $\pm 1^\circ\text{C}$ (2°F).

$$f = \frac{100 T_s (K_3 V_{1c} + (V_m/T_m)(P_{\text{bar}} + \Delta H/13.6))}{60 Q_{v2} P_2 A_n}$$

Equation 5-7

where:

 $K_3 = 0.003454 \text{ mm Hg} \cdot \text{m}^3/\text{ml} \cdot ^\circ\text{K for metric units}$
 $= 0.002669 \text{ in. Hg} \cdot \text{ft}^3/\text{ml} \cdot ^\circ\text{R for English units}$

6.11.2 Calculation From Intermediate Values.

$$f = \frac{T_s V_m (\text{sd}) P_{\text{sd}} 100}{T_{\text{sd}} v_{s0} A_n P_2 60 (1 - B_{ws})}$$

$$= K_4 \frac{T_s V_m (\text{sd})}{P_2 V_{s0} A_n \theta (1 - B_{ws})}$$

Equation 5-8

where:

 $K_4 = 4.320 \text{ for metric units}$
 $= 0.09450 \text{ for English units}$

6.12 Acceptable Results. If 90 percent $f \leq 110$ percent, the results are acceptable. If the results are low in comparison to the standard and f is beyond the acceptable range, or if f is less than 90 percent, the Administrator may opt to accept the results.

6.6 Acetone Blank Concentration.

$$C_a = \frac{m_a}{V_a \rho_a}$$

Equation 5-4

6.7 Acetone Wash Blank.

$$W_a = C_a V_a \rho_a$$

Equation 5-5

6.8 Total Particulate Weight. Determine the total particulate catch from the sum of the weights obtained from containers 1 and 2 less the acetone blank (see Figure 5-3). NOTE.—Refer to Section 4.1.5 to assist in calculation of results involving two or more filter assemblies or two or more sampling trains.

6.9 Particulate Concentration.

$$C_p = (0.001 \text{ g/mg}) (m_p/V_m (\text{sd}))$$

Equation 5-6

6.10 Conversion Factors:

From	To	Multiply by
scf/h	m^3/h	0.02832
g/ft^3	lb/ft^3	15.43
g/ft^3	lb/ft^3	2.205×10^{-3}
g/ft^3	g/m^3	35.31

6.11 Isokinetic Variation.

6.11.1 Calculation From Raw Data.

Use Criterion 4 to make judgments. Otherwise, reject the results and repeat the test.

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METHOD 6—DETERMINATION OF SULFUR DIOXIDE EMISSIONS FROM STATIONARY SOURCES

1. Principle and Applicability

1.1 Principle. A gas sample is extracted from the sampling point in the stack. The sulfuric acid mist (including sulfur trioxide) and the sulfur dioxide are separated. The sulfur dioxide fraction is measured by the barium-thoron titration method.

1.2 Applicability. This method is applicable for the determination of sulfur dioxide emissions from stationary sources. The minimum detectable limit of the method has been determined to be 3.4 milligrams (mg) of SO_2/m^3 (2.12×10^{-7} lb/ft³). Although no upper limit has been established, tests have shown that concentrations as high as 80,000 mg/m³ of SO_2 can be collected efficiently in two midge impingers, each containing 15 milliliters of 3 percent hydrogen peroxide, at a rate of 1.0 lpm for 20 minutes. Based on theoretical calculations, the upper concentration limit in a 20-liter sample is about 93,300 mg/m³.

Possible interferences are free ammonia, water-soluble cations, and fluorides. The cations and fluorides are removed by glass wool filters and an isopropanol bubbler, and hence do not affect the SO_2 analysis. When samples are being taken from a gas stream with high concentrations of very fine metallic fumes (such as in inlets to control devices), a high-efficiency glass fiber filter must be used in place of the glass wool plug (i.e., the one in the probe) to remove the cation interferences.

Free ammonia interferes by reacting with SO_2 to form particulate sulfite and by reacting with the indicator. If free ammonia is present (this can be determined by knowledge of the process and noticing white particulate matter in the probe and isopropanol bubbler), alternative methods, subject to the approval of the Administrator, U.S. Environmental Agency, are required.

2. Apparatus

PROPOSED
MODIFIED METHOD 5X
DETERMINATION OF PARTICULATE AND CONDENSIBLE
ORGANIC MATTER FROM STATIONARY SOURCES
IN THE PLYWOOD INDUSTRY

1. Applicability and Principle

1.1 Applicability. This method applies to the determination of particulate and condensible organic matter within the context of the following definition: "Particulate matter" means any finely divided solid or liquid material, other than uncombined water, that condenses at or above the filtration temperature, and is collected by the front half of the sampling train. "Condensible organic matter" means any material which is collected in the impinger portion of the train, inclusive of the back-up filter.

1.2 Principle. Particulate and condensible organic matter is withdrawn isokinetically from the source, according to EPA Method 5. Particulate matter is collected on a glass fiber filter maintained at temperatures of $350 \pm 25^{\circ}\text{F}$. The particulate mass is determined gravimetrically after removal of uncombined water. Condensed organics are collected in the water-filled Greenburg-Smith impingers at temperatures less than 70°F . The condensed organics are analyzed gravimetrically after evaporation and from the water by ether and chloroform.*

*Warning: Chloroform is a suspected carcinogen. The vapors of ethyl ether are an explosion hazard. All work should be done under an explosion proof hood with the analyst protected from exposure to these chemicals. Ether should not be retained beyond the container date; opened containers should not be stored for more than six months.

2. Apparatus

2.1 Sampling Train. Same as EPA Method 5, Section 2.1 (Federal Register, 40 CFR 60), except that the Greenburg-Smith system shall be used to determine stack gas moisture content and condensible organic matter and an unheated 2-1/2" glass fiber filter shall be inserted between the third and fourth impingers. A schematic of this train is presented in Figure 2.1. In addition, before initial use, the impingers and filter assemblies will be washed with a chromic acid cleaning solution followed by a thorough tap water rinse and six deionized distilled water and acetone rinses.

2.2 Sample Recovery. Same as Method 5, Section 2.2. In addition, all glassware used to handle the sample will be cleaned with chromic acid cleaning solution as described in Section 2.1 (sample jars, graduates, etc.).

2.3 Analysis. Same as Method 5, Section 2.3, with the following additional items:

2.3.1 Separatory Funnels. Two, 100 ml capacity with Teflon stopcock.

2.3.2 Buchner Funnel. 47 mm diameter.

2.3.3 Erlenmeyer Flask. 500 ml.

3. Reagents

3.1 Sampling and Sample Recovery. Same as Method 5, Sections 3.1 and 3.2, respectively, with the following additions:

3.1.1 Water. Deionized distilled to conform to ASTM specification D1193-74, Type 3. Blanks will be analyzed prior to field use to eliminate a high blank on test samples.

3.1.2 Chromic Acid Cleaning Solution. Prepare by slowly adding 1 liter concentrated sulfuric acid, with stirring, to 35 ml saturated sodium dichromate solution. HANDLE WITH CAUTION.

MODIFIED EPA 5X SAMPLING TRAIN

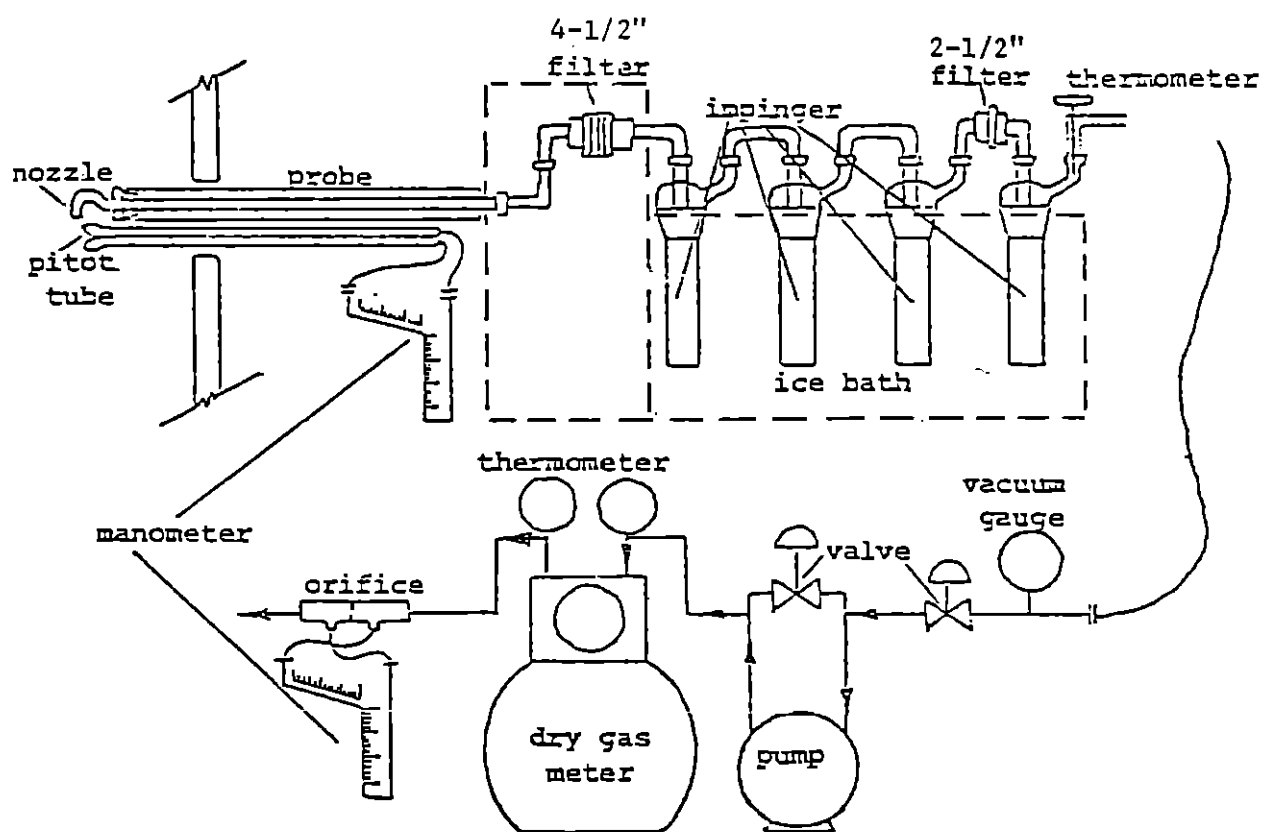


FIGURE 2.1

3.2 Analysis. Same as Method 5, Section 3.3, except the following additional reagents are required for the analysis.

3.2.1 Ethyl Ether. Reagent grade, ≤ 0.001 percent residue in suitable containers to retain low residue blank

3.2.2 Chloroform. Reagent grade, ≤ 0.001 percent residue, in glass bottles.

3.2.3 Water. Deionized distilled as described in Section 3.1.

3.2.4 Filters. 4-1/2" and 2-1/2" diameter glass fiber filters as described in Method 5, Section 3.1.1.

3.2.5 Hydrochloric Acid, Concentrated. HANDLE WITH CAUTION.

3.2.6 Sodium Hydroxide, 10 N. Dissolve 40 g NaOH in deionized distilled water and dilute to 100 ml. HANDLE WITH CAUTION.

4. Procedure

4.1 Sampling. Same as Method 5, Section 4.1, except use deionized distilled water will be used in the impingers.

4.2 Sample Recovery. Same as Method 5, Section 4.2, with the following exceptions and/or additions.

4.2.1 Container No. 1 (4-1/2" glass fiber filter) Carefully remove filter from holder and place in identified inert petri dish, and seal.

4.2.2 Container No. 2 (DI distilled H₂O probe rinse) Rinse and brush probe, nozzle, and front half of 4-1/2" filter holder three times with DI distilled H₂O into identified glass sample container.

4.2.3 Container No. 3 (Acetone probe rinse) Rinse and brush as in Section 4.2.2 using acetone instead of H₂O.

4.2.4 Container #4 (Impinger Water). Treat the first three impingers as follows: Leaving each impinger intact to transfer the liquid, cap off the inlet, and pour the liquid through the outlet directly into a tared sample container. Determine the liquid weight to within ± 0.5 g.

After transferring the water and condensible organic matter to the sample container, tighten the lid on the sample container and seal so that water will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine later whether leakage occurred during transport. Label the container to clearly identify its contents.

4.2.5 Container No. 5 (Acetone Wash). After insuring that all joints of the impinger section glassware are wiped clean of silicone grease, rinse the inside surfaces of the first three impingers and the glass connecting joints with acetone. Rinse all surfaces three times or more if necessary to remove visible particulate. A nylon bristle brush may be used to facilitate removal of any adhering material. In addition, rinse the graduated cylinder used to measure the impinger catch with acetone.

After all acetone washings and particulate matter are collected in the sample container, tighten the lid on the sample container and seal so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine later whether leakage occurred during transport. Label container to clearly identify its contents.

4.2.6 Container No. 6 (2-1/2" Filter). Recover same as Container No. 1, Method 5, Section 4.2.

4.2.7 Container #7 (Silica Gel) Weigh to nearest 0.5g.

4.2.6 Water Blank. Save a portion of the deionized distilled water used in the impingers. Take 200 ml of this water and place it in a glass sample container labeled "water blank."

4.3 Analysis. Samples should be analyzed within one week of sampling in order to prevent any possibility of degradation. Same as Method 5, Section 4.3. In addition, handle Containers No. 1, 4, 5 and 6 as follows (an example data sheet is shown in Figure 5K-1):

1 Plant _____ 2 Date _____
 3 Run No. _____ 4 Acetone blank volume, ml _____
 5 Acetone wash volume, ml _____ 6 Acetone blank concentration, mg/mg (equation 27-4) _____
 7 Acetone wash blank, mg (equation 27-5) _____ 8 E-C water blank volume, ml _____
 9 Water volume, ml _____ 10 E-C blank concentration, mg/mg (equation 27-6) _____
 11 E-C wash blank, mg (equation 27-7) _____ 12 Filter no. _____

CONTAINER NUMBER	WEIGHT OF PARTICULATE COLLECTED, mg		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
1			
2			
TOTAL			
Less acetone blank			
Weight of particulate matter			$m_n =$

CONTAINER NUMBER	WEIGHT OF CONDENSABLE ORGANIC MATTER COLLECTED, mg		
	FINAL WEIGHT*	TARE WEIGHT	WEIGHT GAIN
4			$m_c =$
6*			$m_{11} =$
TOTAL			
Less E-C water blank			
Weight of condensable organic matter			$m_o =$

*Data corrected for acetone blank (eqn. 27-5)

	VOLUME OF LIQUID WATER COLLECTED	
	IMPINGER VOLUME, ml.	SILICA GEL WEIGHT, g
FINAL		
INITIAL		
LIQUID COLLECTED	$V_{ww} =$	
TOTAL VOLUME COLLECTED	$V_{lc} =$	$g^* \quad ml$

CONVERT WEIGHT OF WATER TO VOLUME BY DIVIDING
 TOTAL WEIGHT INCREASE BY DENSITY OF WATER (1g/ml).

$$\frac{\text{INCREASE, g}}{1 \text{ g/ml}} = \text{VOLUME WATER, ml}$$

Figure 5X-1. Analytical data.

4.3.1 Container No. 1 - Desiccate filter at 70°F or less for 24 hours and weigh.*

4.3.2 Container No. 2 - Note the level of liquid in the container and confirm on the analysis sheet whether or not leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator to correct the final results. Measure the liquid in this container either volumetrically to ± 1 ml or gravimetrically to ± 0.5 g. Transfer the contents to a tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours and weigh. Report the results to the nearest 0.1 mg.

4.3.3 Container No. 3 - Note the level of the liquid in the container and confirm on the analysis sheet whether or not leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator to correct the final results. Measure the liquid in this container either volumetrically to ± 1 ml or gravimetrically to ± 0.5 g. Transfer the contents to a tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours and weigh. Report the results to the nearest 0.1 mg.

4.3.4 Container No. 4 - Note level of liquid in container and confirm on analysis sheet whether leakage occurred during transport. Measure the liquid in this container either volumetrically to ± 1 ml or gravimetrically to ± 0.5 g. Transfer the contents to a separatory funnel. Rinse the container with deionized distilled water and add to the separatory funnel. Then rinse the container with acetone and add to Container No. 5. Extract the water with three 25 ml portions of ether, followed by three 25 ml portions of chloroform. (Note: Due to the flammability of ether and the health related effects of chloroform, the use of

*Desiccation may give rise to slow vaporization of the condensible material. Therefore, it is not recommended that an attempt to weigh to a constant weight be made.

these reagents should be carefully supervised.) Transfer the aqueous phase to a tared beaker and evaporate at 220°F. Desiccate for 24 hours and weigh to nearest 0.1 mg.

Filter the organic phase through Buchner funnel apparatus and a 47 mm glass fiber filter to remove any particulates entrained in the solvent. Then, evaporate the filtrate at 70°F and laboratory pressure until the solvent has evaporated. This is typically indicated by the absence of a mobile liquid phase. Desiccate for 24 hours and weigh. Report the results to the nearest 0.1 mg.

4.3.5 Container No. 5 - Note the level of the liquid in container and confirm on the analysis sheet whether leakage occurred during transport. Measure the liquid in this container either volumetrically to ± 1 ml or gravimetrically to ± 0.5 g. Transfer the contents to a tared 250-ml beaker, and evaporate at ambient temperature and pressure. Desiccate for 24 hours and weigh. Report the results to the nearest 0.1 mg.

4.3.6 Container No. 6 - Analysis same as Container No. 1, Section 4.3.1.

4.3.7 Container No. 7 - Weigh and record to nearest 0.5 g.

4.3.8 Water-Ether-Chloroform Blank - Transfer 100 ml of water taken in the field as a water blank into a separatory funnel. Extract the water with three 25 ml portions of ether followed by three 25 ml portions of chloroform. Combine the organic extract in a tared container and evaporate the contents at ambient temperature and pressure. Desiccate for 24 hours and weigh. Report the results to the nearest 0.1 mg.

5. Calibration

The calibration procedures are the same as Method 5, Section 5.

6. Calculations

All calculation and nomenclature are the same as in Method 5, Section 6, with the following additions.

6.1 Nomenclature. Add the following:

- m_b = Residue mass from acetone rinse of impingers after ether-chloroform extraction and evaporation, mg.
- m_c = Residue mass from ether-chloroform extraction of impinger water after evaporations, mg.
- m_e = Extract residue mass of water blank, mg.
- m_f = Residue mass collected on 2-1/2" filter.
- m_o = Total amount of condensed organic matter collected, mg.
- V_e = Volume of water blank used in the ether-chloroform extraction, ml.
- V_{ww} = Volume of recovered impinger contents including impingers deionized distilled water rinse.
- M_w = Mass of ether-chloroform-water blank extract, mg.

6.2 Ether-Chloroform-Water Blank Concentration.

$$M_w = \frac{m_e}{V_e} \quad \text{Eq. 5X-1}$$

$$M_o = m_c + m_b + m_f = M_w \quad \text{Eq. 5X-2}$$

6.3 Total Particulate and Condensed Organic Matter Concentration.

$$C_t = (0.001 \text{ g/mg})(m_n + m_o) / V_m(\text{std}) \quad \text{Eq. 5X-3}$$

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APPENDIX F.2
EPA METHOD 25 AS USED BY TRC

EPA Method 25 as used by TRC during the Georgia-Pacific testing program differs slightly from the method as it is presented in this appendix. The TRC modifications to Method 25 are discussed in detail in Section 5.3.2 of the main text report.

**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 (CO₂) which is quantitatively collected in an evacuated vessel; then a portion of the CO₂ is reduced to methane (CH₄) 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), CO₂ and CH₄; the nonmethane organics (NMO) are oxidized to

CO₂ reduced to CH₄ 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 (1/8-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 Analysts. 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 CO₂ 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 CO₂ 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, CO₂, and CH₄ from nonmethane organic compounds, (2) reducing the CO₂ to CH₄ and quantifying as CH₄, and (3) oxidizing the nonmethane organic compounds to CO₂, reducing the CO₂ to CH₄ and quantifying as CH₄. 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, CO₂, and CH₄ 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 ($\pm 5\%$) 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 CH₄.

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 μ l and 100 μ l 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 O₂ in N₂, 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 CO₂ 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 CH₄, 2 percent CO₂, and 20 ppm C₂H₆, prepared in air.

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

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

3.3.4.2 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_0), the ambient temperature (T_0), and the barometric pressure (P_b) 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; 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_1); record the tank temperature (T_1) 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_0 and B_1 , 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, 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 2. Monitor the NDIR; when CO₂ 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_2), barometric pressure (P_b), and ambient temperature (T_2). 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 3. 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

Hg (nominal). When the vessel is pressurized, vent the carrier, measure and record the final intermediate collection vessel pressure (P_i) as well as the barometric pressure (P_b), ambient temperature (T_a), and collection vessel volume (V_c).

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 condensable organics as CO_2 (C_{co}).

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_{nm}).

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 6. 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 μ l hexane.
- 5.1.3.2 10 μ l hexane.
- 5.1.3.3 100 μ l toluene.
- 5.1.3.4 10 μ l 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_{nm}).

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_{nm}) calculated in section 5.2.2. Record the overall mean of the response factor values as the CO_2 calibration response factor (RF_{co}).

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_a) 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} calculated during the initial performance test (section 5.2.2). Use the daily response factor (DRF_{co}) for analyzer calibration and calculation of measured CO_2 concentrations in the collection vessel samples. In addition, record the NMO blank value (B_a); 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_{nm} calculated during the initial performance test (section 5.2.1). Use the daily response factor (DRF_{nm}) 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.

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:

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

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

$$C_t = \left[\frac{P_{tf}}{P_{ti}} \right] \left[\frac{1}{r} \sum_{j=1}^r C_{tmj} - B_a \right]$$

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

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

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:

$$W_C = 0.498 C$$

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

$$\text{percent recovery} = 1.6 \frac{H}{L} \frac{V}{\rho} \frac{P_f}{T_f} \frac{C_{cm}}{N}$$

6.7 Relative Standard Deviation.

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

Where:

- B_1 = Measured NMO blank value for NMO analyzer, ppm C.
- B_2 = Measured CO_2 blank value for condensate recovery and conditioning system carrier gas, ppm CO_2 .
- C = total gaseous nonmethane organic (TGNMO) concentration of the effluent, ppm C equivalent.
- C_c = Calculated condensable organic (condensate trap) concentration of the effluent, ppm C equivalent.
- C_{cm} = Measured concentration (NMO analyzer) for the condensate trap (intermediate collection vessel), ppm CO_2 .
- C_{cn} = Calculated noncondensable organic concentration (sample tank) of the effluent, ppm C equivalent.
- C_{cm} = 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_i = Final pressure of the intermediate collection vessel, mm Hg absolute.
- P_u = Gas sample tank pressure prior to sampling, mm Hg absolute.
- P_l = 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_i = Final temperature of intermediate collection vessel, °K.
- T_u = Sample tank temperature prior to sampling, °K.
- T_l = Sample tank temperature at completion of sampling, °K.
- T_u = Sample tank temperature after pressurizing, °K.
- V = Sample tank volume, cm.
- V_i = 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.
- $\bar{X}$ = Mean value.
- ρ = Density of liquid injected, g/cc.

7. Bibliography

- 7.1 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.
- 7.2 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. $\frac{3}{8}$ " OD $\times$ 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. $\frac{3}{8}$ " OD $\times$ 14" Inconel tubing packed with 8 inches of hopcalite oxidizing catalyst and operated at 800°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. $\frac{1}{8}$ 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) 80/80 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.

BILLING CODE 6580-01-M

*MSA registered trademark.

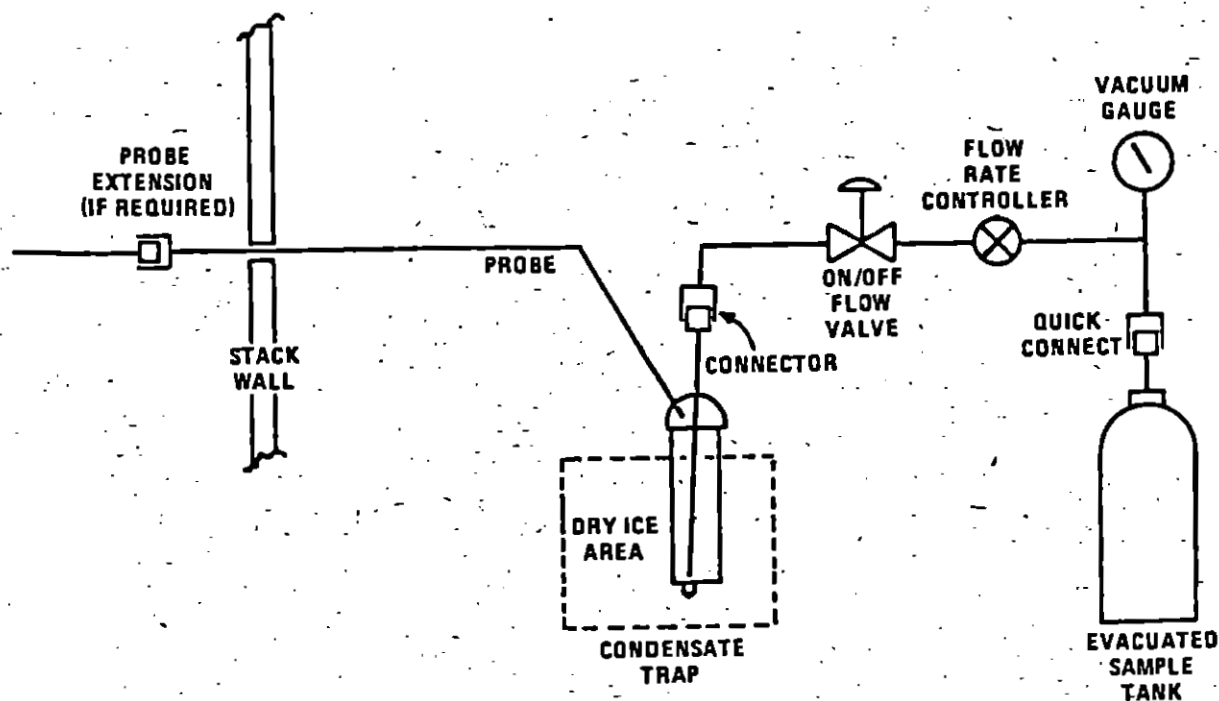


Figure 1. Sampling apparatus.

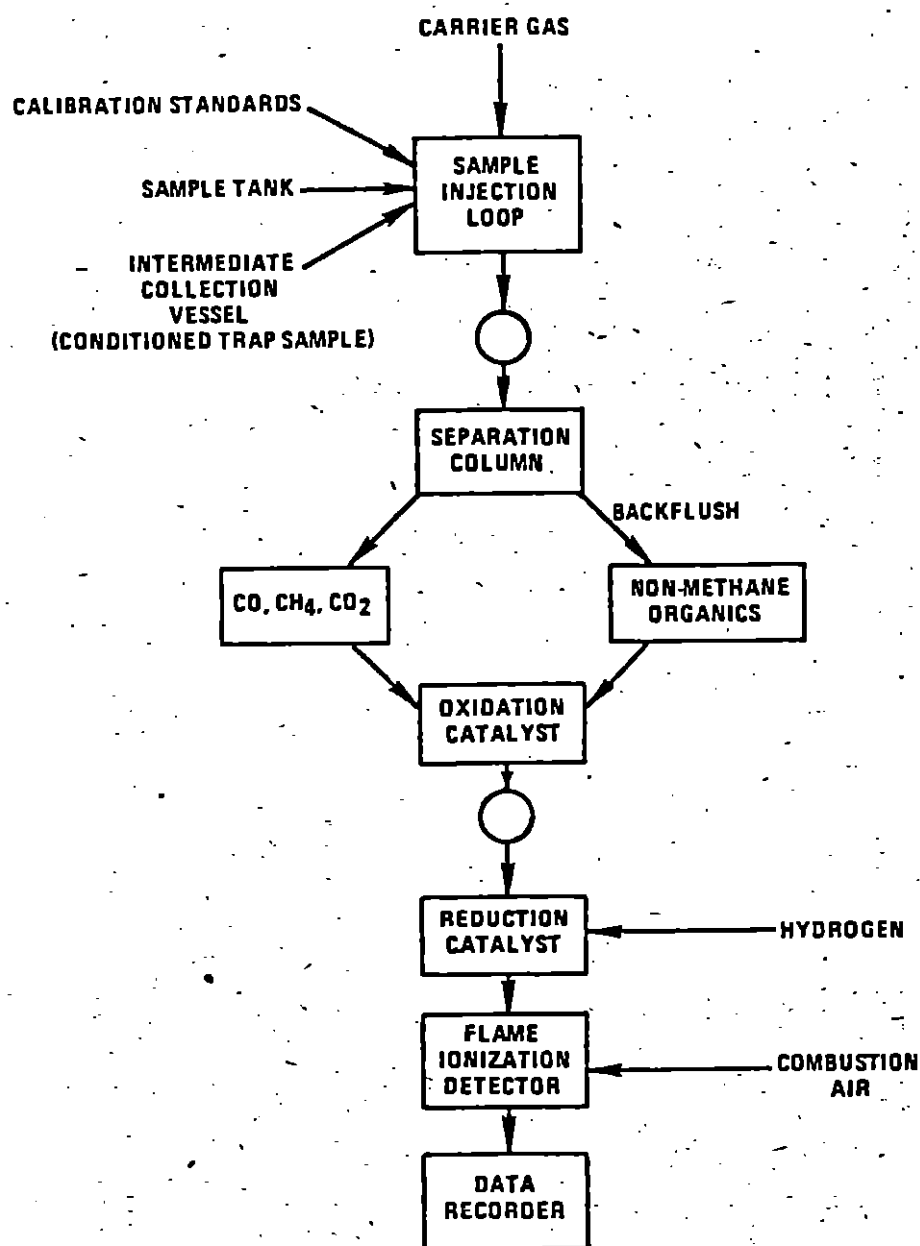


Figure 2. Simplified schematic of non-methane organic (NMO) analyzer.

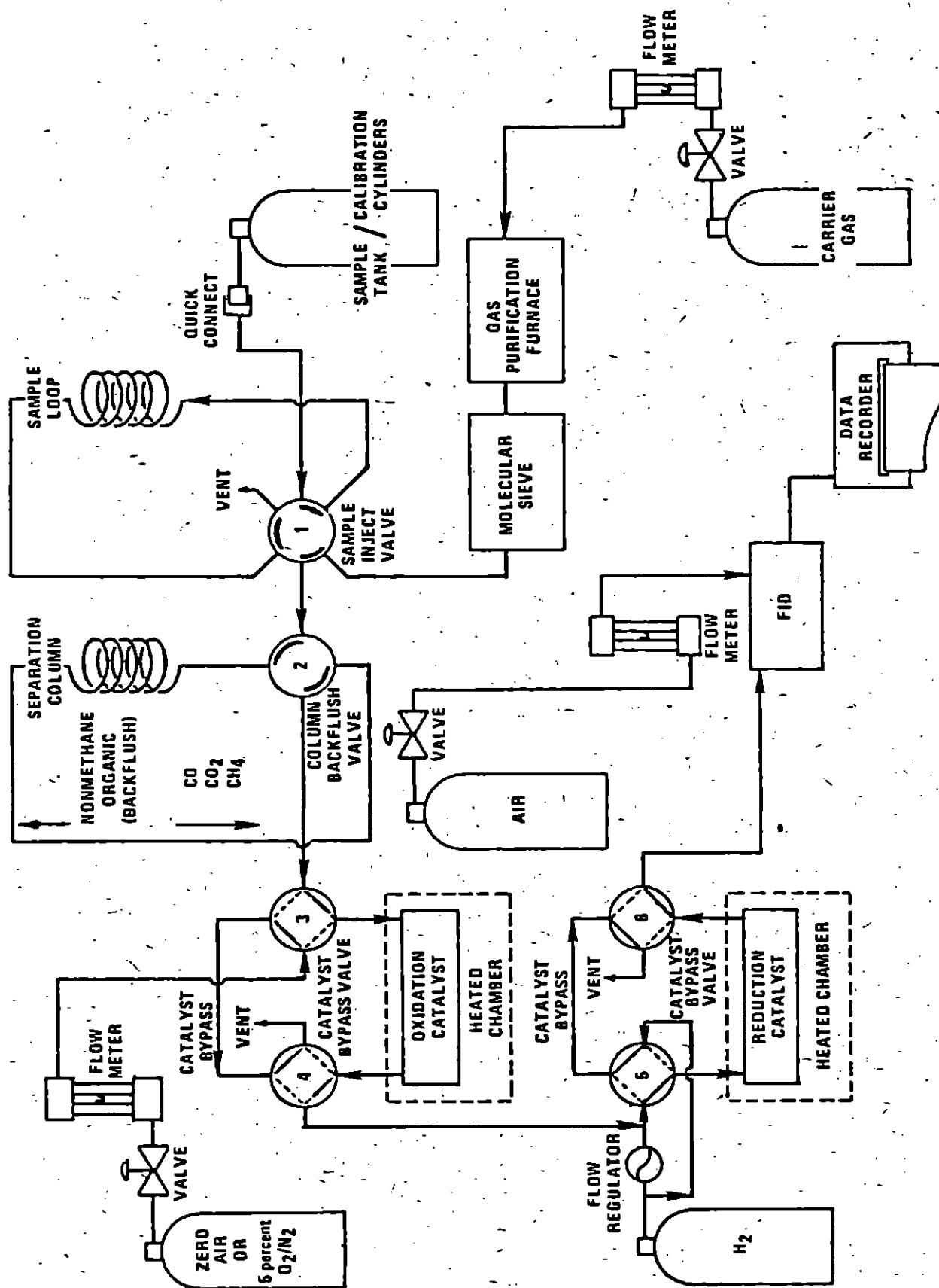


Figure 3. Nonmethane organic (NMO) analyzer.

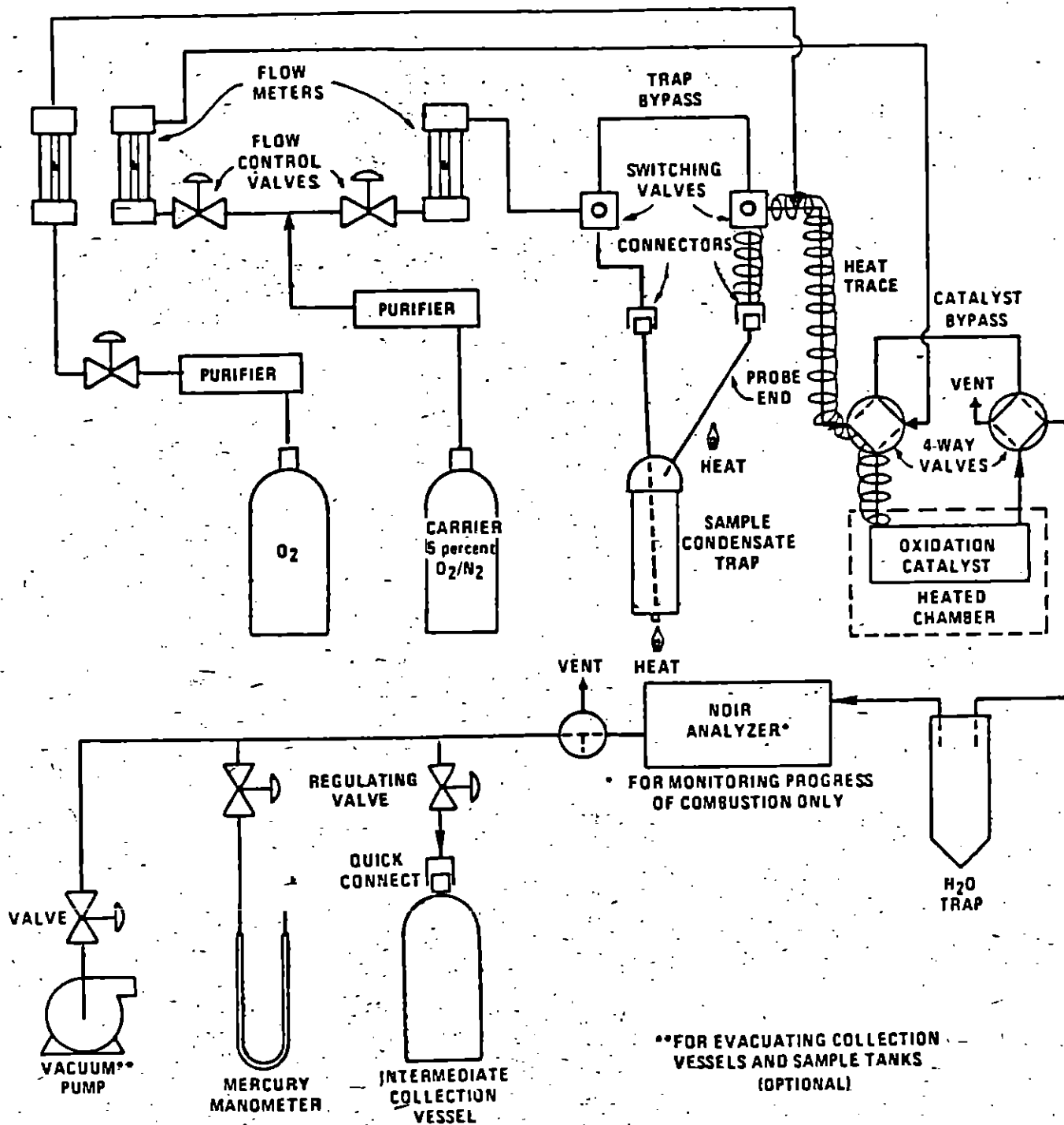
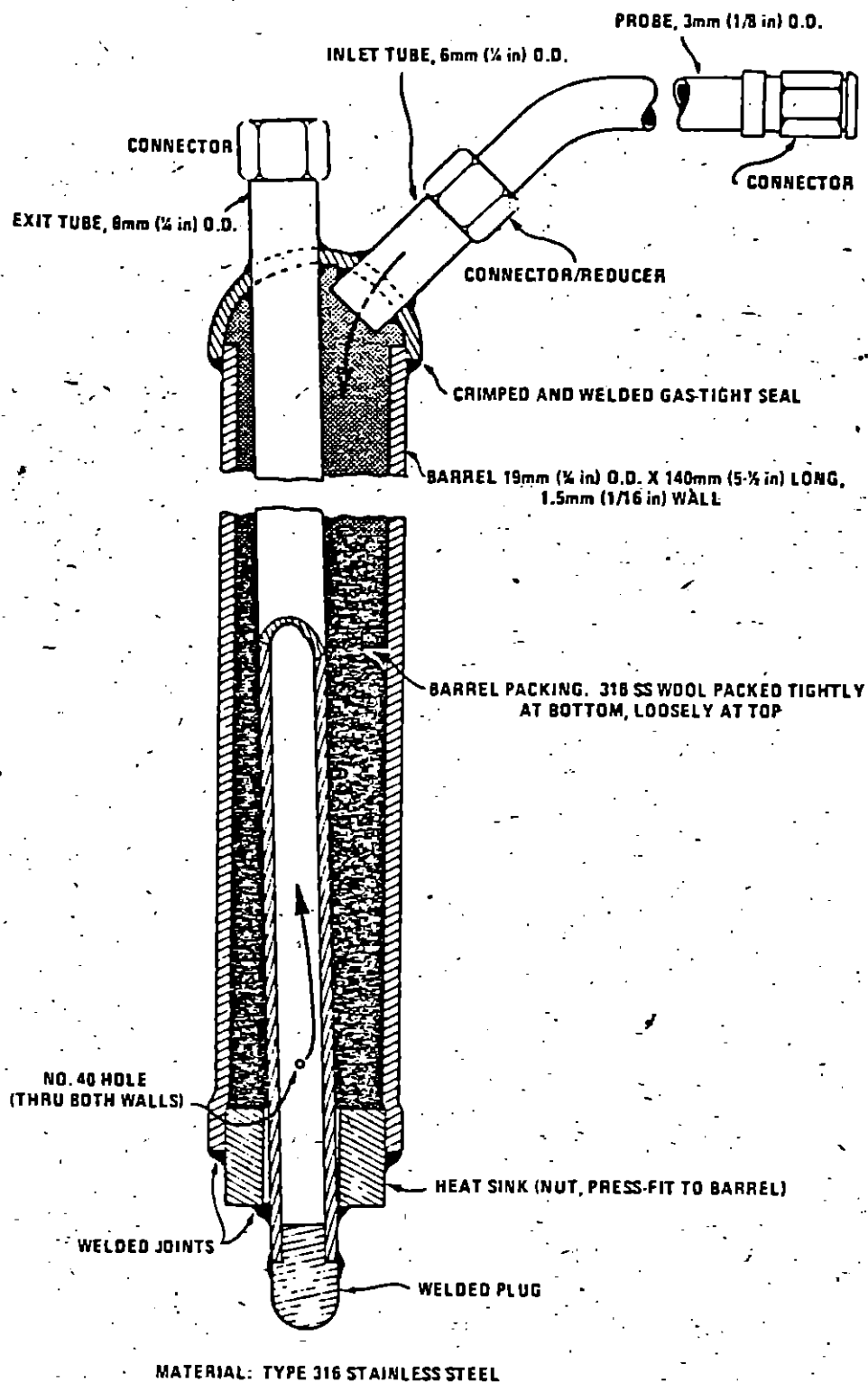


Figure 4. Condensate recovery and conditioning apparatus.

Figure 5. Condensate trap².

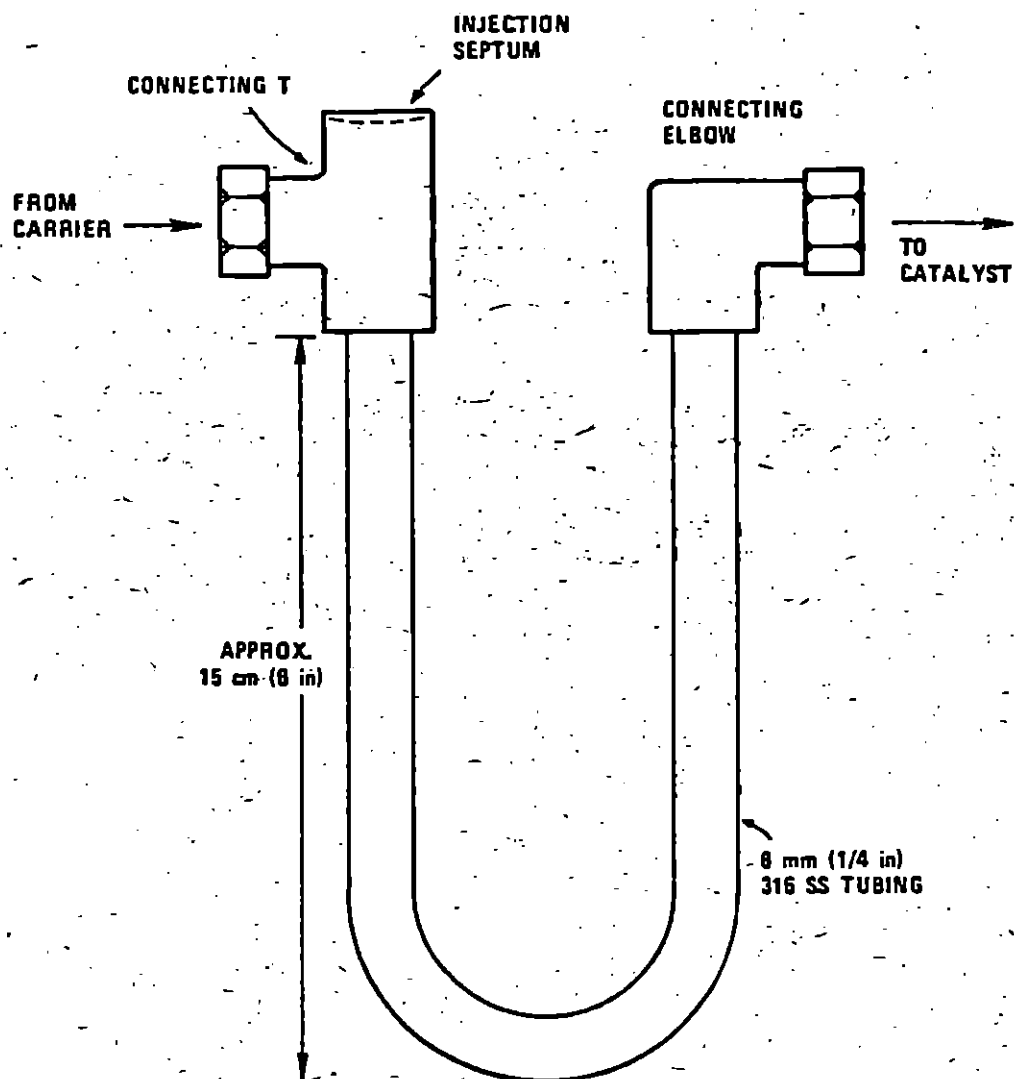


Figure 6. Liquid sample injection unit.

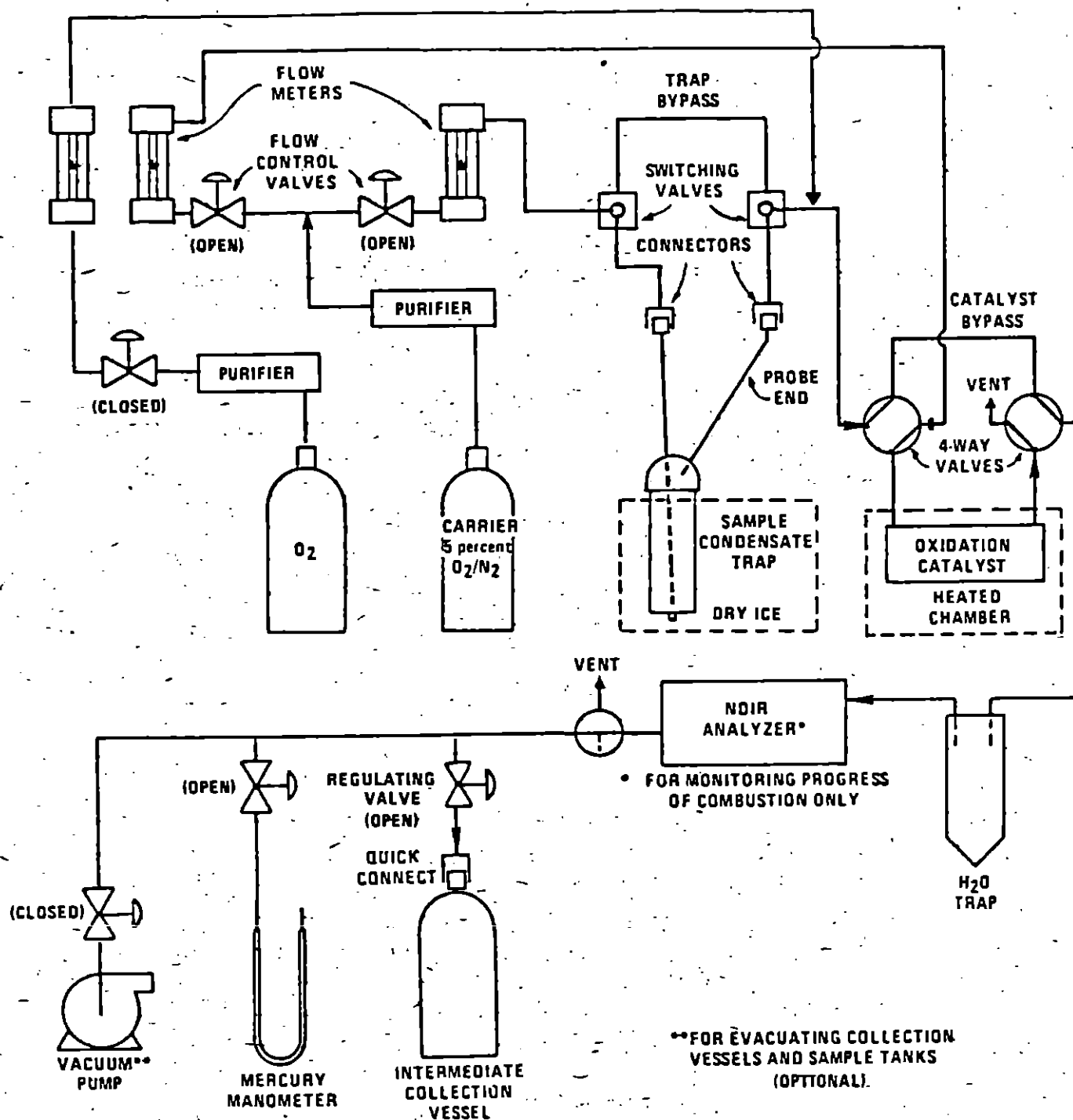


Figure 8. Condensate recovery and conditioning apparatus, carbon dioxide purge.

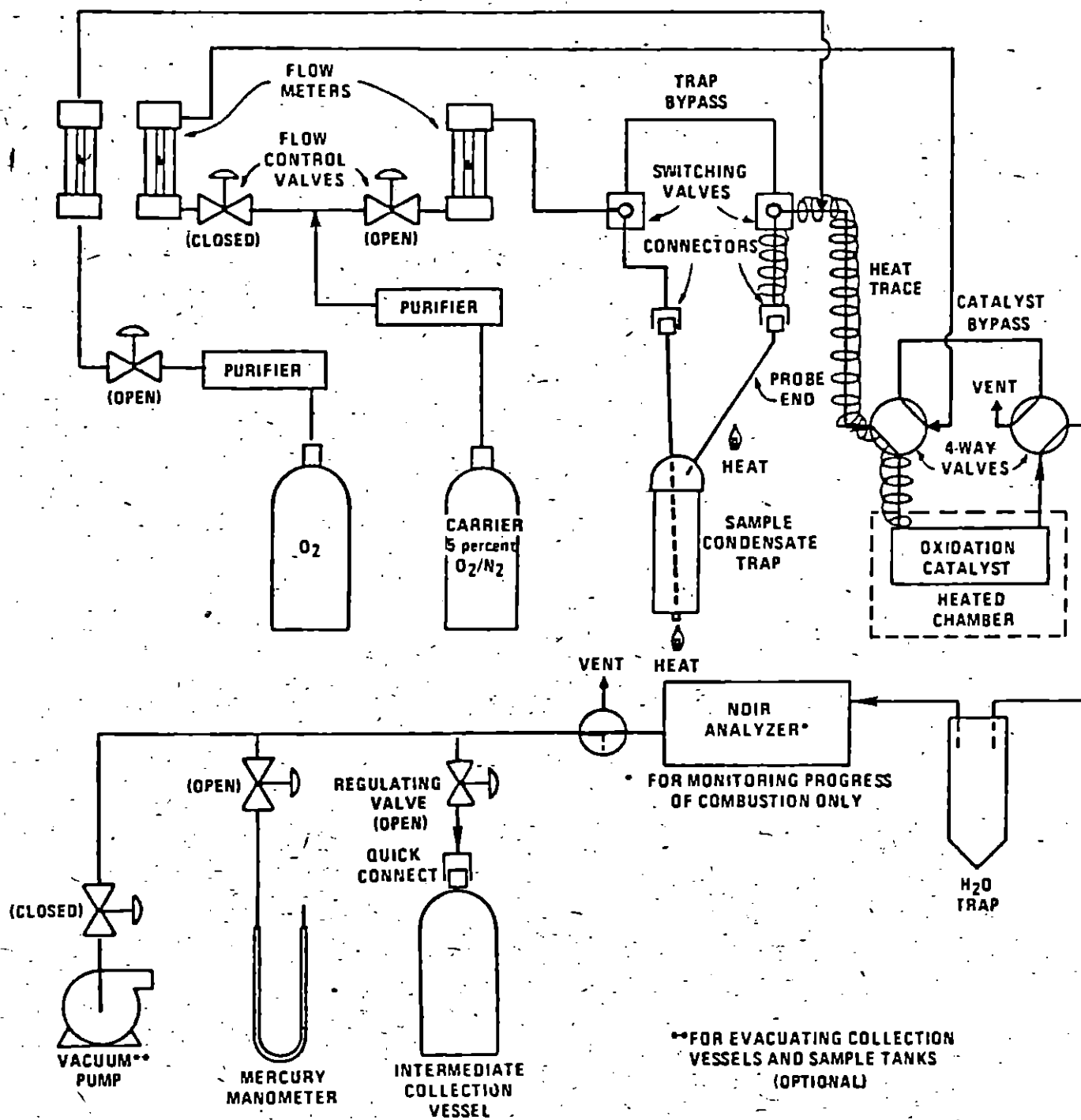


Figure 9. Condensate recovery and conditioning apparatus, collection of trap organics.

APPENDIX F.3
METHOD 25 AS USED BY NCASI

NATIONAL COUNCIL OF THE PAPER INDUSTRY
FOR AIR AND STREAM IMPROVEMENT, INC. (NCASI)

TOTAL GASEOUS PHOTOCHEMICALLY REACTIVE ORGANICS
(TGPRO)
SAMPLING AND ANALYSIS PROCEDURES

ANALYSIS OF TOTAL GASEOUS ORGANICS FROM PULP AND PAPER MILL COMBUSTION SOURCES

Victor J. Dallons, NCASI

The National Council is currently surveying total gaseous organic emission from pulp and paper industry combustion and other process sources. The objective of the project is to develop a data base on gaseous organic which could enter into a photochemical reaction in the ambient and form ozone. It is the aim to produce data consistent with what the National Council expects will be the EPA reference method for the measurement of total gaseous non-methane organic compounds. The sampling and analysis procedures used in this study are in accordance with the latest EPA draft document circulated for comment on the proposed method.

The total gaseous nonmethane organic analysis method gives results for carbon monoxide, carbon dioxide, methane, and total gaseous organics. The National Council also adjusted the analytical method to measure ethane and ethene. Ethane and methane are nonphoto reactive compounds and are not included in the gaseous compound results. The total gaseous photochemically reactive organics (TGPRO) are reported as methane.

SAMPLING AND ANALYSIS PROCEDURES

The procedure used on this project was similar to the one developed by the Southern California Air Pollution Control District and the April 5, 1979 EPA "Draft do not quote" procedures. The principle of the procedure was to separate the light compounds (those with vapor pressures at 78°C) from the heavier organics with a cold trap in the field. The light components were captured in an evacuated tank. The trap containing condensed organics was burned to convert organics to CO₂ for analysis in the laboratory. The light organics captured in the evacuated tank were separated on a chromatographic column yielding concentrations for CO, CH₄, CO₂, C₂H₆, C₂H₄, and all other organics. Summation of the trap and tank organic results gave TGNRO stack concentrations. All results were reported as methane.

A. Sampling

Field samples were taken in duplicate through a single ½ in. stainless steel probe fitted with a tee to split the flow to two sampling trains. The stack end of the probe was filled with quartz glass wool before each sample was drawn to prevent collection of particles in the traps. Six feet of 1/8 in. stainless steel tubing ran from the tee to each trap which were submerged in granular dry ice. Schematics of the trap construction and sampling assembly are presented in Figure 1 and 2, respectively. Condensable organics and water vapor were captured in the traps.

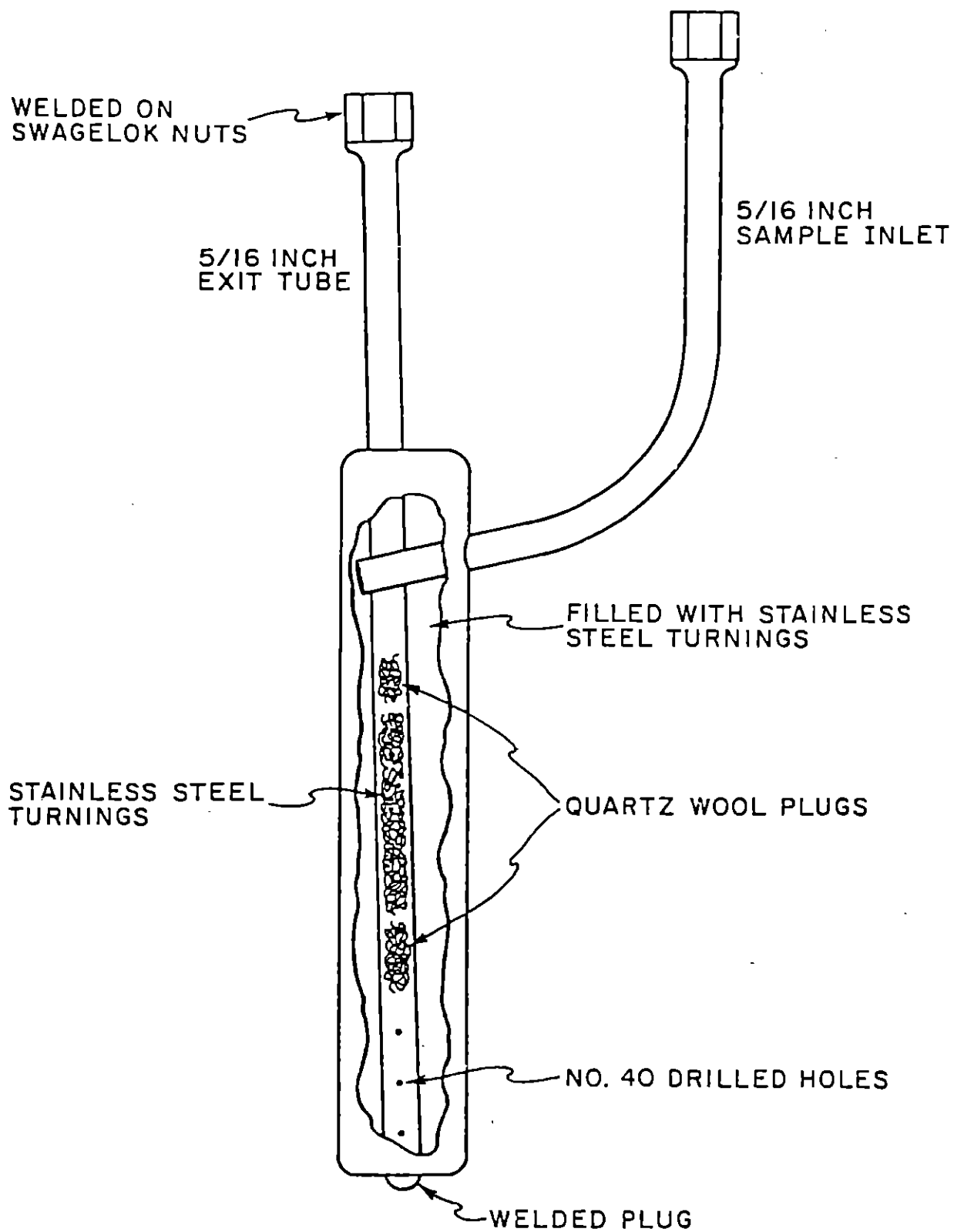


FIGURE 1
CONDENSATE TRAP

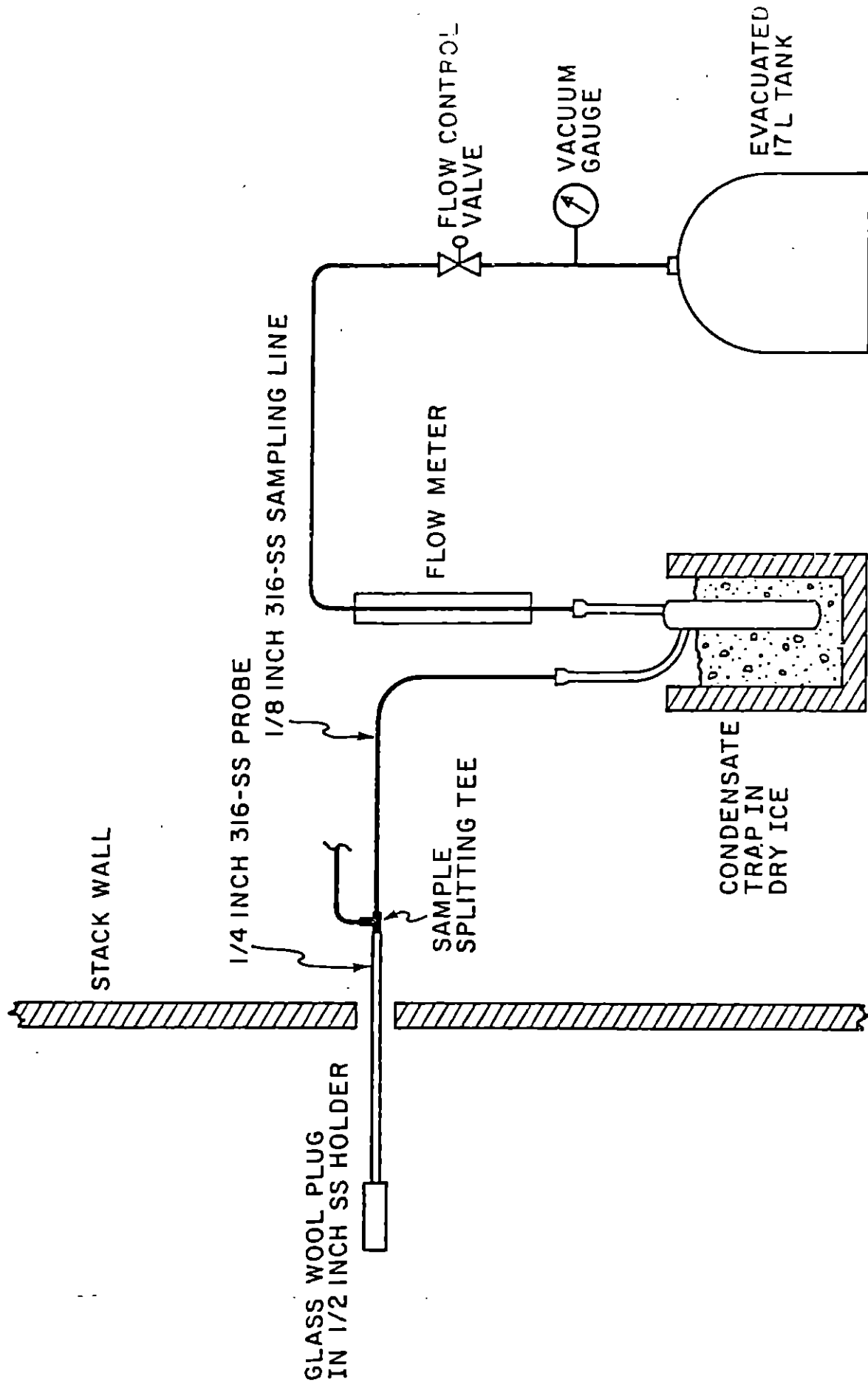


FIGURE 2

40000 00000 00000 00000

From the traps the gas flowed through a rotometer, a flow control valve, and into a 17 liter evacuated stainless steel tank.

All screw connections in the sampling system were checked for leaks in the field before sampling by pressurizing with air at 30 psi and soaking the joints individually with soapy water. Leaks detected were eliminated prior to sampling.

Sampling flow rates were set at about 180 ml/min so that about 10 liters of sample was collected in 3/4 hr. When a trap frozen due to condensation of stack moisture the trap inlet was heated momentarily with a propane torch to melt the ice. The sampling system was watched closely to maintain the proper flow rate. At the end of the sampling period the tee and probe to the stack were heated gently with a propane torch to volatilize any organics condensed. After sampling, the trap and 6 foot section of line to the tee was capped and transported to the laboratory packed in dry ice. Tank pressures were measured before and after sampling to determine sample size. Orsat analyses were made for CO₂ and O₂ before and after sampling.

B. Sample Preparation

When the samples were returned to the laboratory, each trap and sample tank combination used in the field was connected to the trap burning system in the sequence of trap, oxidation tube furnace, U-tube water trap packed in dry ice and IR analyzer and sampling vessel as shown in Figure 3. The stack gases remaining in the trap was flushed into the tank with carbon compound free air (hereafter referred to as zero air). When all of the CO₂ was flushed and into the tank as indicated by the IR detector response, the tank was pressurized with zero air via a trap bypass.

Following sampling tank pressurization, a four liter stainless steel vessel evacuated to a minimum of 28 in. Hg was then attached in the tank's place. Zero air was passed through the sampling line and trap while they were heated to a dull red color with an acetylene torch. A metering valve in the zero air supply line controlled the pressure in the trap to 15 to 25 in Hg while flow was controlled by a valve on the evacuated vessel. Pressure in the trap can increase rapidly due to boiling of condensed water. The trap was monitored to avoid excess pressures that may result in leaks. Figure 4 shows the burn-out assembly.

Care was taken that the sampling line, trap, and lines to the oxidizer were heated sequentially so that incompletely oxidized organics that might recondense in the system would be revolatilized. Each trap was burned until the CO₂ in the carrier gas as shown by the IR analyzer had returned to baseline. The vessel was then pressurized to less than 5 in. Hg.

Zero air was prepared by further purifying zero grade air from cylinders. Air from the cylinder was passed over an oxidation catalyst to oxidize organic contents and then passed through

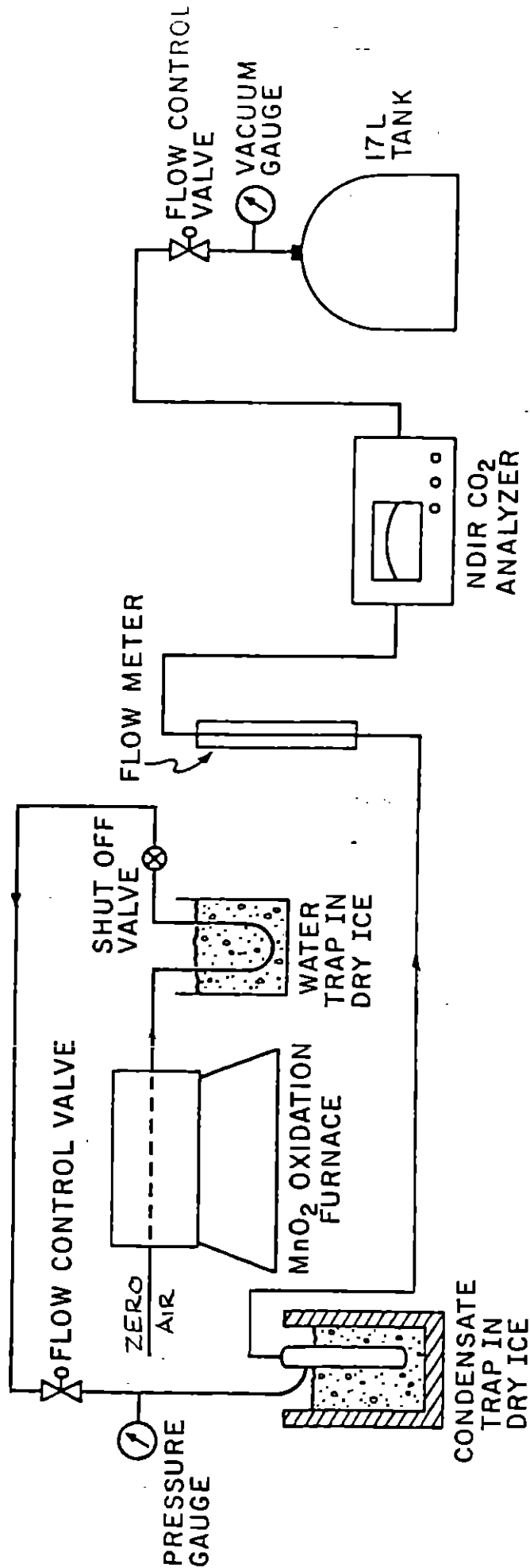


FIGURE 3
TRAP BURN OUT SYSTEM
TRAP FLUSH MODE

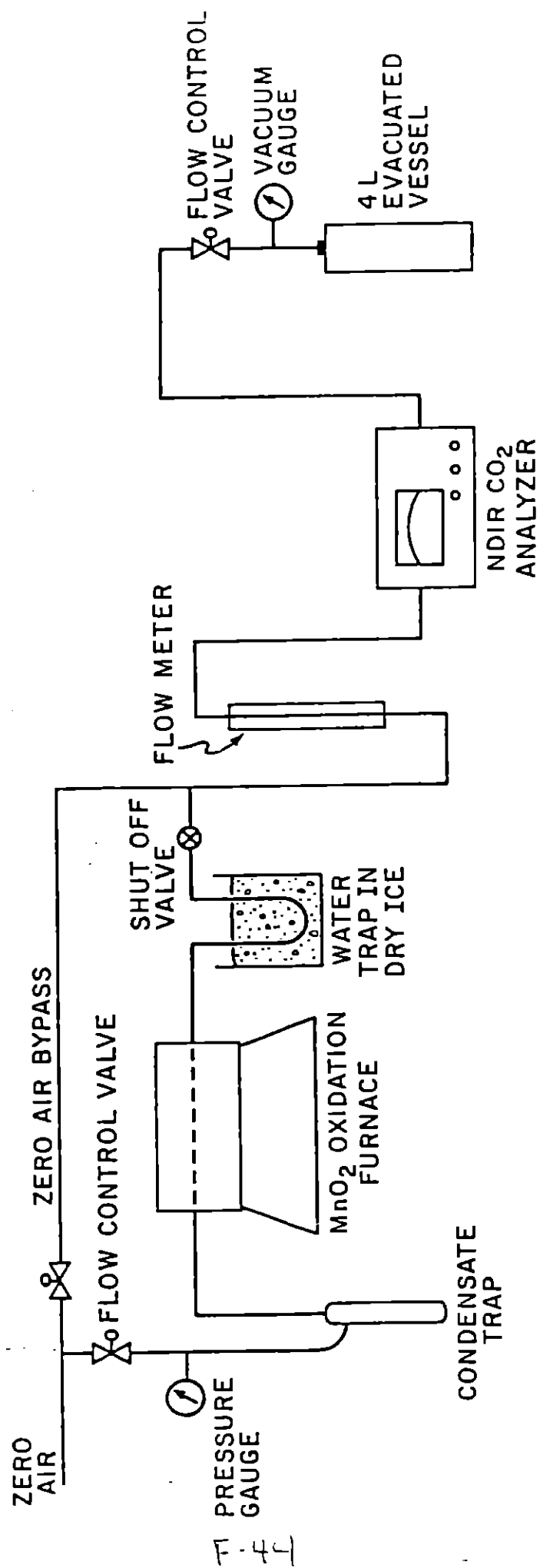


FIGURE 4

TRAF BURN OUT SYSTEM
TRAP BURN MODE

ascarite for carbon dioxide removal. The nitrogen carrier gas used for the chromatographic column was cleaned by passing through a molecular sieve and through a catalytic oxidation column.

C. Sample Analysis

The analysis system components consisted of an injection port with an inert septum, a silicon SF-96 on Chromosorb W/Porapak Q column operated at -78°C , -30°C , 25°C , and 100°C with back flush capability, a MnO_2 oxidation furnace for oxidation of the CH_4 , CO , and VOC's to CO_2 , and hydrogen addition to the nitrogen carrier at a rhodium catalyst methanator to convert CO_2 to CH_4 . The CH_4 was analyzed by a flame ionization detector (FID). The FID output was integrated with an integrator. A second inert injection port was placed just prior to the oxidation furnace for system checks. Figure 5 depicts the system.

Starting with the column submerged in a dry ice-isopropanol bath at -78°C , a 5 ml sample was drawn from the pressurized evacuated sampling tank and injected into the carrier gas to the column. Carbon monoxide and methane were separated. The column was then operated at room temperature for carbon dioxide elution. After the elution, the column was placed in a boiling water bath and the carrier gas flow through the column reversed. The VOC's were released from the column. Each evacuated sampling tank was analyzed in triplicate. On the first injection of each duplicate pair, the column was placed in a CaCl_2 -ice bath at -30°C to separate ethylene, ethane, and propane. If no ethylene was detected the samples were analyzed as above. If ethylene was present, the samples were analyzed with the -30°C column temperature step.

Analysis of the sampling tank for carbon dioxide required separate injections from that used for the organic analyses. The amount of carbon dioxide in a 5 ml injection was shown to overload the reduction catalyst causing a low carbon dioxide value to be reported. Carbon dioxide concentrations in the tanks are determined in triplicate using $\frac{1}{2}$ ml injections directly to the oxidizer. Carbon monoxide and TGNMO concentrations were subtracted from the CO_2 value thus attained.

The trap burn-off vessel contents were analyzed by injecting 5 ml drawn from the vessel into the carrier gas bypassing the chromatographic column and entered the oxidation furnace. The results were reported as ppm CH_4 .

D. Calculations

Laboratory results are in terms of ppm VOC as methane as found in the sampling tank or vessel. These were corrected to standard conditions in the stack. Summation of tank and vessel concentrations are presented as stack TGPRO concentration at standard conditions.

TRAP ANALYSIS

TANK ANALYSIS

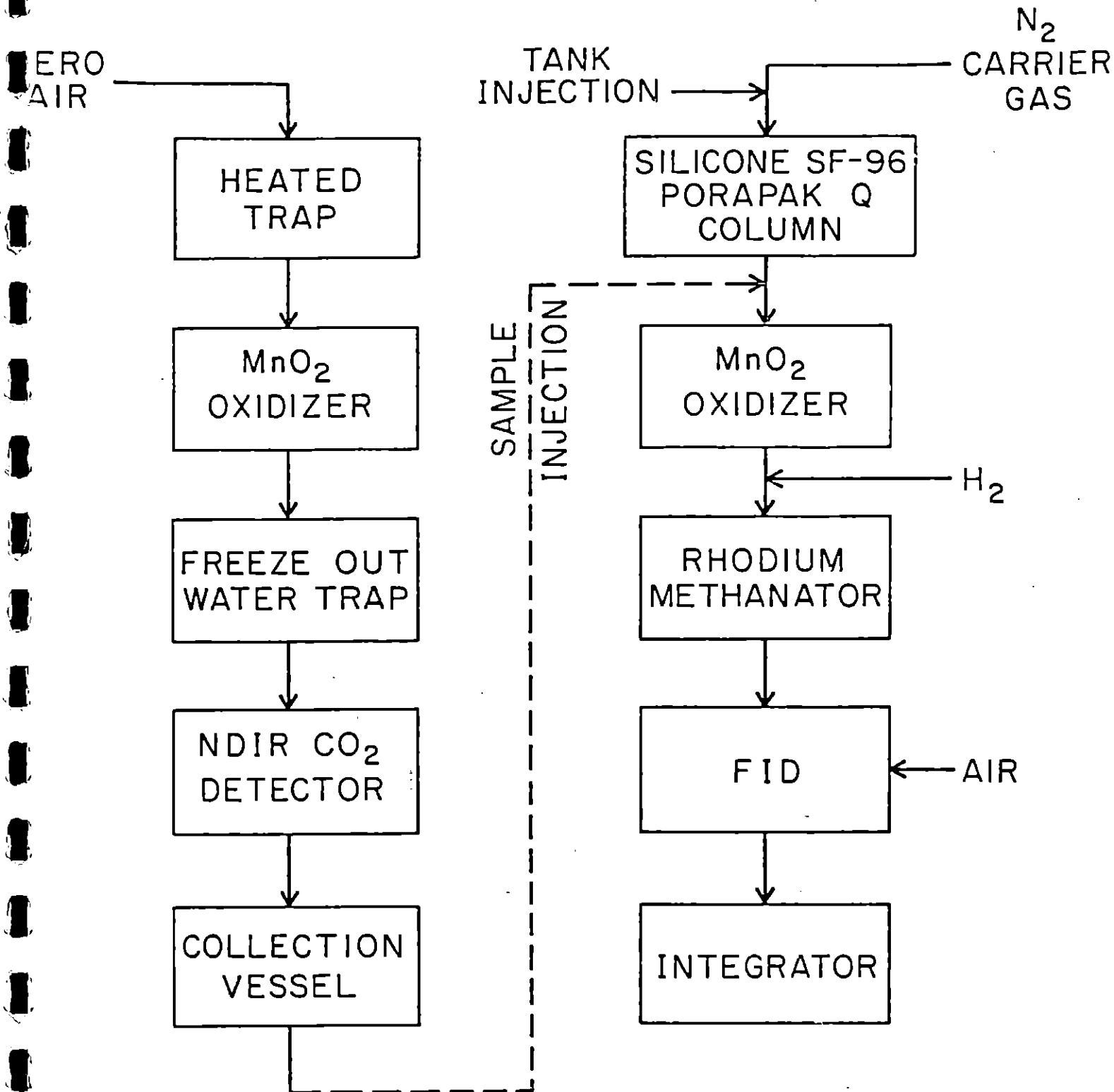


FIGURE 5

TGPRO ANALYTICAL SCHEME

For wood residue boilers stack TGPRO concentrations were converted to lb/10⁶ Btu emissions through use of conversion formulas published in 40 CFR 121:1516, 60.45, sections E and F. The conversion equation used was:

$$E = C F_c \frac{100}{\% \text{ CO}_2}$$

where E= pollutant emissions, lb/10⁶ Btu
where C= pollutant concentration, lb/dscf
and F_c = 1840 scf CO₂/10⁶ Btu for wood residue

For kraft recovery furnaces, stack TGPRO were converted to lb/million Btu emissions by multiplying stack concentrations by the stack gas flow rate and an appropriate units conversion factor. Stack flow rates were measured by S-type pitot tube traverses at the point of sampling each day samples were taken. Gas molecular weights were calculated from Orsat analysis results and moisture contents found by measurement of the water found in the condensate traps.

QUALITY CONTROL

The TGPRO analysis system was checked for proper operation at frequent intervals. Daily checks were made for the FID sensitivity, zero air purity, column carrier gas purity and system leaks. Weekly checks were made on all catalysts efficiencies. Bi-weekly checks were made for evacuated sampling tank leaks and tank contamination.

A. Catalyst Efficiency Checks

All catalyst efficiencies were checked at the beginning of each week.

The Oxidation Catalyst Efficiency was checked weekly by injecting methane gas standard to the oxidation catalyst while the reduction catalyst was bypassed. If the oxidation catalyst was operating properly, the only gas reaching the FID was carbon dioxide and no response was indicated. When the catalyst efficiency was found to be less than 95%, it was replaced.

The Reduction Catalyst Efficiency was checked while operating the TGPRO analysis system in its normal operating mode and injecting standard CO₂ gas directly to the reduction catalyst. Low FID responses indicated a faulty reduction catalyst. When the catalyst efficiency was less than 95% it was replaced.

The cryogenic trap oxidation catalyst was checked by connecting the methane calibration gas cylinder to the trap oxidation catalyst and venting to atmosphere a flow of 160 ml/min. Samples of the flow taken from an injection/withdrawal port following the

catalyst were injected into the TGPMO analysis system while the carrier gas bypassed both the oxidizer and the methanator. A response from the FID detector indicated a faulty oxidizer catalyst in the cryogenic trap burn-out system. At a catalyst efficiency of less than 95% it was replaced.

B. Carrier Gas Contaminate Check

The purity of the chromatographic column nitrogen carrier gas and the zero air used for cryogenic trap burning as well as for tank and vessel pressurization were checked daily. Impurities in either gas result in a positive bias in the results. Zero air was checked for its total carbon content by withdrawing a sample from a port in the zero air supply line when the trap burnout system was receiving a flow of 160 ml/min, and injecting it into the TGNMO analysis system prior to the oxidizer. A zero air total carbon content greater than 5 ppm indicated that replacement of the ascarite CO₂ filter, molecular sieve, or zero air oxidation catalyst was required.

The nitrogen carrier gas was checked for contaminants daily by measurement of material caught on the column during a blank run. If the organics peak calculated was more than 5 ppm, the carrier gas cleanup system is regenerated with a new molecular sieve and oxidation catalyst. Organics peaks of less than 5 ppm are subtracted from that day's tank analyses.

C. Leak Checks

Leaks in the TGPRO analysis and sampling system are not readily apparent and the system must be diligently checked to assure integrity of the samples. Each section of the sampling and analysis system was checked for leaks daily prior to use.

(1) Tank Leaks The evacuated sampling tanks were checked for leaks once every two weeks by evacuating them to more than 25 in. Hg. measuring the vacuum with a mercury nanometer, and remeasuring the vacuum 24 hours or more later. If the vacuum decreased the tank was assumed to have leaked, and was repaired.

(2) Sampling Assembly Leaks The gauge assembly, connections between the gauge assembly, rotometer, traps, and sampling lines were checked daily at the sampling site for leaks. The sampling line was capped and a tank pressurized to 30 in. hg. was attached to the gauge assembly. All connections in the system were squirted with soapy water and inspected for bubbles. If a leak was found it was corrected before sampling.

(3) Trap Burnoff Assembly Leaks This assembly was checked for leaks daily by plugging the trap burnoff system where the trap was connected and a vacuum of 20 in. Hg drawn on the system. Both the flow meter and the IR analyzer were monitored. A flow through the flow meter or a CO₂ response on the IR analyzer indicated a leak which was repaired prior to use of the system. All trap connections

to the burn-out system were checked for leaks by squirting the joints with soapy water while the system was under pressure, prior to burnout of each trap.

(4) Analytical-Field CO₂ Cross Check An unreasonably low analytical CO₂ value as compared to the orsat CO₂ value indicated a possible leak in the sampling system during the sample collect and the results were discarded.

D. FID Calibration

Daily calibration checks of the flame ionization detector (FID) were required to detect changes in gas flows and leaks which cause decreases in sensitivity. Two calibrations were needed, one through the catalyst and FID, and one through the column, catalyst and FID.

The detector linearity was checked once a week. Three simulated concentrations of methane were injected both through the column and bypassing the column. A r^2 was calculated to show that linearity was maintained.

The FID detector was calibrated daily by four injections of a standard methane calibration gas. The calibration line was required to stay within bounds determined by statistical analysis of previous calibration data so as to avoid calibration line drift. When the calibration line fell out of the bounds the system was checked for leaks, gas flows, detector cleanliness, etc. In addition the four calibration points were required to have air accuracy of $\pm 3\%$ at the 95% confidence level.

E. Data Rejection and Precision

Nonduplicated results from paired samples were an indication of errors either during the sampling or sample preparation portions of the procedure. Data was rejected when the analytical results from the duplicate samples did not agree with each other. A paired result was accepted when the absolute difference between the pair was not greater than three times the standard deviation of all the test data taken from a source. Data was also rejected when sampling or analysis errors such as leaks were noted.

An estimate of the precision of the average of the data pairs can be found from the standard deviation of the signed difference of the data pairs. The confidence interval around the signed average difference was found by the equation:

$$\text{Confidence interval} = \pm \frac{s}{\sqrt{n}} \quad t_{\alpha/2 : v}$$

where s is the standard deviation of the signed difference between the data pairs, n is the number of data pairs, $t_{\alpha/2 : v}$ is the students t value from tables at the appropriate confidence level.

F. Accuracy

The accuracy of the overall TGPRO analysis technique was demonstrated by injection of known quantities of organics into traps both in the laboratory and in the field. Laboratory methanol injections into the traps equivalent to 410 to 490 ppm methane showed an average recovery of 104%. Field recoveries were determined by injecting the equivalent of 250 to 410 ppm methanol into one of the duplicate pairs while sampling a wood residue boiler. The TGPRO determined from the sample without methanol injection was subtracted from the sample results into which methanol was injected to give the recovery. The average of the field recoveries was 96%.

F. Conclusion

Sampling and analysis of TGPRO emissions is cumbersome and exacting work requiring a highly trained and dedicated team for worthy results. A carefully planned quality control program is required to perform meaningful TGPRO sampling and analysis. Assembly of the equipment and personnel at individual mills for TGPRO sampling is not advisable.

APPENDIX F.4
SCRUBBER SOLUTION ANALYSIS

ORGANIC CARBON, TOTAL

Method 415.1 (Combustion or Oxidation)

STORET NO. Total 00680

Dissolved 00681

1. Scope and Application
 - 1.1 This method includes the measurement of organic carbon in drinking, surface and saline waters, domestic and industrial wastes. Exclusions are noted under Definitions and Interferences.
 - 1.2 The method is most applicable to measurement of organic carbon above 1 mg/l.
2. Summary of Method
 - 2.1 Organic carbon in a sample is converted to carbon dioxide (CO_2) by catalytic combustion or wet chemical oxidation. The CO_2 formed can be measured directly by an infrared detector or converted to methane (CH_4) and measured by a flame ionization detector. The amount of CO_2 or CH_4 is directly proportional to the concentration of carbonaceous material in the sample.
3. Definitions
 - 3.1 The carbonaceous analyzer measures all of the carbon in a sample. Because of various properties of carbon-containing compounds in liquid samples, preliminary treatment of the sample prior to analysis dictates the definition of the carbon as it is measured. Forms of carbon that are measured by the method are:
 - A) soluble, nonvolatile organic carbon; for instance, natural sugars.
 - B) soluble, volatile organic carbon; for instance, mercaptans.
 - C) insoluble, partially volatile carbon; for instance, oils.
 - D) insoluble, particulate carbonaceous materials, for instance, cellulose fibers.
 - E) soluble or insoluble carbonaceous materials adsorbed or entrapped on insoluble inorganic suspended matter; for instance, oily matter adsorbed on silt particles.
 - 3.2 The final usefulness of the carbon measurement is in assessing the potential oxygen-demanding load of organic material on a receiving stream. This statement applies whether the carbon measurement is made on a sewage plant effluent, industrial waste, or on water taken directly from the stream. In this light, carbonate and bicarbonate carbon are not a part of the oxygen demand in the stream and therefore should be discounted in the final calculation or removed prior to analysis. The manner of preliminary treatment of the sample and instrument settings defines the types of carbon which are measured. Instrument manufacturer's instructions should be followed.

Approved for NPDES

Issued 1971

Editorial revision 1974

4. Sample Handling and Preservation

- 4.1 Sampling and storage of samples in glass bottles is preferable. Sampling and storage in plastic bottles such as conventional polyethylene and cubitainers is permissible if it is established that the containers do not contribute contaminating organics to the samples. NOTE 1: A brief study performed in the EPA Laboratory indicated that distilled water stored in new, one quart cubitainers did not show any increase in organic carbon after two weeks exposure.
- 4.2 Because of the possibility of oxidation or bacterial decomposition of some components of aqueous samples, the lapse of time between collection of samples and start of analysis should be kept to a minimum. Also, samples should be kept cool (4°C) and protected from sunlight and atmospheric oxygen.
- 4.3 In instances where analysis cannot be performed within two hours (2 hours) from time of sampling, the sample is acidified (pH < 2) with HCl or H₂SO₄.

5. Interferences

- 5.1 Carbonate and bicarbonate carbon represent an interference under the terms of this test and must be removed or accounted for in the final calculation.
- 5.2 This procedure is applicable only to homogeneous samples which can be injected into the apparatus reproducibly by means of a microliter type syringe or pipette. The openings of the syringe or pipette limit the maximum size of particles which may be included in the sample.

6. Apparatus

- 6.1 Apparatus for blending or homogenizing samples: Generally, a Waring-type blender is satisfactory.
- 6.2 Apparatus for total and dissolved organic carbon:
- 6.2.1 A number of companies manufacture systems for measuring carbonaceous material in liquid samples. Considerations should be made as to the types of samples to be analyzed, the expected concentration range, and forms of carbon to be measured.
- 6.2.2 No specific analyzer is recommended as superior.

7. Reagents

- 7.1 Distilled water used in preparation of standards and for dilution of samples should be ultra pure to reduce the carbon concentration of the blank. Carbon dioxide-free, double distilled water is recommended. Ion exchanged waters are not recommended because of the possibilities of contamination with organic materials from the resins.
- 7.2 Potassium hydrogen phthalate, stock solution, 1000 mg carbon/liter: Dissolve 0.2128 g of potassium hydrogen phthalate (Primary Standard Grade) in distilled water and dilute to 100.0 mL.
- NOTE 2: Sodium oxalate and acetic acid are not recommended as stock solutions.
- 7.3 Potassium hydrogen phthalate, standard solutions: Prepare standard solutions from the stock solution by dilution with distilled water.
- 7.4 Carbonate-bicarbonate, stock solution, 1000 mg carbon/liter: Weigh 0.3500 g of sodium bicarbonate and 0.4418 g of sodium carbonate and transfer both to the same 100 mL volumetric flask. Dissolve with distilled water.

- 7.5 Carbonate-bicarbonate, standard solution: Prepare a series of standards similar to step 7.3.

NOTE 3: This standard is not required by some instruments.

- 7.6 Blank solution: Use the same distilled water (or similar quality water) used for the preparation of the standard solutions.

8. Procedure

- 8.1 Follow instrument manufacturer's instructions for calibration, procedure, and calculations.

- 8.2 For calibration of the instrument, it is recommended that a series of standards encompassing the expected concentration range of the samples be used.

9. Precision and Accuracy

- 9.1 Twenty-eight analysts in twenty-one laboratories analyzed distilled water solutions containing exact increments of oxidizable organic compounds, with the following results:

Increment as TOC mg/liter	Precision as Standard Deviation TOC, mg/liter	Bias, %	Accuracy as Bias, mg/liter
4.9	3.93	+15.27	+0.75
107	8.32	+ 1.01	+1.08

(FWPCA Method Study 3, Demand Analyses)

Bibliography

1. Annual Book of ASTM Standards, Part 31, "Water", Standard D 2574-79, p 469 (1976).
2. Standard Methods for the Examination of Water and Wastewater, 14th Edition, p 532, Method 505, (1975).

APPENDIX F.5
EPA METHOD 22 - FUGITIVE EMISSIONS

METHOD 22
VISUAL DETERMINATION OF FUGITIVE
EMISSIONS FROM MATERIAL PROCESSING SOURCES

Preamble

This method involves the visual determination of fugitive emission; i.e., emissions not emitted directly from a process stack or duct. Fugitive emissions include such emissions as those: 1) escaping capture by process equipment exhaust hoods; 2) emitted during material transfer; 3) emitted from buildings housing material processing or handling equipment; 4) emitted directly from process equipment.

This method does not require that the opacity of emissions be determined. Instead, this method determines the amount of time that any visible emissions occur during the observation period; i.e., the accumulated emission time. Since this procedure requires only the determination of whether or not a visible emission exists and does not require the determination of opacity levels, no special inspector training is required.

1. Principle. Fugitive emissions produced during material processing, handling, and transfer operations are visibly determined by an observer without the aid of instruments.

2. Applicability. This method is applicable for the determination of the frequency of fugitive emissions from stationary sources only when specified as the test method for determining compliance with new source performance standards. This method is applicable to emission sources located indoors or outdoors.

3. Definitions.

3.1 Emission Frequency. The percent of time emissions are visible during the observation period.

3.2 Emission Time. The accumulated amount of time that emissions are visible during the observation period.

3.3 Fugitive Emission. The pollutant generated by an affected facility which is not collected by a capture system and is released to the atmosphere.

3.4 Observation Period. The accumulated time period during which observations are conducted, not to be less than 6 minutes.

4. Equipment.

4.1 Stopwatch. Accumulative type stopwatch with a sweep second hand and unit divisions of at least one-half second.

4.2 Light Meter. Light meter capable of measuring illuminance in the 50 to 200 lux (lx.) range; required for indoor observations only.

5. Procedure.

5.1 General. The inspector surveys the affected facility or building or structure housing the process unit to be observed and determines the locations of potential emissions. The observer then chooses a suitable observation position. If the affected facility is located inside a building the observer chooses an observation location which permits observation of the emissions in a manner consistent with the requirements of the applicable regulation (i.e., outside observation of emission escaping the building/structure or inside observations of emissions directly emitted from the affected facility process unit).

5.2 Position. The observer stands in a position which enables a clear view of the potential emission point(s) of the affected facility or of the building or structure housing the affected facility, as appropriate for the applicable subpart. A position of at least 15 feet but not more than one-quarter mile from the emission source is recommended. For outdoor locations the observer should be positioned so that the sun is not directly in the observer's eyes.

5.3 Field Records.

5.3.1 Outdoor Location. The observer shall record the following information on the field data sheet (Figure 1): company name, industry, process unit, observer's name, observer's affiliation, and date. Weather conditions, including estimated wind speed, wind direction, and sky condition will be recorded. The observer shall sketch the process unit being observed and shall note his location relative to the source and the sun. The potential and actual fugitive emission points should be indicated on the sketch.

5.3.2 Indoor Location. The observer shall record the following information on the field data sheet (Figure 2): company name, industry, process unit, observer's name, observer's affiliation, and date. The type, location, and intensity of lighting will be recorded as appropriate on

the data sheet. The observer shall sketch the process unit being observed and shall note his location relative to the source. The potential and actual fugitive emission points should be indicated on the sketch.

5.4 Indoor Lighting Requirements. For indoor locations, a light meter shall be used to measure the level of illumination. The observer shall measure the illumination at a location as close to the emission source(s) as is feasible. An illumination of greater than 100 lux (10 f.c.) is considered necessary for proper application of this method.

5.5 Observations. The observer records the clock time observations begin. One stopwatch is used to monitor the duration of the observation period; this stopwatch is started when the observation period begins. If the observation period is divided into two or more segments by process shutdowns or inspector rest breaks, the stopwatch is stopped when a break begins and restarted without resetting when the break ends. The stopwatch is stopped at the end of the observation period. The accumulated time indicated by this stopwatch is the duration of the observation period. When the observation period is completed the observer records the clock time.

During the observation period, the observer continuously watches the potential emission source. Upon observing an emission (condensed water vapor is not considered an emission), the second accumulative stopwatch is started; the watch is

stopped when the emission stops. The observer continues this procedure for the entire observation period. The accumulated elapsed time on this stopwatch indicates the total time emissions were visible during the observation period, i.e., the emission time.

5.5.1 Observation Period. The observer shall choose an observation period of sufficient length to meet the requirements for determining compliance with the emission regulation in the applicable subpart. When the length of the observation period is specifically stated in the applicable subpart, it may not be necessary to observe the source for this entire period if the emission time required to indicate non-compliance (based on the specified observation period) is observed in a shorter time period. In other words if the regulation prohibits emissions for more than 6 minutes in any hour, then observations may (optional) be stopped after an emission time of 6 minutes is exceeded. Similarly, when the regulation is expressed as an emission frequency, if the regulation prohibits emissions for greater than 10 percent of the time in any hour, then observations may (optional) be terminated after 6 minutes of emissions are observed since 6 minutes is 10 percent of an hour. In any case, the observation period shall not be less than 6 minutes in duration. In some cases, the process operation may be intermittent or cyclic. In such cases, it may be convenient for the observation period to coincide with the length of the process cycle.

5.5.2 Inspector Rest Breaks. The inspector shall not observe emissions continuously for a period of more than 15 to 20 minutes without taking a rest break. For sources requiring observation periods of greater than 20 minutes, the observer shall take a break of not less than 5 minutes and not more than 10 minutes after every 15 to 20 minutes of observation. If continuous observations are desired for extended time periods, this can be accomplished by two inspectors alternating between making observations and taking breaks.

5.5 Recording Observations. The accumulated time of the observation period is recorded on the data sheet as the observation period duration. The accumulated time emissions were observed is recorded on the data sheet as the emission time. Record the clock time the observation period began and ended, as well as the clock time any inspector breaks began and ended.

6. Calculations. If the applicable subpart requires that the emission rate be expressed as an emission frequency, determine this value as follows: Divide the accumulated emission time (seconds) by the duration of the observation period (seconds) or by any minimum observation period required in the applicable subpart if the actual observation period is less than the required period; multiply this quotient by one hundred to determine the emission frequency (percent).

APPENDIX G

LABORATORY ANALYSIS DATA

- G.1 EPA Method 5X - Data
 - G.1.1 Data Summary
 - G.1.2 Laboratory Data and Notebook
- G.2 EPA Method 25 - Data
 - G.2.1 Data Summaries
 - G.2.2 TRC Laboratory Data and Notebook
 - G.2.3 NCASI Laboratory Data and Notebook
 - G.2.4 PCS Laboratory Data and Notebook
- G.3 Scrubber Solution Data

APPENDIX G.1
EPA METHOD 5X - DATA

The Method 5X analytical procedures used during the Georgia-Pacific testing program are discussed in detail in Section 5.3.1 of the main report.

APPENDIX G.1.1
DATA SUMMARY

TABLE G-1
SUMMARY OF METHOD 5X PARTICULATE AND CONDENSIBLE ORGANICS
SAMPLE FRACTIONS

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run No.	Front-Half				Back-Half				Total Sample (mg)	
	Probe Wash		Filter (mg)	Total (mg)	Organic Extraction (mg)	Residue On Evaporation (mg)	Acetone Rinse (mg)			
	H ₂ O (mg)	Acetone (mg)								
Inlet-0	11.7	44.9	n.m.	78.6	1.4	21.0	15.1	n.m.	39.5	118.1
Outlet-0	11.6	11.2	n.m.	22.8	1.9	136.0	26.0	n.m.	163.9	186.7
Inlet-1	40.0	36.6	-2.4	74.2	129.2	29.7	200.3	148.9	508.1	582.3
Outlet-1	14.3	35.6	7.0	56.9	72.9	34.1	106.8	16.2	230.0	286.9
Inlet-2	25.4	18.7	0.1	44.2	99.4	20.8	230.7	64.5	415.4	459.6
Outlet-2	9.0	37.3	-4.4	41.9	80.3	19.3	78.5	37.6	215.7	257.6
Inlet-3	5.1	8.6	6.0	19.7	75.8	16.3	202.7	26.1	320.9	340.6
Outlet-3	10.5	32.0	19.1	61.6	73.7	22.2	50.6	0.7	147.2	208.8

n.m.i Not measured. Filters were not inserted in the clean-up trains.

APPENDIX G.1.2
LABORATORY DATA AND NOTEBOOK

ENVIRONMENTAL LABORATORY
1600 S.W. Western Blvd.
Corvallis, Oregon 97330

METHOD 5x SAMPLE ANALYSIS

Client Name: TRC ENVIRONMENTAL CONSULTANTS Date Received: June 12, 1981
Location: GEORGIA-PACIFIC CORP. Date Analyzed: June 15, 1981
Source: EUGENE OREGON Project No.: _____

Sample Identity 5x-1-IN 5x-1-OUT _____ Blank

FRONT HALF ANALYSIS

• Probe Wash (D.I./Dist. H₂O Rinse)

	<u>250</u>	<u>370</u>	<u>100</u>
Volume, mls			
Tare No.	<u>1-I-2</u>	<u>1-O-2</u>	<u>DT/DW</u>
Tare + Residue	<u>64.0547</u>	<u>63.3809</u>	<u>66.7168</u>
Tare Wt.	<u>64.0144</u>	<u>63.3662</u>	<u>66.7167</u>
Residue Wt.	<u>0.0403</u>	<u>0.0147</u>	<u>0.0001</u>
Blk. Corr.	<u>0.0003</u>	<u>0.0004</u>	
Residue Wt.	<u>0.0400</u>	<u>0.0143</u>	

• Probe Wash (Acetone Rinse)

	<u>210</u>	<u>378</u>	<u>100</u>
Volume, mls			
Tare No.	<u>1-I-3</u>	<u>1-O-3</u>	<u>ACE BLK</u>
Tare + Residue	<u>65.9167</u>	<u>63.7738</u>	<u>64.4137</u>
Tare Wt.	<u>65.8797</u>	<u>63.7374</u>	<u>64.4135</u>
Residue Wt.	<u>0.0370</u>	<u>0.0364</u>	<u>0.0002</u>
Blk. Corr.	<u>0.0004</u>	<u>0.0008</u>	
Residue Wt.	<u>0.0366</u>	<u>0.0356</u>	

• Filter Collection (Front Filter)

	<u>#3</u>	<u>#3</u>	<u>#9</u>	<u>#10</u>
Filter No.				
Tare + Part.	<u>0.1980</u>	<u>0.7747</u>	<u>0.7620</u>	<u>0.1940</u>
Tare Wt.	<u>0.2001</u>	<u>0.7665</u>	<u>0.7608</u>	<u>0.1937</u>
Part. Wt.	<u>- 0.0021</u>	<u>0.0082</u>	<u>0.0012</u>	<u>0.0003</u>
Blk. Corr.	<u>- 0.0003</u>	<u>0.0012</u>	<u>(4 1/2")</u>	<u>(2 1/2")</u>
Paticulate Wt.	<u>- 0.0024</u>	<u>0.0070</u>		

• Front Half (wt. gms)

<u>0.0742</u>	<u>0.0569</u>		

RUN 1 SCRUBBER LIQUID TOC = 3010 mg/l
4 1/2" filter used in 5x-1-0

METHOD 5x SAMPLE ANALYSIS

Client Name: TRC ENVIRONMENTAL CONSULTANTS Date Received: June 12, 1981
Location: GEORGIA-PACIFIC CORP. Date Analyzed: June 15, 1981
Source: EUGENE OREGON Project No.: _____

Sample Identity 5x-1-IN 5x-1-OUT Blank

BACK HALF ANALYSIS

• Impinger Water (+ H₂O Rinse)

Total Volume, ml (T)

1350 1310 CHLORO/ETHER

• Organic Extraction

Volume Extracted, ml (Ex)

1350 1310 150

Tare No.

1-T-ORG 1-O-ORG

Tare + Extract

66.2712 67.1863 66.2458

Tare Wt.

66.1418 67.1132 66.2456

Extract Wt.

0.1294 0.0731 0.0002

Blk. Corr.

0.0002 0.0002

Extract Wt. x (T/Ex)

0.1292 0.0729

• Residue on Evaporation

Volume Evap., ml (Ev)

100 100 100

Tare No.

1-T-RES 1-O-RES 0-O-RES

Tare + Residue

66.8688 62.7472 66.7168

Tare Wt.

66.8665 62.7445 66.7167

Residue Wt.

0.0023 0.0027 0.0001

Blk. Corr. ^{Blk.} Corrected Res. Wt.

0.0022 0.0026

Residue Wt. x (T/Ev)

0.0297 0.0341

• Back Half Rinse (Acetone)

Volume, mls

421 416 100

Tare No.

1-T-5 1-O-5 ACE BLK

Tare + Residue

64.2383 65.0247 64.4137

Tare Wt.

64.0372 64.9171 64.4135

Residue Wt.

0.2011 0.1076 0.0002

Blk. Corr.

0.0008 0.0008

Residue Wt.

0.2003 0.1068

• Filter Collection (Back-Up Filter)

Filter No.

#1 #2 #10

Tare + Part.

0.3467 0.2185 0.1940

Tare Wt.

0.1975 0.2020 0.1937

Part. Wt.

0.1492 0.0165 0.0003

Blk. Corr.

0.0003 0.0003

Particulate Wt.

0.1489 0.0162

• Back Half (wt. gms)

0.5081 0.2300

• Total Sample (wt. gms)

0.5823 0.2869

The information shown on this sheet is test data only and no analysis or interpretation is intended or implied.
Samples will be retained 30 days unless otherwise requested.

ENVIRONMENTAL LABORATORY
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Corvallis, Oregon 97330

METHOD 5x SAMPLE ANALYSIS

Client Name: TRC ENVIRONMENTAL CONSULTANTS Date Received: JUNE 12, 1981
Location: GEORGIA - PACIFIC CORP. Date Analyzed: JUNE 15, 1981
Source: EUGENE OREGON Project No. _____

Sample Identity 5x-2-IN 5x-2-OUT Blank

FRONT HALF ANALYSIS

• Probe Wash (D.I./Dist. H₂O Rinse)

	370	350	
Volume, mls	2-T-2	2-O-2	REFER TO RUN 5x-1 FOR BLANK APPLICATIONS
Tare No.	65.6144	63.6889	
Tare + Residue	65.5886	63.6796	
Tare Wt.	0.0258	0.0093	
Residue Wt.	-0.0004	-0.0003	
Blk. Corr.	0.0254	0.0090	
Residue Wt.			

• Probe Wash (Acetone Rinse)

	296	402	
Volume, mls	2-I-3	2-O-3	REFER TO RUN 5x-1 FOR BLANK APPLICATIONS
Tare No.	66.6215	66.7392	
Tare + Residue	66.6022	66.7011	
Tare Wt.	0.0193	0.0381	
Residue Wt.	-0.0006	-0.0008	
Blk. Corr.	0.0187	0.0373	
Residue Wt.			

• Filter Collection (Front Filter)

	#5	#6	
Filter No.	0.2018	0.1993	REFER TO RUN 5x-1 FOR BLANK APPLICATIONS
Tare + Part.	0.2014	0.2034	
Tare Wt.	0.0004	-0.0041	
Part. Wt.	-0.0003	-0.0003	
Blk. Corr.	0.0001	-0.0044	
Particulate Wt.			

• Front Half (wt. gms)

	0.0442	0.0419	

RUN 2 SCRUBBER LIQUID TOC = 3000 mg/l

METHOD 5x SAMPLE ANALYSIS

Client Name: TRC ENVIRONMENTAL CONSULTANTS Date Received: June 12, 1981
Location: GEORGIA - PACIFIC CORP. Date Analyzed: June 15, 1981
Source: EUGENE OREGON Project No.: _____

Sample Identity 5x-2-IN 5x-2-OUT _____ Blank

BACK HALF ANALYSIS

• Impinger Water (+ H₂O Rinse)

Total Volume, ml (T)

1300

1375

• Organic Extraction

Volume Extracted, ml (Ex)

1300

1375

Tare No.

2-I-ORG

2-O-ORG

Tare + Extract

66.6644

63.9970

Tare Wt.

66.5648

63.9165

Extract Wt.

0.0996

0.0805

Blk. Corr.

-0.0002

-0.0002

Extract Wt x (T/Ex)

0.0994

0.0803

• Residue on Evaporation

Volume Evap., ml (Ev)

100

100

Tare No.

2-I-RES

2-O-RES

Tare + Residue

65.8125

64.4031

Tare Wt.

65.8108

64.4016

Residue Wt.

0.0017

0.0015

Blk. Corr. ^{Blk.} Corrected Res. wt.

0.0016

0.0014

Residue Wt. x (T/Ev)

0.0208

0.0193

• Back Half Rinse (Acetone)

Volume, mls

420

394

Tare No.

2-I-5

2-O-5

Tare + Residue

63.9042

62.1443

Tare Wt.

63.6727

62.0650

Residue Wt.

0.2315

0.0793

Blk. Corr.

-0.0008

-0.0008

Residue Wt.

0.2307

0.0785

• Filter Collection (Back-Up Filter)

Filter No.

#4

#7

Tare + Part.

0.2667

0.2313

Tare Wt.

0.2016

0.1934

Part. Wt.

0.0648

0.0379

Blk. Corr.

-0.0003

-0.0003

Particulate Wt.

0.0645

0.0376

• Back Half (wt. gms)

0.4134

0.2157

• Total Sample (wt. gms)

0.4596

0.2576

The information shown on this sheet is test data only and no analysis or interpretation is intended or implied.
Samples will be retained 30 days unless otherwise requested.

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METHOD 5x SAMPLE ANALYSIS

Client Name: TRC ENVIRONMENTAL CONSULTANTS Date Received: JUNE 12, 1981
Location: GEORGIA - PACIFIC CORP. Date Analyzed: JUNE 15, 1981
Source: EUGENE OREGON Project No. _____

Sample Identity 5x-3-IN 5x-3-OUT _____ Blank

FRONT HALF ANALYSIS

• Probe Wash (D.I./Dist. H₂O Rinse)

Volume, mls	<u>370</u>	<u>370</u>	
Tare No.	<u>3-T-2</u>	<u>3-O-2</u>	
Tare + Residue	<u>63.2259</u>	<u>66.6692</u>	
Tare Wt.	<u>63.2204</u>	<u>66.6583</u>	
Residue Wt.	<u>0.0055</u>	<u>0.0109</u>	
Blk. Corr.	<u>-0.0004</u>	<u>-0.0004</u>	
Residue Wt.	<u>0.0051</u>	<u>0.0105</u>	

• Probe Wash (Acetone Rinse)

Volume, mls	<u>398</u>	<u>358</u>	
Tare No.	<u>3-I-3</u>	<u>3-O-3</u>	
Tare + Residue	<u>64.0581</u>	<u>64.2181</u>	
Tare Wt.	<u>64.0487</u>	<u>64.1853</u>	
Residue Wt.	<u>0.0094</u>	<u>0.0328</u>	
Blk. Corr.	<u>-0.0008</u>	<u>-0.0008</u>	
Residue Wt.	<u>0.0086</u>	<u>0.0320</u>	

• Filter Collection (Front Filter)

Filter No.	<u>#145</u>	<u>#144</u>	<u>#146</u>	
Tare + Part.	<u>0.8614</u>	<u>0.8504</u>	<u>0.8604</u>	
Tare Wt.	<u>0.8530</u>	<u>0.8477</u>	<u>0.8532</u>	
Part. Wt.	<u>0.0084</u>	<u>0.0027</u>	<u>0.0152</u>	
Blk. Corr.	<u>0.0024</u>	<u>-0.0024</u>	<u>-0.0024</u>	
Particulate Wt.	<u>0.0060</u>	<u>0.0063</u>	<u>0.0128</u>	

• Front Half (wt. gms)

	<u>0.0197</u>	<u>0.0616</u>	

REFER TO RUN 5x-1 FOR BLANK APPLICATIONS

RUN 3 SCRUBBER LIQUID TOC = 2860 mg/l
filters 145, 144 and 146 are 4 1/2"
filter holder broke during 5x-3-0, so 2 filters were used
6-6

METHOD 5x SAMPLE ANALYSIS

Client Name: TRC ENVIRONMENTAL CONSULTANTS Date Received: June 12, 1981
Location: Georgia-Pacific Corp Date Analyzed: June 15, 1981
Source: Eugene, Oregon Project No.: _____
Sample Identity: 5x-3-IN 5x-3-OUT Blank

BACK HALF ANALYSIS

• Impinger Water (+ H₂O Rinse)

Total Volume, ml (T)

1255 1385

• Organic Extraction

Volume Extracted, ml (Ex)

1255 1385

Tare No.

3-I-009 3-O-009

Tare + Extract

65.5129 67.2639

Tare Wt.

65.4369 67.1900

Extract Wt.

0.0760 0.0739

Blk. Corr.

-0.0002 -0.0002

Extract Wt. x (T/Ex)

0.0758 0.0737

• Residue on Evaporation

Volume Evap., ml (Ev)

100 100

Tare No.

3-I-009 3-O-009

Tare + Residue

67.1235 64.3789

Tare Wt.

67.1221 64.3772

Residue Wt.

0.0014 0.0017

Blk. Corr. Res. wt.

0.0013 0.0016

Residue Wt. x (T/Ev)

0.0163 0.0222

• Back Half Rinse (Acetone)

Volume, mls

416 422

Tare No.

3-I-5 3-O-5

Tare + Residue

66.7339 66.6252

Tare Wt.

66.5304 66.5738

Residue Wt.

0.2035 0.0514

Blk. Corr.

-0.0008 -0.0008

Residue Wt.

0.2027 0.0506

• Filter Collection (Back-Up Filter)

Filter No.

#8 #9

Tare + Part.

0.2220 0.1985

Tare Wt.

0.1956 0.1975

Part. Wt.

0.0264 0.0010

Blk. Corr.

-0.0003 -0.0003

Particulate Wt.

0.0261 0.0007

• Back Half (wt. gms)

0.3209 0.1472

• Total Sample (wt. gms)

0.3406 0.2088

Wts in blue ink.

43% 72°

472 spectrograde filters
Weighed on H2O Balance

FILTER WEIGHTS

- ☐ Put in Oven
☒ Not put in Oven
☒ Pre-weight
☐ Post-weight

Client: _____

Project No.: _____

Date
Time
Temp.
Humidity
Initials

3-10-81	4-3-81	4-15-81	4-15-81	
10:00	9:00	10:00	10:30	
68°	70°	68°	68°	
28%	40%	40%	40%	
EMS	EMS	SMR	SMR	

Filter Number	Wt. 1(g)	Wt. 2(g)	Wt. 3(g)	Wt. 4(g)	Final Ave. Weight
121	0.88238	0.87319	0.87319 ✓	0.87317	0.87318
122	0.84585	0.84499 ✓	0.84507 ✓		0.84503
123	0.82919	0.82845 ✓	0.82844 ✓		0.82844
124	0.85013	0.84983 ✓	0.84923 ✓		0.84928
125	0.85174	0.85131 ✓	0.85131 ✓		
126	0.86345	0.86213	0.86265		
127	0.84883	0.84861 ✓			0.84872
128	0.85174	0.85125 ✓			0.85150
129	0.86990	0.86915 ✓	0.86928 ✓		0.86932
130	0.87605	0.87485	0.87479		
131	0.84795	0.84812 ✓			0.84804
Used 132	0.87816	0.87788 ✓			0.87802
Metky 5/81 133	0.87939	0.87927 ✓			0.87933
Used 134	0.85519	0.85530 ✓			0.85525
Metky 0.1 135	0.85112	0.85106 ✓			0.85109
136	0.88001	0.87949 ✓	0.87963 ✓		0.87952
137	0.88238	0.88224 ✓			0.88231
138	0.88237	0.88412 ✓	0.88493 ✓		0.88480
139	0.84546	0.84587			
140	0.85734	0.85579	0.85688		
141	0.85226	0.85000 ✓	0.85014 ✓		0.85007

Security
1399-680 21 5/24/81

Security

Security

Initial
FILTER WEIGHTS

Weighed on H2O Balance

- ☐ Put in Oven
☒ Not put in Oven
☒ Pre-weight
☐ Post-weight

Client: _____

Project No.: _____

Date
Time
Temp.
Humidity
Initials

4/10/81	4/14/81	4/15/81		
12 noon	1100	1000		
72°	70°	68°		
43%	47%	40%		
EMS	SMR	SMR		

Filter Number	Wt. 1(g)	Wt. 2(g)	Wt. 3(g)	Wt. 4(g)	Final Ave. Weight
✓ 142	0.85662	0.85589 ✓	0.85625 ✓		0.85608
✓ 143	0.84919	0.84838 ✓	0.84861 ✓		0.84850
✓ 144	0.84866	0.84772 ✓	0.84767 ✓		0.84770
✓ 145	0.85375	0.85294 ✓	0.85300 ✓		0.85297
✓ 146	0.85395	0.85318 ✓	0.85327 ✓		0.85322
✓ 147	0.84599 ✓	0.84556 ✓			
✓ 148	0.84978	0.84920 ✓			
✓ 149	0.85113	0.85034 ✓	0.85034 ✓		0.85034
✓ 150	0.84300	0.84247 ✓	0.84268 ✓		0.84259
151	0.84537	0.84467 ✓	0.84453 ✓		0.84460
152	0.85452	0.85388 ✓	0.85384 ✓		0.85386
Stone - 1625-Elm MAA 5/15/81 ✓ 153	0.84700	0.84628 ✓	0.84606 ✓		0.84617
✓ 154	0.84636	0.84555 ✓	0.84557 ✓		0.84556
✓ 155	0.84671	0.84607 ✓	0.84639 ✓		0.84623
✓ 156	0.84844	0.84773 ✓	0.84769 ✓		0.84771
✓ 157	0.84720	0.84668 ✓	0.84655 ✓		0.84662
✓ 158	0.84704	0.84730 ✓			0.84717
✓ 159	0.84938	0.84921 ✓			0.84930
160	0.84258	0.84175 ✓	0.84168 ✓ 0.84168 ✓		
161	0.84372	0.84312 ✓	0.84324 ✓		0.84318
162	0.84614	0.84552 ✓	0.84550 ✓		0.84551

APPENDIX G.2
EPA METHOD 25 - DATA

The Method 25 analytical procedures used during the Georgia-Pacific testing program are discussed in detail in Section 5.3.2 of the main text report.

APPENDIX G.2.1
DATA SUMMARIES

TABLE G-2

TRC METHOD 25 SAMPLING TRAIN DATA

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run No.	Sample Tank										H ₂ O Ice Trap										Dry Ice Trap									
											Intermediate Tank										Intermediate Tank									
	P _{t1} (mm Hg)	T _{t1} (K)	P _t (mm Hg)	T _t (K)	V (l)	V _g (l)	P _{tf} (mm Hg)	T _{tf} (K)	C _{tm} (ppm)	C _t (ppm)	V _{g1} (l)	P _{f1} (mm Hg)	T _{f1} (K)	C _{cm1} (ppm)	C _{cl} (ppm)	V _{g2} (l)	P _{f2} (mm Hg)	T _{f2} (K)	C _{cm2} (ppm)	C _{cl} (ppm)										
Inlet	A	13.6	284	433	295	4.83	2.64	1515	299	115	409	4.88	1474	299	136	477	4.86	1071	299	118	300									
Run 1	B	12.6	284	454	295	4.83	2.78	1368	302	n.d.	n.d.	4.88	1212	302	90	245	4.84	1268	302	213	601									
Inlet	A	10.6	290	426	294	4.86	2.64	1481	299	229	804	4.86	1286	299	158	483	4.86	1295	299	53	163									
Run 2	B	25.6	290	447	294	4.86	2.68	1304	299	267	814	4.86	1220	299	171	489	4.85	1351	299	67	212									
Inlet	A	10.1	288	370	295	4.85	2.28	1540	302	262	1102	4.85	1214	302	165	545	4.82	1296	302	134	469									
Run 3	B	10.1	288	497	295	4.86	3.10	1408	302	278	786	4.84	1430	302	329	940	4.85	1168	302	185	433									
Outlet	A	15.6	284	504	295	4.82	3.08	1328	299	203	546	4.86	1256	299	319	815	4.86	1311	299	104	278									
Run 1	B	11.6	284	544	295	4.86	3.38	1322	299	158	388	4.88	1174	299	346	758	4.89	1290	299	307	740									
Outlet	A	13.6	290	431	294	4.85	2.65	1414	299	206	687	4.82	1393	299	142	465	4.85	1313	299	107	332									
Run 2	B	10.6	290	415	294	4.87	2.58	1412	302	238	810	4.86	1310	302	251	792	4.83	1268	302	100	303									
Outlet	A	16.1	288	483	295	4.82	2.94	1543	302	137	443	16.3	1108	302	106	831	4.85	1208	302	77	196									
Run 3	D	25.1	288	520	295	4.86	3.14	1179	302	182	424	4.83	1368	302	164	441	4.85	1238	302	79	193									

n.d.: None detected.

APPENDIX G.2.2
TRC LABORATORY DATA AND NOTEBOOK

TABLE G-3

TRC METHOD 25 DAILY CALIBRATION SUMMARY

Georgia-Pacific Plywood Plant, Springfield, Oregon

Analysis Date	Type Calibration	Compound	Concentration	Injection Run	Area Units	Range	Area/ppm C ₁ (10 ⁻¹¹)	Area/ppm C ₁ Relative Standard Deviation (%)	System Deviation (%)
6/27/81	NMO	Propane	17.3 ppm	1	77915	1 x 10 ⁻¹¹	15012	0.8	10.8
				2	77020		14840		
				Average	77467.5		14926		
6/27/81	CO ₂	CO ₂	18	1	119980	1 x 10 ⁻⁹	11999	12.0	6.7
				2	119500		11950		
				3	121830		12183		
				Average	120440		12044		
6/28/81	NMO	Propane	17.3 ppm	1	70473	1 x 10 ⁻¹¹	13579	2.2	3.4
				2	73456		14153		
				3	72832		14033		
				Average	72254		13922		
6/28/81	CO ₂	CO ₂	1.958	1	220470	1 x 10 ⁻⁹	11306	2.8	10.0
				2	233940		11997		
				3	228630		11725		
				4	224710		11524		
				5	226070		11593		
				6	235490		12076		
				7	216470		11101		
				8	223290		11451		
				Average	226134		11597		
6/29/81	NMO	Propane	17.3 ppm	1	58592	1 x 10 ⁻¹¹	11289	19.1	4.6
				2	70433		13571		
				3	58130		11200		
				4	74023		14263		
				5	93737		18061		
				6	83522		16093		
				Average	73073		14080		
6-29-81	CO ₂	CO ₂	1.958	1	243620	1 x 10 ⁻⁹	12493	2.4	5.8
				2	241460		12382		
				3	241300		12374		
				4	234130		12007		
				5	232720		11934		
				6	235970		12101		
				7	240280		12322		
				8	226680		11625		
				Average	237020		12155		

TABLE G-3 (Continued)

TRC METHOD 25 DAILY CALIBRATION SUMMARY

Georgia-Pacific Plywood Plant, Springfield, Oregon

Analysis Date	Type Calibration	Compound	Concentration	Injection Run	Area Units	Range	Area/ppm C1 (10 ⁻¹¹)	Area/ppm C1 Relative		System Deviation (%)
								Standard	Deviation	
6/30/81	NMO	Propane	17.3 ppm	1	70212	1 x 10 ⁻¹¹	13528	7.0		6.8
				2	70078		13502			
				3	78601		15145			
				4	79673		15351			
				Average	74641		14382			
6/30/81	CO ₂	CO ₂	1.958	1	236070	1 x 10 ⁻⁹	12106	0.7		6.6
				2	235790		12092			
				3	233200		11959			
				Average	235020		12052			

TABLE G-4

TNC METHOD 25 ANALYTICAL RESULTS (SCRUBBER INLET)

Georgia-Pacific Plywood Plant, Springfield, Oregon

Location & Run No.	Tank No.	Trap No.	Anal. No.	Analyzed Date	Area Counts			Uncorrected Results (ppm)		
					Tank	H ₂ O Trap	CO ₂ Trap	Tank	H ₂ O Trap	CO ₂ Trap
Inlet 1 Sample A	5	215 (52)	A-1	6-27-81	17199x10 ⁻¹⁰	1653x10 ⁻¹⁰	13951x10 ⁻¹⁰	114.6	136	118
			A-2		16590x10 ⁻¹⁰	16377x10 ⁻¹⁰	13919x10 ⁻¹⁰			
			A-3		19688x10 ⁻¹⁰	15963x10 ⁻¹⁰	14812x10 ⁻¹⁰			
			Avg.		17826x10 ⁻¹⁰	16311x10 ⁻¹⁰	14227x10 ⁻¹⁰			
Inlet 1 Sample B	1	219 (63)	B-1	6-30-81	25390x10 ⁻¹⁰	10815x10 ⁻¹⁰	n.d.	90	213	
			B-2		25840x10 ⁻¹⁰	10651x10 ⁻¹⁰				
			B-3		25627x10 ⁻¹⁰	11047x10 ⁻¹⁰				
			Avg.		25622x10 ⁻¹⁰	10818x10 ⁻¹⁰				
Inlet 2 Sample A	4	31 (22)	A-1	6-29-81	3397x10 ⁻¹⁰	20504x10 ⁻¹⁰	6828.3x10 ⁻¹⁰	229	53.2	158.4
			A-2		30851x10 ⁻¹⁰	18590x10 ⁻¹⁰	6110.7x10 ⁻¹⁰			
			A-3		31855x10 ⁻¹⁰	18671x10 ⁻¹⁰				
			Avg.		32214x10 ⁻¹⁰	19255x10 ⁻¹⁰	6469.5x10 ⁻¹⁰			
Inlet 2 Sample B	21	210 (16)	B-1	6-29-81	32036x10 ⁻¹⁰	20659x10 ⁻¹⁰	8451.1x10 ⁻¹⁰	262	170.8	6.7
			B-2		40186x10 ⁻¹⁰	21185x10 ⁻¹⁰	7831.6x10 ⁻¹⁰			
			B-3		42169x10 ⁻¹⁰	20438x10 ⁻¹⁰	8189.6x10 ⁻¹⁰			
			B-4		36145x10 ⁻¹⁰					
			Avg.		37634x10 ⁻¹⁰	20761x10 ⁻¹⁰	8157.4x10 ⁻¹⁰			
Inlet 3 Sample A	14	26 (6)	A-1	6-30-81	38878x10 ⁻¹⁰	16435x10 ⁻¹⁰	19427x10 ⁻¹⁰	262	165	134
			A-2		37188x10 ⁻¹⁰	16295x10 ⁻¹⁰	18763x10 ⁻¹⁰			
			A-3		37007x10 ⁻¹⁰	15755x10 ⁻¹⁰	18658x10 ⁻¹⁰			
			Avg.		37961x10 ⁻¹⁰	16162x10 ⁻¹⁰	18949x10 ⁻¹⁰			
Inlet 3 Sample B	19	15 (12)	B-1	6-30-81	42428x10 ⁻¹⁰	41422x10 ⁻¹⁰	23075x10 ⁻¹⁰	278	329	185
			B-2		38161x10 ⁻¹⁰	40209x10 ⁻¹⁰	22159x10 ⁻¹⁰			
			B-3		39348x10 ⁻¹⁰	38837x10 ⁻¹⁰	27134x10 ⁻¹⁰			
			B-4		38126x10 ⁻¹⁰					
			Avg.		39979x10 ⁻¹⁰	39698x10 ⁻¹⁰	22323x10 ⁻¹⁰			

TABLE G-5

TMC METHOD 25 ANALYTICAL RESULTS (SCRUBBER OUTLET)

Georgia-Pacific Plywood Plant, Springfield, Oregon

Location & Run No.	Tank No.	Trap No.	Anal. No.	Analyzed Date	Area Counts			Uncorrected Results (ppm)	
					Tank	H ₂ O Trap	CO ₂ Trap	Tank	H ₂ O Trap
Outlet 1									
Sample A	68	229 (55)	233 (56)	6-23-81	29782x10 ⁻¹⁰	37161x10 ⁻¹⁰	12050x10 ⁻¹⁰	203	104
					27221x10 ⁻¹⁰	37204x10 ⁻¹⁰	12261x10 ⁻¹⁰		
					29843x10 ⁻¹⁰	36604x10 ⁻¹⁰	11010x10 ⁻¹⁰		
					28948x10 ⁻¹⁰	36990x10 ⁻¹⁰	12040x10 ⁻¹⁰		
			Avg.						
Outlet 1									
Sample B	9	221 (70)	235 (50)	6-28-81	23200x10 ⁻¹⁰	35422x10 ⁻¹⁰	41499x10 ⁻¹⁰	158	346
					22168x10 ⁻¹⁰	35625x10 ⁻¹⁰	38541x10 ⁻¹⁰		
					22601x10 ⁻¹⁰	35719x10 ⁻¹⁰	40175x10 ⁻¹⁰		
			Avg.		22656x10 ⁻¹⁰	35589x10 ⁻¹⁰	40072x10 ⁻¹⁰		
Outlet 2									
Sample A	23	226 (65)	222 (18)	6-29-81	28978x10 ⁻¹⁰	13824x10 ⁻¹⁰	17747x10 ⁻¹⁰	206	142
					28583x10 ⁻¹⁰	13194x10 ⁻¹⁰	18460x10 ⁻¹⁰		
					28781x10 ⁻¹⁰	12038x10 ⁻¹⁰	15724x10 ⁻¹⁰		
			Avg.			13039x10 ⁻¹⁰	17310x10 ⁻¹⁰		
Outlet 2									
Sample B	60	230 (59)	190 (3)	6-30-81	31747x10 ⁻¹⁰	30589x10 ⁻¹⁰	13609x10 ⁻¹⁰	238	100
					34784x10 ⁻¹⁰	30749x10 ⁻¹⁰	11460x10 ⁻¹⁰		
					36290x10 ⁻¹⁰	29564x10 ⁻¹⁰	11044x10 ⁻¹⁰		
			Avg.		84274x10 ⁻¹⁰	30301x10 ⁻¹⁰	12038x10 ⁻¹⁰		
Outlet 3									
Sample C	54	6 (L)	113 (62)	7-01-81	17010x10 ⁻¹⁰	8979x10 ⁻¹⁰	12907x10 ⁻¹⁰	129	10
					18753x10 ⁻¹⁰	9238.6x10 ⁻¹⁰	12710x10 ⁻¹⁰		
					20080x10 ⁻¹⁰	8777.2x10 ⁻¹⁰	11502x10 ⁻¹⁰		
			Avg.		18614x10 ⁻¹⁰	8998.3x10 ⁻¹⁰	12373x10 ⁻¹⁰		
Outlet 3									
Sample D	53	223 (20)	202 (64)	6-30-81	25253x10 ⁻¹⁰	19603x10 ⁻¹⁰	9866.2x10 ⁻¹⁰	169	164
					26963x10 ⁻¹⁰	19541x10 ⁻¹⁰	9076.4x10 ⁻¹⁰		
					26108x10 ⁻¹⁰	20620x10 ⁻¹⁰	9568.3x10 ⁻¹⁰		
			Avg.			19741x10 ⁻¹⁰	9503x10 ⁻¹⁰		

EPA METHOD 25
(MODIFIED)

68

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-15I-A

Date Analyzed: 6/27/81

Laboratory Sample Run No. _____

Analyst: PALCENON

SAMPLING TRAIN DATA

H₂O Ice Trap No. 215 CO₂ Ice Trap No. 111 Sample Tank No. 5

Sample Tank Data

V (liters) 1.83

P_{ti} (mm Hg) 13.6

P_t (mm Hg) 432.6

P_{tf} (mm Hg) 1514.7

T_{ti} (°C) 284°K

T_t (°C) 295°K

T_{tf} (°C) 299°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 52

V_{v1} (liters) 4.877

P_{f1} (mm Hg) 1473.6

T_{f1} (°C) 299°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 111

V_{v2} (liters) 4.86

P_{f2} (mm Hg) 1070.9

T_{f2} (°C) 299°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ 114.6 ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 136 ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 118 ppm C₁

METHOD 25
CALCULATIONS

1. Sample Volume, V_s (M^3 ~~liters~~)

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 (1.4186) (.00483)$$

$$V_s = .00264 m^3 = 2.64 l$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left\{ \frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right\} \bar{C}_{tm}$$

$$C_t = \left\{ 3.57 \right\} (114.6)$$

$$C_t = 409. \text{ ppm}$$

3. Condensable Organics, C_c (ppm C_1)

a. H_2O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 [9.10] (136)$$

$$C_{c1} = 477. \text{ ppm}$$

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2}^P f2}{V_{sT} f2} \right] \bar{C}_{m2}$$

$$C_{c2} = 0.386 \left[6.59 \right] (118)$$

$$C_{c2} = 300.$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C = 1186 \text{ ppm}$$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = 3.69 \times 10^{-5}$$

GP

EPA METHOD 25
(MODIFIED)

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-1-52-B

Date Analyzed: 6-30-87

Laboratory Sample Run No. _____

Analyst: PFL

SAMPLING TRAIN DATA

H₂O Ice Trap No. 219 CO₂ Ice Trap No. 220 Sample Tank No. 1

Sample Tank Data

V (liters) 4.83

P_{ti} (mm Hg) 12.6

P_t (mm Hg) 453.6

P_{tf} (mm Hg) 1368.4

T_{ti} (°C) 284°K

T_t (°C) 295°K

T_{tf} (°C) 302°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 63

V_{v1} (liters) 4.875

P_{f1} (mm Hg) 1212.4

T_{f1} (°C) 302°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 66

V_{v2} (liters) 4.84

P_{f2} (mm Hg) 1268.4

T_{f2} (°C) 302°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ n.d. ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 90. ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 2/3. ppm C₁

METHOD 25
CALCULATIONS

GP 25-1-SI-B

1. Sample Volume, V_s (^{m³}liters)

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 (.007)$$

$$V_s = .00278 \text{ m}^3 = 2.78 \text{ l}$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left\{ \frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right\} \bar{C}_{tm}$$

$$C_t = \left\{ 3.03 \right\} (n.d.)$$

$$C_t = n.d.$$

3. Condensible Organics, C_c (ppm C_1)

a. H₂O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 [7.04] (90.)$$

$$C_{c1} = 245.$$

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2} P_{f2}}{V_{sT} T_{f2}} \right] \bar{C}_{m2}$$

$$C_{c2} = 0.386 \left[7.31 \right] (213)$$

$$C_{c2} = 601.$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C = 846.$$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = 2.63 \times 10^{-5}$$

EPA METHOD 25
(MODIFIED)

GP

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-2-SI-A

Date Analyzed: 6-29-81

Laboratory Sample Run No. _____

Analyst: PALenum

SAMPLING TRAIN DATA

H₂O Ice Trap No. 31 CO₂ Ice Trap No. 102 Sample Tank No. 4

Sample Tank Data

V (liters) 4.855

P_{ti} (mm Hg) 10.6 P_t (mm Hg) 425.6 P_{tf} (mm Hg) 1481.4

T_{ti} (°C) 270°K T_t (°C) 294°K T_{tf} (°C) 299°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 22

V_{v1} (liters) 4.86 P_{f1} (mm Hg) 1286.4 T_{f1} (°C) 299°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 10

V_{v2} (liters) 4.855 P_{f2} (mm Hg) 1295.4 T_{f2} (°C) 299°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ 229 ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 53.2 ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 158.4 ppm C₁

METHOD 25
CALCULATIONS

GP 25-2-SI-A

1. Sample Volume, V_s ($\overset{m^3}{\text{liters}}$)

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 (20065)$$

$$V_s = .00264 m^3 = 2.64 l$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left\{ \frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right\} \bar{C}_{tm}$$

$$C_t = \left\{ 3.51 \right\} (229)$$

$$C_t = 804. \text{ ppm}$$

3. Condensible Organics, C_c (ppm C_1)

a. H_2O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 [7.92] (58)$$

$$C_{c1} = \cancel{462} \text{ ppm}$$

$$483$$

GP 25-2-SI-A

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2} P_{f2}}{V_{sT} T_{f2}} \right] \bar{C}_{m2}$$

$$C_{c2} = 0.386 \left[7.97 \right] (\cancel{158}) 53$$

$$C_{c2} = \cancel{146} \text{ ppm} \\ 163$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C = \cancel{1450} \text{ ppm} \\ 1450$$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = 4.51 \times 10^{-5}$$

EPA METHOD 25
(MODIFIED)

GP

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-2-51-B

Date Analyzed: 6-29-81

Laboratory Sample Run No. _____

Analyst: PA Lemm

SAMPLING TRAIN DATA

H₂O Ice Trap No. 218 CO₂ Ice Trap No. 210 Sample Tank No. 21

Sample Tank Data

V (liters) 4.855

P_{ti} (mm Hg) 25.6 P_t (mm Hg) 446.6 P_{tf} (mm Hg) 1304.4

T_{ti} (°C) 270°K T_t (°C) 274°K T_{tf} (°C) 279°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 16

V_{v1} (liters) 4.860 P_{f1} (mm Hg) 1220.4 T_{f1} (°C) 279°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 11

V_{v2} (liters) 4.850 P_{f2} (mm Hg) 1351.4 T_{f2} (°C) 279°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ 262 267.3 ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 170.8 ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 6.7 67.1 ppm C₁

METHOD 25
CALCULATIONS

1. Sample Volume, V_s (m^3 (liters))

G8 25-2-SI-B

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 (.007)$$

$$V_s = .00268 \text{ m}^3 = 2.68 \text{ l}$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left\{ \frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right\} \bar{C}_{tm}$$

$$C_t = \left\{ 3.05 \right\} \left(\frac{262}{267} \right)$$

$$C_t = \frac{799}{814} \text{ ppm}$$

3. Condensable Organics, C_c (ppm C_1)

a. H_2O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 [7.40] (171)$$

$$C_{c1} = 489. \text{ ppm}$$

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2} P_{f2}}{V_{s1} f2} \right] \bar{C}_{m2}$$

$$C_{c2} = 0.386 \left[8.18 \right] \left(\frac{67.1}{67.1} \right)$$

$$C_{c2} = 212 \text{ ppm}$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C = \cancel{1309} \text{ ppm}$$

$$\cancel{1324} 1515$$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = \cancel{4.07} \times 10^{-5}$$

$$\cancel{4.13} 4.71 \times 10^{-5} \text{ lb C}_1 / \text{scf}$$

GP 25-2-SI-8

EPA METHOD 25
(MODIFIED)

GP

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-3-51-A

Date Analyzed: 6-30-87

Laboratory Sample Run No. _____

Analyst: PA Lennon

SAMPLING TRAIN DATA

H₂O Ice Trap No. 26 CO₂ Ice Trap No. 225 Sample Tank No. 14

Sample Tank Data

V (liters) 4.85

P_{ti} (mm Hg) 10.1

P_t (mm Hg) 370.1

P_{tf} (mm Hg) 1548.4

T_{ti} (°C) 288°K

T_t (°C) 295°K

T_{tf} (°C) 302°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 6

V_{v1} (liters) 4.85

P_{f1} (mm Hg) 1214.4

T_{f1} (°C) 302°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 74

V_{v2} (liters) 4.82

P_{f2} (mm Hg) 1296.4

T_{f2} (°C) 302°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ 262. ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 165 ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 134. ppm C₁

METHOD 25
CALCULATIONS

GP

25-3-SI-A

1. Sample Volume, V_s (^{m³}~~liters~~)

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 (0.0059)$$

$$V_s = .00228 \text{ m}^3 = 2.28 \text{ l}$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left\{ \frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right\} \bar{C}_{tm}$$

$$C_t = \left\{ 4.2 \right\} (262)$$

$$C_t = 1102. \text{ ppm}$$

3. Condensible Organics, C_c (ppm C_1)

a. H₂O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 \left[8.55 \right] (165)$$

$$C_{c1} = 545. \text{ ppm}$$

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2} P_{f2}}{V_{sT} T_{f2}} \right] \bar{C}_{m2}$$

GP.

25-3-SI-4

$$C_{c2} = 0.386 \left[9.07 \right] (134)$$

$$C_{c2} = 469$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C = 2116. \text{ ppm}$$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = 6.58 \times 10^{-5}$$

EPA METHOD 25
(MODIFIED)

GP

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-3-SI-B

Date Analyzed: 6-30-81

Laboratory Sample Run No. _____

Analyst: PA Lcunn

SAMPLING TRAIN DATA

H₂O Ice Trap No. 15 CO₂ Ice Trap No. 205 Sample Tank No. 19

Sample Tank Data

V (liters) 4.86

P_{ti} (mm Hg) 10.1

P_t (mm Hg) 497.1

P_{tf} (mm Hg) 1408.4

T_{ti} (°C) 288°K

T_t (°C) 275°K

T_{tf} (°C) 302°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 12

V_{v1} (liters) 9.845

P_{f1} (mm Hg) 1430.4

T_{f1} (°C) 302°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 17

V_{v2} (liters) 4.855

P_{f2} (mm Hg) 1168.4

T_{f2} (°C) 302°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ 278 ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 329. ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 185. ppm C₁

METHOD 25
CALCULATIONS

1. Sample Volume, V_s ($\overset{m^3}{\text{liters}}$)

GP-
25-3-SI-B

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 (,008)$$

$$V_s = .00310 m^3 = 3.10 \text{ l}$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left\{ \frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right\} \bar{C}_{tm}$$

$$C_t = \left\{ 2.83 \right\} (278)$$

$$C_t = 786.$$

3. Condensible Organics, C_c (ppm C_1)

a. H_2O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 [7.40] (329)$$

$$C_{c1} = 940, \text{ ppm}$$

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2} P_{f2}}{V_{sT} T_{f2}} \right] \bar{C}_{m2}$$

GP

25-3-SI-B

$$C_{c2} = 0.386 \left[6.06 \right] (185)$$

$$C_{c2} = 433. \text{ ppm}$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C = 2159$$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = 6.71 \times 10^{-5} \text{ lb C}_1 / \text{scf}$$

EPA METHOD 25
(MODIFIED)

GP

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-1-50-A

Date Analyzed: 6-28-81

Laboratory Sample Run No. _____

Analyst: D. Allen

SAMPLING TRAIN DATA

H₂O Ice Trap No. 229 CO₂ Ice Trap No. 233 Sample Tank No. 68

Sample Tank Data

V (liters) 4.822

P_{ti} (mm Hg) 15.6

P_t (mm Hg) 503.6

P_{tf} (mm Hg) ~~542~~ 1328.4

T_{ti} (°C) 284°K

T_t (°C) 295°K

T_{tf} (°C) 299°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 55

V_{v1} (liters) 4.855

P_{f1} (mm Hg) 1256.4

T_{f1} (°C) 299°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 56

V_{v2} (liters) 4.6

P_{f2} (mm Hg) 1311.4

T_{f2} (°C) 299°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ 203 ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 319 ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 104 ppm C₁

METHOD 25
CALCULATIONS

GP
25-1-50-A

1. Sample Volume, V_s (m^3 (liters))

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 \left(\frac{0.008}{\cancel{4008}} \right)$$

$$V_s = .00308 \text{ m}^3 = 3.08 \text{ L}$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left\{ \frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right\} \bar{C}_{tm}$$

$$C_t = \left\{ 2.69 \right\} (203)$$

$$C_t = 546. \text{ ppm}$$

3. Condensable Organics, C_c (ppm C_1)

a. H_2O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 \left[6.62 \right] (319)$$

$$C_{c1} = 815 \text{ ppm}$$

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2} P_{f2}}{V_{sT} f2} \right] \bar{C}_{m2}$$

GP

25-1-50-A

$$C_{c2} = 0.386 \left[6.92 \right] (154)$$

$$C_{c2} = 278 \text{ ppm}$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C = 1639. \text{ ppm}$$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = 5.10 \times 10^{-5}$$

EPA METHOD 25
(MODIFIED)

GP

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-1-50-B Date Analyzed: 6-28
Laboratory Sample Run No. _____ Analyst: D. Allman

SAMPLING TRAIN DATA

H₂O Ice Trap No. 221 CO₂ Ice Trap No. 235 Sample Tank No. 9

Sample Tank Data

V (liters) 4.855
P_{ti} (mm Hg) 11.6 P_t (mm Hg) 543.6 P_{tf} (mm Hg) 1322.4
T_{ti} (°C) 284°K T_t (°C) 295°K T_{tf} (°C) 299°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 70
V_{v1} (liters) 4.882 P_{f1} (mm Hg) 1174.7 T_{f1} (°C) 299°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 50
V_{v2} (liters) 4.890 P_{f2} (mm Hg) 1290.4 T_{f2} (°C) 299°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ 158 ppm C₁
Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 346 ppm C₁
Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 307 ppm C₁

METHOD 25
CALCULATIONS

1. Sample Volume, V_s (m^3 (liters))

of
25-1-50-B

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 \left(\frac{0.0087}{1.00} \right)$$

$$V_s = .00338 \text{ m}^3 = 3.38 \text{ L}$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left\{ \frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right\} \bar{C}_{tm}$$

$$C_t = \left\{ 2.45 \right\} (158)$$

$$C_t = 388. \text{ ppm}$$

3. Condensible Organics, C_c (ppm C_1)

a. H_2O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 \left[5.67 \right] (346)$$

$$C_{c1} = 758. \text{ ppm}$$

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2} P_{f2}}{V_{sT} f2} \right] \bar{C}_{m2}$$

GP 25-1-50-B

$$C_{c2} = 0.386 \left[6.24 \right] (307)$$

$$C_{c2} = 740 \text{ ppm}$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C = 1886 \text{ ppm}$$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = 5.86 \times 10^{-5}$$

EPA METHOD 25
(MODIFIED)

GP

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-2-50-A

Date Analyzed: 6-29-81

Laboratory Sample Run No. _____

Analyst: PA Lennum

SAMPLING TRAIN DATA

H₂O Ice Trap No. 226

CO₂ Ice Trap No. 222

Sample Tank No. 23

Sample Tank Data

V (liters) 4.85

P_{ti} (mm Hg) 13.6

P_t (mm Hg) 430.6

P_{tf} (mm Hg) 1414.4

T_{ti} (°C) 290°K

T_t (°C) 294°K

T_{tf} (°C) 299°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 65

V_{v1} (liters) 4.82

P_{f1} (mm Hg) 1393.4

T_{f1} (°C) 299°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 18

V_{v2} (liters) 4.855

P_{f2} (mm Hg) 1313.4

T_{f2} (°C) 299°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ 206. ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 142. ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 107 ppm C₁

METHOD 25
CALCULATIONS

1. Sample Volume, V_s (m^3 liters)

OP

25-2-50-A

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 (.0069)$$

$$V_s = .00265 \text{ m}^3 = 2.65 \text{ l}$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left\{ \frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right\} \bar{C}_{tm}$$

$$C_t = \left\{ 3.34 \right\} (206)$$

$$C_t = 687. \text{ ppm}$$

3. Condensible Organics, C_c (ppm C_1)

a. H_2O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 [8.476] (142)$$

$$C_{c1} = 465. \text{ ppm}$$

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2} P_{f2}}{V_{sT} T_{f2}} \right] \bar{C}_{m2}$$

GP
25-2-SO-A

$$C_{c2} = 0.386 \left[8.05 \right] (107)$$

$$C_{c2} = 332. \text{ ppm}$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C = 1484. \text{ ppm}$$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = 4.62 \times 10^{-5}$$

CP

EPA METHOD 25
(MODIFIED)

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-2-50-B

Date Analyzed: 6-30-87

Laboratory Sample Run No. _____

Analyst: PA Lennon

SAMPLING TRAIN DATA

H₂O Ice Trap No. 230 CO₂ Ice Trap No. 109 Sample Tank No. 60

Sample Tank Data

V (liters) 4.87

P_{ti} (mm Hg) 10.6

P_t (mm Hg) 414.6

P_{tf} (mm Hg) 1412.4

T_{ti} (°C) 290°K

T_t (°C) 294°K

T_{tf} (°C) 302°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 59

V_{v1} (liters) 4.858

P_{f1} (mm Hg) 1310.4

T_{f1} (°C) 302°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 3

V_{v2} (liters) 4.83

P_{f2} (mm Hg) 1248.4

T_{f2} (°C) 302°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ 238. ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 251 ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 100 ppm C₁

METHOD 25
CALCULATIONS

1. Sample Volume, V_s ($\frac{m^3}{liters}$)

GP
25-2-50-B

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 (.0067)$$

$$V_s = .00258 m^3 = 2.58 l$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left[\frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right] \bar{C}_{tm}$$

$$C_t = \left\{ 3.40 \right\} (238)$$

$$C_t = 810. ppm$$

3. Condensible Organics, C_c (ppm C_1)

a. H_2O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 \left[8.17 \right] (251)$$

$$C_{c1} = 792. ppm$$

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2} P_{f2}}{V_{sT} f2} \right] \bar{C}_{m2}$$

GP
25-2-50-B

$$C_{c2} = 0.386 \left[7.86 \right] (100)$$

$$C_{c2} = 303 \text{ ppm}$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C =$$

~~19~~
1905

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = \frac{5 \times 10^{-5}}{5.93 \times 10^{-5}}$$

EPA METHOD 25
(MODIFIED)

69

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-3-50-C

Date Analyzed: 7-1-81

Laboratory Sample Run No. _____

Analyst: PA Lennon

SAMPLING TRAIN DATA

H₂O Ice Trap No. 6 CO₂ Ice Trap No. 113 Sample Tank No. 54

Sample Tank Data

V (liters) 4.82

P_{ti} (mm Hg) 16.1 P_t (mm Hg) 483.1 P_{tf} (mm Hg) 1543.4

T_{ti} (°C) 288°K T_t (°C) 295°K T_{tf} (°C) 302°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. "L"

V_{v1} (liters) 16.29 P_{f1} (mm Hg) 1108.4 T_{f1} (°C) 302°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 62

V_{v2} (liters) 4.852 P_{f2} (mm Hg) 1208.4 T_{f2} (°C) 302°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ 137 ~~129~~ ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 106 ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 75.77.2 ppm C₁

METHOD 25
CALCULATIONS

CP

25-3-50-C

1. Sample Volume, V_s (m^3 ~~liters~~)

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 (1076)$$

$$V_s = .00294 m^3 = 2.94 l$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left\{ \frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right\} \bar{C}_{tm}$$

$$C_t = \left\{ 3.23 \right\} \left(\frac{137}{129} \right)$$

$$C_t = 443 \text{ ppm}$$

3. Condensible Organics, C_c (ppm C_1)

a. H_2O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 \left[20.3 \right] (106)$$

$$C_{c1} = 831 \text{ ppm}$$

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2} P_{f2}}{V_{sT} f2} \right] \bar{C}_{m2}$$

CP

25-3-50-C

$$C_{c2} = 0.386 \left[6.6 \right] (77)$$

$$C_{c2} = 196 \text{ ppm}$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C = 1470 \text{ } ~~686~~ \text{ ppm}$$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = ~~2.13 \times 10^{-5}~~ \\ 4.57 \times 10^{-5}$$

EPA METHOD 25
(MODIFIED)

GP

LABORATORY DATA AND CALCULATIONS

Field Sample Run No. 25-3-50-D

Date Analyzed: 6-30-81

Laboratory Sample Run No. _____

Analyst: PH Leung

SAMPLING TRAIN DATA

H₂O Ice Trap No. 223 CO₂ Ice Trap No. 202 Sample Tank No. 53

Sample Tank Data

V (liters) 4.82

P_{ti} (mm Hg) 25.1

P_t (mm Hg) 520.1

P_{tf} (mm Hg) 1179.4

T_{ti} (°C) 288°K

T_t (°C) 295°K

T_{tf} (°C) 302°K

Intermediate Tank Data - H₂O Ice Trap

Tank No. 20

V_{v1} (liters) 4.83

P_{f1} (mm Hg) 1368.4

T_{f1} (°C) 302°K

Intermediate Tank Data - CO₂ Ice Trap

Tank No. 64

V_{v2} (liters) 4.85

P_{f2} (mm Hg) 1238.4

T_{f2} (°C) 302°K

ANALYSIS DATA

Average Sample Tank Concentration, $\bar{C}_{tm}$ (182) 169. ppm C₁

Average H₂O Ice Trap Concentration, $\bar{C}_{cm1}$ 164. ppm C₁

Average CO₂ Ice Trap Concentration, $\bar{C}_{cm2}$ 79. ppm C₁

METHOD 25
CALCULATIONS

GP

25-3-50-D

1. Sample Volume, V_s (m^3 liters)

$$V_s = 0.386 V \left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]$$

$$V_s = 0.386 (.008)$$

$$V_s = .00314 m^3 = 3.14 l$$

2. Non-condensable Organics, C_t (ppm C_1)

$$C_t = \left\{ \frac{\frac{P_{tf}}{T_{tf}}}{\left[\frac{P_t}{T_t} - \frac{P_{t1}}{T_{t1}} \right]} \right\} \bar{C}_{tm}$$

$$C_t = \left\{ 2.33 \right\} \left(\frac{182}{169} \right)$$

$$C_t = \frac{394. ppm}{424}$$

3. Condensable Organics, C_c (ppm C_1)

a. H_2O Ice Trap

$$C_{c1} = 0.386 \left[\frac{V_{v1} P_{f1}}{V_s T_{f1}} \right] \bar{C}_{m1}$$

$$C_{c1} = 0.386 [6.97] (164)$$

$$C_{c1} = 441 ppm$$

b. CO₂ Ice Trap

$$C_{c2} = 0.386 \left[\frac{V_{v2}^p f2}{V_{sT} f2} \right] \bar{C}_{m2}$$

GP

25-3-50-D

$$C_{c2} = 0.386 \left[6.33 \right] (79)$$

$$C_{c2} = 193. \text{ ppm}$$

4. Total Gaseous Nonmethane Organics, C (ppm C₁)

$$C = C_t + C_{c1} + C_{c2}$$

$$C = 1058 \text{ } ~~1058~~ \text{ ppm}$$

5. Total Gaseous Nonmethane Organic Mass Concentration, M_c (lbCl/scf)

$$M_c = 3.11 \times 10^{-8} C$$

$$M_c = ~~3.197 \times 10^{-5}~~ \\ 3.29 \times 10^{-5}$$

From Page No.

6-16-81

Tank Inventory

The following tanks are in house and available for use as intermediate tanks. Tanks have been evacuated & pressurized w/ H₂.

12
52
15
18
6
74
56
22
66
50
63
65
55

Tank color coding:

yellow-green = tank empty available
Red = tank sample returned from field (12)
White/Black = intermediate tank sample (traps)
Blue = performance blanks, lig. inj tanks

To Page No.

Witnessed & Understood by me,

Date

Invented by

Date

Recorded by

6-51

From Page No. _____

June 16, 1981

Calibration / Operational Checks

Ref Fed Reg Oct 3 1980

S.1.1

Carrier Gas + Auxiliary Oxygen Blank

Tank #65

Initial Press

 $32.3 + 32.3 = 64.6 \text{ mm Hg}$

Final Press

492 mm Hg

S.1.2

Catalyst Efficiency Check

Tank #3

Initial Press

640 mm Hg

Final Pressure

67 mm Hg

Repeat Tank #3

Initial Pressure

591 mm Hg

9960 ppm

Final Pressure

was 290 mm Hg

15900 ppm

To Page No. _____

Witnessed & Understood by me,

Date

6-52

Invented by

Date

From Page No. _____

6-13-1981

5.2.2 Analyzer Linearity Check - NMO Calibration

Standard	Area	RF (Area/ppmC)	Avg RF
54.3 ppmC ₃ H ₈	2897100	18.3370×10^3	18.6104×10^3
	2936900	18.0288×10^3	
	<u>3170900</u>	19.4653×10^3	
	Avg = 3001633		
274 ppmC ₃ H ₈	1.0320×10^7	12.5547×10^3	12.53×10^3
	1.0297×10^7	12.5268×10^3	
	<u>1.0282×10^7</u>	12.5085×10^3	
	Avg = 1.0300×10^7		
2382 ppmC ₃ H ₈	7.7529×10^7	10.849×10^3	10.7332×10^3
	7.6358×10^7	10.6854×10^3	
	<u>7.6213×10^7</u>	10.6651×10^3	
	Avg = 7.67×10^7		

Area Response Factor = Area/ppmC = $\left[\text{Area/ppmC}_{\text{C}_3\text{H}_8} \right] \div 3$

Linear Reg. (based on Area Units)
 corr coeff = 0.99999
 slope = 31596
 y int = 1.455463×10^6

To Page No. _____

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

om Page No. _____

[Analysis] 6-17-81

5.2.3 Reduction Catalyst Efficiency Check & CO₂ Calibration

Standard	Area	RF (Area/ppmC)	Avg. RF	std. dev. (overall)
51 ppm CO ₂	507850	9.9578×10^3	9.8053×10^3	4.2%
	462950			
	516130	10.7202×10^3		
	476240	9.3380×10^3		
	Avg = 500073			

492 ppm CO ₂	6275600			
	5650900			
	5413100	11.0022×10^3	10.8865×10^3	
	5375100	10.925×10^3		
	5280300	10.7323×10^3		

1% CO ₂	5.0265×10^7			
	9.0778×10^7			
	9.5368×10^7	9.5368×10^3	9.5799×10^3	
	9.5564×10^7	9.5564×10^3		
	9.6466×10^7	9.6466×10^3		
	(9.6548×10^7)	(9.6548×10^3)		

$$\text{mean RF} = \left[\frac{(9.8053 + 10.8865 + 9.5799)}{3} \right] \times 10^3 = 10.0906 \times 10^3$$

Because the avg. RF of the 492 ppm & 1% CO₂ standards did not come w/in $\pm 5\%$ of the overall mean value of 10.0906×10^3 additional runs of the 492 & 1% standards was made. (see pg. 5) A new mean RF value was calculated.

To Page No. _____

Witnessed & Understood by me, _____

Date

6-54

Invented by _____

Date _____

om Page No. _____

6-17-81

5.2.5. Red. Catalyst Efficiency Check + CO₂ Calibration

Standard	Area	RF	Avg RF	Rel. Stand. dev. (between Area)	% diff (cal-g & area)
✓ 1% CO ₂	9.9868 × 10 ⁷	9.9868 × 10 ³	9.9997 × 10 ³	0.5%	-1.6%
	9.9554 × 10 ⁷	9.9554 × 10 ³			
	1.0057 × 10 ⁸	10.057 × 10 ³			
Avg	9.9997 × 10 ⁷				
✓ 492 ppm CO ₂	5399500			±5%	
	5251200 ✓	10.6732 × 10 ³	10.6722 × 10 ³	0.3%	5.0%
	5267500 ✓	10.7063 × 10 ³			
	5233500 ✓	10.6372 × 10 ³			
Avg	5250733				

$$\text{mean RF} = \frac{(9.8053 \times 10^3) + (9.9997 \times 10^3) + (10.6722 \times 10^3)}{3}$$

$$= 10.1591 \times 10^3$$

The Avg RF Value for the 51 ppm CO₂ standard run on 6-16-81 was within ±5% of the mean RF value calculated using the 1% CO₂, 492 ppm CO₂ run 6-17-81 so no repeats of this standard were necessary.

Linear Reg. (based on Area)

corr coeff = 0.99999

slope = 9984.42

y int = 160695

Relative standard deviation = $\frac{\text{standard dev} \times 100}{\text{average}}$ Limit ±5%

% Diff = $\frac{(\text{Avg RF for stnd}) - (\text{mean RF})}{(\text{mean RF})} \times 100$ ±5%

To Page No. _____

Witnessed & Understood by me, _____

Date _____

Invented by _____

Date _____

Recorded by _____

6-55

2.2 Analyzer Linearity Check & NMD Calibration

Standard	Area	RF (area/ppm)	Avg RF	Rel. S. dev.	% difference (stand RF: mean RF)
111 ppm C ₁₀ H ₈	2476100	10100	9906	3.0%	
	2154700	9564			
	2264700	10052			
Avg	2251855	24.71%			
274 ppm C ₁₀ H ₈	5016900		6932	2.7%	
	5590100 ✓	6776			
	5871800 ✓	7143			
	6755500	6876			
	2652000 ✓				
Avg	5097967	20795 C ₃			
		6931 C ₁			
2382 ppm	4.9413 x 10 ⁷	20744 C ₃	7145	3.0%	
	5.1342 x 10 ⁷	6914 C ₁			
	5.2423 x 10 ⁷				
Avg					
54.3 ppm C ₁₀ H ₈	2480500		13667	3.3%	
	2148100 ✓				
	2295800 ✓				
	1987900				
	1760200				
	2235400 ✓				
Avg	2226433				

From Page No. _____

6-20-81

5.2.2 Analyzer Linearity Check + NMO Calibration (cont.)

Standard	Area
9.7 # ppm C ₂ H ₂	2622700

To Page No. _____

Witnessed & Understood by me,

Date

Invented by

Date

Recorded by

G-57

Project No. _____

Book No. _____

TITLE _____

Page No. _____

5.1.3 System Performance Check

Tank No.	Solvent Injection	Final Pressure	Tank Volume
63	10 μ l Hexane	334 mm Hg	4.875
74	100 μ l Hexane	325 mm Hg	4.820 l
6	10 μ l Toluene	426 mm Hg	4.850 l
66	100 μ l Toluene	254 mm Hg	4.840 l

.004820

To Page No. _____

Witnessed & Understood by me,

Date

G 58

Invented by

Date

om Page No. _____

6-21-81

5.2.3 Reduction Catalyst Efficiency Check + CO₂ Calibration

Standard	Area	RF	Avg RF	Rel std dev	% diff.
51 ppm CO ₂	323530 ✓	6344	6227	1.8%	+0.4%
	317110 ✓	6218			
	358930				
	260540				
	312100 ✓	6120			
Avg	317580				
500 ppm CO ₂	781680		6223	2.9%	+0.3%
	2717500				
	3021100 ✓	6042			
	3199200 ✓	6398			
	3114200 ✓	6228			
Avg	3111500				
1% CO ₂	3.3928×10^7		6164 ~~6158~~	4.3%	-0.7%
	5.8692×10^7 ✓	5869			
	6.2334×10^7 ✓	6233			
	6.3896×10^7 ✓	6390			

$$\text{mean RF} = (6227 + 6223 + 6164) / 3 = 6205$$

To Page No. _____

Witnessed & Understood by me, _____

Date _____

Invented by _____

Date _____

Recorded by _____

6-59

Analyzer Linearity Check + NMO Calibration

Standard	Area	RF	Avg RF	rd % stdv	% diff
54/3 ppm C ₃ H ₈	3459600				
	4214400	365333	22427		4.6%
	3834700	-1057433			
	3665700	2595900	15936		
iso xim (vib)	2595900				

$$\text{Factor} = (365333 - 2595900) \cdot 1057433$$

274 ppm	1.3905×10^7	1.3398×10^7	16299	1.5%
	1.2391×10^7	-1057433		
	1.2341×10^7		15013	

2382 ppm	1.0415×10^8	1.0664×10^8		
	1.0913×10^8	-1057433		
	1.0558×10^8		14775	3.1%

$$\text{mean RF} = 15241$$

$$\% \text{ diff} = \frac{(\text{RF std}) - (\text{RF mean})}{(\text{RF mean})} \times 100$$

Linear Regression (based on Blank corr Area)

$$\begin{aligned} \text{corr coeff} &= 1.0000 \\ \text{slope} &= 44238 \\ y \text{ int} &= 206121 \end{aligned}$$

5.2.3 Reduction Catalyst Efficiency Check and CO₂ Calibration

Standard	Area	RF	Avg RF	Rel. % SD	% diff
51. ppm	806020 ✓ 782770 ✓ 695580 733350 ✓ $\bar{x} = 774047$	15177		4.8	2.6

492 ppm	5214000 6532500 6832700 ✓ 7115100 ✓ 6924600 ✓ $\bar{x} = 6958133$	14142		2.1	4.3

1.00%	9.8409 x 10 ⁷ 1.5023 x 10 ⁸ ✓ 1.5027 x 10 ⁸ ✓ $\bar{x} = 1.5025 \times 10^8$	15025 15025	14781	0.0	1.6

$$\text{mean RF} = (15177 + 14142 + 15025) \div 3 = 14781$$

The CO₂ RF factor is within 3.0% of the NM10 RF factor.

To Page No.

Witnessed & Understood by me,

Date

Invented by

Date

Recorded by

6-61

Project No. _____

Book No. _____

TITLE _____

m Page No. _____

6-21-81

5.3.2 Daily Performance Check
 NAD10 Calibration - Mixed Std.

Standard	Area	RF
CO = 51.9 ppm		
CH ₄ = 53.0 ppm		
CO ₂ = 1.96%		
C ₃ H ₈ = 1010 ppm	4.9313×10^7	16275

RF of 16275 $\delta = \frac{15241 - 16275}{16275} \times 100\%$ difference from RF_{CO₂} of 15241
 -6.7%

6-22-81

5.3.2 Mixed Std 17.3 ppm propane

Area	
3743200	3650700
5110400	-(1057433 - 375535)
1551600	
541700	

Area	RF
ppm	
3217700	15241
1551600	
(C ₃ H ₈) = 145	

(X(C)) = 48

Diff. Error Adj = 45 ppm

To Page No. _____

Witnessed & Understood by me, _____

Date

6-62

Invented by _____

Date _____

From Page No. _____

6-22-81

5.2.4 NM10 Septem Blank

Standard	Area	RF	Area corrected (-1057433)	ppm C ₂ H ₆
1% CO ₂	1.5758 × 10 ⁸	1273800	216367 ✓	0.23
	1.5745 × 10 ⁸ ✓	1434100	376667 ✓	3.86
	1.5944 × 10 ⁸ ✓	1591100	533667 ✓	7.40
	1.5944 × 10 ⁸	1735100	677667	10.
Aug =	1.5812 × 10 ⁸		$\bar{y} = 375567$	
mean B _a =	$\frac{0.23 + 3.86 + 7.40}{3} = 3.83 \text{ ppm} \checkmark$			

$$\text{mean RF} = 15812$$

$$\text{RF}_{\text{CO}_2} = 14781$$

$$\% \text{ difference} = 9.0\% \checkmark$$

5.1.2 Catalyst Efficiency Check

Tank ③

1% Methane

$$P_{\text{inlet}} = 131.125 \text{ mm}$$

$$P_{\text{inlet}} = 107 \text{ mm}$$

$$P_{\text{inlet}} = 80 \text{ mm}$$

Area	rel s. dev	
8268600	0.4%	By linear reg = 563 ppm CO ₂
8290300		
8325300		avg RF value = 584 ppm
$\bar{x}$ 8261400		$\frac{8261400}{\text{ppm C}} = \text{RF} = (14781)$

To Page No. _____

Witnessed & Understood by me, _____

Date _____

Invented by _____

Date _____

Recorded by _____

G-63

Project No. _____

Book No. _____

TITLE _____

From Page No. _____

6-22-81

5.1.1 Carburizer Gas

Tank 65

$$P_T = 73 + 77 = 150 \text{ mm}$$

5.2.1 Oxidation Efficiency check

SecArea10% CH₄
 n_{eds}
 n_d
 n_d

To Page No _____

Witnessed & Understood by me, _____

Date 6-64 Invented by _____

Date _____

From Page No. _____ 6-22-81

513 System Performance Check

Tank #63 100 µl Hexane

$$P_{init} = 120 + 167 = 327 \text{ mm}$$

$$P_{final} = 132 + 126 = 258 \text{ mm}$$

Area

7288500

7354500

7364700

$\Sigma = 7335900$

$$\% \text{ Rec} = \left(\frac{1.6}{x} \times \frac{86.2}{\mu\text{l}} \times \frac{V_0}{.66} \times \frac{PF}{T_0} \times \frac{C}{N} \right) \times 100$$

$$x = 10$$

$$B\phi = \frac{1000}{37} = 27.0$$

$$76.2 \text{ mm}$$

$$(N=6) \quad T_0 = 299$$

$$P_0 = 762 + P_0$$

Tank #74 100 µl Hexane

$$P_{init} = 161 + 154 = 315 \text{ mm}$$

$$P_{final} = 118 + 112 = 230 \text{ mm}$$

Area

1.7807×10^8

1.7589×10^8

1.8126×10^8

$\Sigma = 1.7841 \times 10^8$

$$d = 1.2 \times 10^{-4}$$

Tank #6 10 µl Toluene

$$P_{init} = 188 + 196 = 384 \text{ mm}$$

$$P_{final} = 155 + 150 = 305 \text{ mm}$$

Area

rel
s.d. dev

9030800

4.1%

8510500

8358200

$\Sigma = 8633167$

To Page No. _____

Witnessed & Understood by me,

Date

Invented by

Date

Recorded by

6-65

Project No. _____

Book No. _____

TITLE _____

From Page No. _____

Tank 06 100 μ l. TolueneArea706
std. dil.P_{initial} = 121 + 115 = 236 mmP_{final} = 89 + 85 = 174 mm 1.7319×10^8

4.35%

 1.5797×10^8 1.6064×10^8

IX

To Page No. _____

Witnessed & Understood by me, _____

Date

- 8-66

Invented by _____

Date _____

Run Page No. _____

6-23-87

5.3 NMO Analyzer Daily Calibration

5.3.1 NMO Blank + CO₂

Std	Area	RF	RF _{CO₂} (initial test)
1.0% CO ₂	1.4752 × 10 ⁸	1.4427 × 10 ⁴	14781
	1.4012 × 10 ⁸		
	1.4519 × 10 ⁸		
	$\bar{x} = 1.4427 \times 10^8$		w/in 2.4%

To Page No. _____

Reviewed & Understood by me,

Date

Invented by

Date

Recorded by

6-67

From Page No. _____

Repeat Liquid Injection

<u>Tank No</u>	<u>vol solvent</u>	<u>PS</u>	<u>Tank Volume</u>
C ₆	10 μ l Hexane		510 mm Hg
74	100 μ l Hexane		545
C ₁₃	10 μ l Toluene		470
C ₁₆	100 μ l Toluene		500

P_r 761.8 mm HgT = 299°K

Leak discovered in oxidation Catalyst

Repeat

C ₆	10 μ l Hexane	545 mm

Repeat

74	10 μ l Hexane	290 + 282 = 572 mm

3	100 μ l Hexane	247 + 240 =

4	10 μ l Toluene	250 + 245 =

To Page No. _____

From Page No.

6-23-81

Tank 74

10 ml Hexane

$$P_f = 572 + 762 = 1334$$

Area

C

8245600

572

7928100

550

7702400

534

$$\% Rec = 1.6 \times \frac{86.2}{10} \times \frac{V_f}{166} \times \frac{1334}{299} \times \frac{C}{6}$$

% Rec

43

41

40

Tank 3

10 ml Hexane

$$P_f = 487 + 762 = 1259$$

1.4448×10^8

1×10^4

$$\% Rec = 1.6 \times \frac{86.2}{100} \times \frac{0.00483}{166} \times \frac{1259}{299} \times \frac{C}{6}$$

% Rec

71

1.5992×10^8

1.7×10^4

100 166 299 6

78

1.3667×10^8

9.5×10^3

67

Tank 6

10 ml Toluene

$$P_f = 495 + 762 = 1257$$

9135900

633

$$\% Rec = 1.6 \times \frac{86.2}{10} \times \frac{0.00485}{166} \times \frac{1257}{299} \times \frac{C}{7}$$

% Rec

31

8808300

611

10 0.87 295 7

30

8584900

595

29

To Page No.

Witnessed & Understood by me,

Date

Invented by

Date

Recorded by

G-69

Project No. _____

Book No. _____

TITLE _____

Page No. _____

Repeat Liquid Injection

Bp = 768.5 mmHg
T = 27°C

Tank No.	Vol. inj	Solvent	Final Press	Tank Vol
74	10 µl	Hexane	301 mm	4820 l

$$\% \text{ Rec} = 16 \times \frac{86.2}{10} \times \frac{.004820}{.66} \times \frac{1067.5}{300} \times \frac{31.4}{6}$$

$$\% \text{ Rec} = 79\%$$

3	100 µl	Hexane	297 mm	4530

$$\text{Area} = \frac{2.0056 \times 10^8}{1.9748 \times 10^8}$$

$$\text{Avg} = 1.9902 \times 10^8$$

$$\% \text{ Rec} = 16 \times \frac{96.2}{100} \times \frac{.004850}{.66} \times \frac{1065.5}{300} \times \frac{12724}{6}$$

$$= 76\%$$

66	10 µl	Toluene	290 mm	4840 l

$$\text{Area} = 3.4147 \times 10^7 = 90.2\% (1058.5)$$

$$90.2\%$$

74	100 µl	Toluene	290 mm	4820 l

To Page No. _____

From Page No. _____

6-24-81Daily Calibration5.3.1 NMO Blank & CO₂

<u>Standard</u>	<u>Area CO₂</u>	<u>Area BF</u>	<u>DRF_{CO₂}</u>	<u>Avg DRF_{CO₂}</u>
1% CO ₂	1.2917 x 10 ⁸			
	1.5845 x 10 ⁸	1222800	15845	
	1.5559 x 10 ⁸	1285500	15559	15641
	1.5520 x 10 ⁸		15520	

$$\text{Initial } R_{F_{CO_2}} = 14781$$

$$\% \text{ diff} = \frac{14781 - 15641}{14781} \times 100 = 5.8\% \checkmark$$

Blank

$$\begin{aligned} \text{Avg Area} &= 1254150 \\ \text{Factor} &= \frac{1057433}{196717} \end{aligned}$$

$$DRF_{NMO} = 14573$$

$$\frac{\text{Area}}{\text{ppm C}_2} = 14573$$

$$\frac{196717}{14573} = 13.5 \text{ ppm C}_1$$

$$\frac{13.5}{3} = 4.5 \text{ ppm C}_2 \checkmark$$

To Page No. _____

Witnessed & Understood by me, _____

Date _____

Invented by _____

Date _____

Recorded by _____

Project No. _____

Book No. _____

TITLE _____

From Page No. _____

6-24-81

5.3.2 NMO Calibration

Standard	Aua	DRF	Avg DRF _{NMO}	RF _{NMO}
Mixed 17.3ppm C ₂ H ₂	722700	13925		
	754500	14538	14573	15241
	791760	15250		

$$\% \text{ diff} = \frac{15241 - 14573}{15241} \times 100 = 4.4\% \checkmark$$

To Page No. _____

Witnessed & Understood by me, _____

Date

6-72

Invented by _____

Date _____

Page No. _____

Repeat Liquid Injection

Tank No	Vol. in	Solvent	Final Pressure	Core Area	Core
74	10 μ l	Hexane	301 mm		
65 4.820l	100 μ l	Hexane	365		
66	10 μ l	Toluene			

% Recovery

$$\text{Hexane} = 1.6 \times \frac{86.2}{10} \times \frac{.004820}{.46} \times \frac{1069.5}{300} \times$$

- Breakthrough of oxidation catalyst

- Leak at fitting (ex + pore) of oxidation catalyst

To Page No. _____

I have Read & Understood by me,

Date

Invented by

Date

Recorded by

6-13

Project No. _____

Book No. _____

TITLE _____

EPA - Plywood

Page No. _____

6-25-87

Liquid Injection Recovery

Bp = 761.5

T = 26 (299)

Tank No.	Tank Vol.	Vol inj	Solvent	Final Pressure	Area

74	4.82 L	10 ml	Hexane	295 mm	

66	4.84	100 ml	Hexane	297	

6	4.85	10 ml	Toluene	302	

65	4.82	100 ml	Toluene	522	

10 ml Hexane

$$\% \text{ Rec} = 16 \times \frac{86.2}{10} \times \frac{.00482}{.66} \times \frac{1057.5}{299} \times$$

100 ml Hexane % Rec =

10 ml ~~Hexane~~
Toluene

$$\% \text{ Rec} = 16 \times \frac{92.1}{10} \times \frac{.00485}{.87} \times \frac{1063.5}{299} \times$$

To Page No. _____

Witnessed & Understood by me,

Date

6-74

Invented by

Date

off Page No. _____

6-26-81

Daily Calibration

5.3.1 NM10 Blank + CO₂

<u>Std</u>	<u>Area</u>
1% CO ₂	148140
	114880

5.23 Reduction Catalyst Efficiency check / CO₂ Calibration

<u>Std</u>	<u>Range</u>	<u>Area</u>	<u>RF</u>	<u>Avg RRF</u>	<u>Pkwd</u>	<u>Thresh</u>	<u>Attn</u>	<u>2 diff</u>
1% CO ₂	1x10 ⁻⁹	119620			.35	-2	1	
		119270						
		119070	11932					
		$\bar{x} = 119320$	11.7					
492 ppm	1x10 ⁻⁹	6288				0		2.02
		6201						1.73
		6247	12693					
		$\bar{x} = 6245$	12.4					
51 ppm	1x10 ⁻¹¹	68682				2		5.2
		75100				2		
		73492				2		
		66176				0		
		72884	13.578			0		
		$\bar{x} = 69247$						

AM

cont p 29

To Page No. _____

Witnessed & Understood by me, _____

Date _____

Invented by _____

Date _____

Recorded by _____

Project No. _____

Book No. _____

TITLE _____

Page No. _____

5.1.3 System Performance Check

Tank #	Description	Area	Thresh	Attu/Range
6	100 μ l Toluene	28839 32047 31474 31683 31042	0	1×10^{-9}

$$\bar{x} = 31400$$

$$\% \text{Recovery} = 1.6 \times \frac{92.15}{10} \times \frac{0.00495}{0.87} \times \frac{1063.5}{299} \times \frac{2432}{7}$$

$$= 102\%$$

66	100 μ l Hexane	153670 154010 152710	0	1×10^{-9}

$$\bar{x} = 154130$$

$$\% \text{Recovery} = 1.6 \times \frac{80.2}{100} \times \frac{0.00484}{0.66} \times \frac{1058.5}{299} \times \frac{11938}{6}$$

$$= 71\%$$

74	10 μ l Hexane	23181 21145 20562 21175	0	1×10^{-9}

$$\bar{x} = 21834$$

$$= 1.6 \times \frac{80.2}{10} \times \frac{0.00482}{0.66} \times \frac{1056.5}{299} \times \frac{1691}{6}$$

$$= 100\%$$

To Page No. _____

Witnessed & Understood by me, _____

Date 6-76

Invented by _____

Date _____

Page No. _____

6-26-81

5.2.3 (cont.)

Std	Range	Area	RF	PWL	Thresh	Attn	(diff %)
1% CO ₂	1x10 ⁻⁹	124290 ✓ 120920 126090 ✓ 139330 119960 123460 ✓ 117260 "	12461	0.35	-3	1	3.5%
		$\bar{x} = 12461.3$					

$$\text{mean } RF_{CO_2} = \frac{(12461 + 12693 + 13578) \div 3}{12911}$$

5.1.3 cont.

Tank	Description	Area	Thresh	Attn/Range
65	100 µl Toluene	237500 ✓ 235970 ✓ 231720 232340 ✓ $\bar{x} = 235270$	0	1x10 ⁻⁹

$$\% \text{ Rec} = 2.16 \times \frac{92.15}{100} \times \frac{0.00482}{0.87} \times \frac{1283.5}{299} \times \frac{18222}{7} = 91.3\%$$

To Page No. _____

Used & Understood by me,

Date

Invented by

Date

Recorded by

6-77

Project No. _____

Book No. _____

TITLE _____

Page No. _____

6-26-81

<u>Stud</u>	<u>Range</u>	<u>Area</u>	<u>RF</u>	<u>PWL</u>	<u>Thresh</u>	<u>Attn</u>	<u>%diff</u>
54.3 ppm C ₃ H ₈	x 10 ⁻¹⁰	231850 227190 234350 X 231130 90923 92851 <u>91887</u>	14188	0.35	2	1	5%

274 ppm C ₃ H ₈	10 ⁻¹⁰ 10 ⁻¹¹ 10 ⁻⁹ 10 ⁻¹¹	119340 ✓ 1155100 ✓ 1169600 ✓ 11485 1164300 - X 1103000 1175767 - 91887 1071113 1083880	+3031 13186	0.35	0 2		2%

2382 ppm
C₃H₈

see pg 10

14975

$$\text{mean RF}_{\text{NIMO}} = \left(\frac{14188 + 13186 + 14775}{3} \right) \div 3$$

$$= 14050$$

cont pg 29

To Page No. _____

Witnessed & Understood by me, _____

Date 6-78

Invented by _____

Date _____

From Page No. _____

6-27-81

Stand	Range	Area	RF	Pink Thresh Att	% Diff
2382 ppm C ₃ H ₈	10 ⁻⁹	86829		0.35 0 1	3%
		94767 ✓	13022		
		94187 ✓			
		92959 ✓			
	10 ⁻¹¹	93971			
		9397100			
		- 91887			
		9305213			

$$\text{Mean RF} = (14188 + 13186 + 13022) \div 3$$

$$\text{mean} = 13465$$

$$\text{RF}_{\text{CO}_2} = 12911$$

$$\text{RF}_{\text{N}_2\text{O}} = 13465$$

$$\frac{13465 - 12911}{13465} \times 100 = 4\% \text{ difference } \checkmark$$

To Page No. _____

Witnessed & Understood by me,

Date

Invented by

Date

Recorded by

6-79

Project No. _____

Book No. _____

TITLE _____

Page No. _____

6-27-81

Daily Calibration

Std.	Flow/Thresh/Att	Area CO ₂	Range	Area BF	Range
1% CO ₂	0.35 2 1	119990 ✓	10 ⁹	24974	10 ⁻¹¹ (sp)
		119500 ✓		244960	- (w/cont)
		111890		163450	
		Σ 121830 ✓	(LP) = [149860]		
		$\bar{X}$ = 120440			

$$DFE_{CO_2} = 12044$$

$$RF_{CO_2} = 12911$$

$$\frac{12911 - 12044}{12911} \times 100 = 6.7\% \text{ difference}$$

(BF) Blank - area contamination corrected ppm
 24974 ✓ 6.2

* Distorted peak [244960 - 149860] = 95100

[163450 - 149860] 13590 ✓

3.4

$$\bar{X} = 1928 (10^{-10})$$

$$RF_{NH_3} = 13465$$

$$\bar{X} = 4.8 \text{ ppm}$$

CS
BF
Just

To Page No. _____

nessed & Understood by me,

Date

G-80

Invented by

Date

From Page No. _____

6-27-81

Daily Calibration

Std Range Area

Mixed Std
17.3 ppm C_{18} 10⁻¹¹

420910

89528

78661 ✓

82855 ✓

~~94032~~

77915 ✓

77020 ✓

86410

 $\bar{x}$ 77467.5

77805

~~7943~~DRF = 14926 ϵ
NMORF_{NMO} = 13465

$$\% \text{ diff} = \frac{14926 - 13465}{13465} \times 100$$

$$= 10.8$$

$$\text{limit} = \pm 10\%$$

contamination peaks separated =
from mixed std.

139200

135240

119550

139100

124420

122190

10⁻¹¹

$$\bar{x} = 1299500 \quad (10^{-12})$$

To Page No. _____

Witnessed & Understood by me,

Date

Invented by

Date

Recorded by

G-81

Project No. _____

Book No. _____

TITLE _____

Page No. _____

5-27-81

Sample	P ₁	P ₂	Range	Atm/Thresh/Pwd	Area	(- Corr. Factor)	(- Blank)	ppm C

15-1-SI-A #5	740	377	10 ⁻¹⁰	1/2/0.35 (CO ₂)	306710 287590 ✓ 291120 ✓ 300890 ✓	12495 (10)	4.8 ppm 1928 (10 ⁻¹⁹)	

$$\bar{X} = 293200$$

2471

10⁻¹⁰

(BF) 708800

10⁻¹⁰

30194 ✓

29585 ✓

32683 ✓

$$\bar{X} = 30820.7$$

119.4

114.4

30.6

178257

15897.7

149.26

#52
Trap 215

715.7 434

10⁻¹¹✓ (CO₂) 166530 ✓

163770 ✓

175410 ✓

159630 ✓

$$\bar{X} = 163310$$

136

10⁻¹¹

(BF) 200030 ✓

181520 ✓

233370 ✓

165640 ✓

$$\bar{X} = 182396.7$$

(3)

To Page No. _____

Witnessed & Understood by me, _____

Date 6-82

Invented by _____

Date _____

From Page No. _____

Sample P_F P_F Range Area (CO₂)
 25-1-51-A 313 205 10" 139510
 139190
 148120
 $\bar{x} = 142273$
 118. ppm C₁

Range Area (BF)
 10" 172790
 171550
 184480
 $\bar{x} = 176273$

6-28-81

Sample P_F P_F Area (CO₂) ppm
 25-1-50-A 562 ²⁴⁶/₃₀₀ 7889800
 #68 10" 78788
 10" 772650
 10" 78509
 10" 77168
 10" 76308
 $\bar{x} = 120403.3$ 103.8

Area (BF) corrected ppm - Blank
 10" 427770
 10" No Good
 10" 402160
 10" ?
 10" 428380
 $\bar{x} = 419437$ 2079 20313
 -129950 = 289487 270297

#56 490 223 10" 179170
 10" 131630
 10" 120800
 10" 122610
 10" 118100
 $\bar{x} = 120403.3$ 103.8

10" 152790
 10" 44740
 10" 145550
 10" 143070
 10" 147250

#55 545 208 10" 388290
 10" 37161
 10" 37204
 10" 36604
 $\bar{x} = 369896.7$ 319.0

10" 127890
 10" 90260
 10" 123900
 10" 113360

To Page No. _____

Witnessed & Understood by me, _____

Date _____

Invented by _____

Date _____

Recorded by _____

6-83

Project No. _____

Book No. _____

TITLE EPA Plywood

Page No. _____

6-28-81

Daily Calibration

Mixed Std. CO₂ 10⁻⁹ 220470 ✓
 1.95% 233940 ✓
 228630 ✓
 10⁻¹⁰ 2247100 ✓
 10⁻⁹ 226070 ✓
 235490 ✓
 216470 ✓
 223290 ✓
 $\bar{x} = 226134$

BRFCO₂ = 11597RF_{CO₂} = 12911

% diff = 10%

Limit ±10%

17.3 ppm C₂H₄ 10⁻¹¹ 81494
 83465
 60186
 70473 ✓
 73456 ✓
 87392
 72832 ✓

 $\bar{x} = 72254$ DRF_{NMD} = 13922RF_{NMD} = 13465

% diff = $\frac{13465 - 13922}{13465} \times 100$

= 3.4%

Limit ±10%

To Page No. _____

Witnessed & Understood by me, _____

Date 6-84

Invented by _____

Date _____

From Page No.

Sample

 P_2 P_1

Range

Area (CO_2)

Range Area (BF)

Corrid

ppm

✓ 25-1-SO-B

556

287

 10^{-9}

58965

 10^{-11}

232000

#9

 10^{-9}

58850

 10^{-11}

221680

 10^{-9}

59343

 10^{-11}

226010

 ≤ 2265630 ~~44430~~

162.7

#50

524

248

 10^{-11}

434200

 10^{-11}

119980

 10^{-10}

41499

 10^{-11}

156000

 10^{-10}

38541

 10^{-11}

161820

 10^{-10}

40175

 10^{-11}

170360

 $\bar{x} = 4007147$

345.5

#70

408

152

 10^{-10}

37275

 10^{-11}

DID NOT PRINT

 10^{-11}

354220

 10^{-11}

161350

 10^{-11}

352660

 10^{-11}

201400

 10^{-11}

356250

 10^{-11}

165510

 10^{-11}

357190

 10^{-11}

180110

 $\bar{x} = 35788667$

306.9

X 25-2-SF-A

715

 10^{-11}

2898400

 10^{-11}

457910

#4

 10^{-9}

28956

 10^{-11}

368900

 10^{-9}

NO PEAK

 10^{-9} 10^{-11}

Repeated

6/29/87

P.37

To Page No.

Witnessed & Understood by me,

Date

Invented by

Date

G-85

Recorded by

6-29-81

Daily Calibration

Threshold = 2 Pt Wd = 0.35 Attm = 1

Mixed Std

1.95% CO₂10⁹

243620 ✓

241460 ✓

241300 ✓

234150 ✓

232720 ✓

235970 ✓

240280 ✓

226680 ✓

 $\bar{x} = 237020$ DRF_{CO₂} = 12155RF_{CO₂} = 12911

% diff = 5.8%

17.3ppm C₃H₈10¹¹

58592

70433

58130

374023

93737

83522

 $\bar{x} = 73073$ DRF_{N₂O} = 14080RF_{N₂O} = 13465

% diff = 4.6%

Blank - Tank 6

300 mm

From Page No. _____

6-29-81

* - do not subtract
Contaminant 1

Sample	PI = PF =	Range	Area (CO ₂)	Range	Area (BF)	
25-2-SI-A						
Tank 1	290mm	10 ⁻¹¹	2809600	10 ⁻¹¹	339370*	
	226mm	10 ⁻¹⁰	288410	10 ⁻¹⁰	43846	- 12995
		10 ⁻¹⁰	282760	10 ⁻¹⁰	31855*	
		10 ⁻¹⁰	272050	X	32214	- 11 229
Tank 10	433mm	10 ⁻¹⁰	—	10 ⁻¹¹	140370	
	382mm	10 ⁻¹¹	68283 ✓	10 ⁻¹¹	185700	
		10 ⁻¹¹	61107 ✓	10 ⁻¹¹	155680	
		10 ⁻¹¹	82521	10 ⁻¹¹	145230	
		X	64695			158.4
Tank 22	514mm	10 ⁻¹¹	205090	10 ⁻¹¹	—	
	380mm	10 ⁻¹¹	185900	10 ⁻¹¹	173390	
		10 ⁻¹¹	186710	10 ⁻¹¹	153810	
		X	14255			53.2
25-2-SI-B	525mm	10 ⁻¹⁰	53044	10 ⁻¹¹	361450*	
Tank 21	370mm	10 ⁻¹¹	209960	10 ⁻¹¹	450310	- 29950
		10 ⁻¹¹	186300	10 ⁻¹¹	531810	- 129950
		10 ⁻¹¹	195150	10 ⁻¹¹	551640	- 129950
					376340	262
Tank 16	454	10 ⁻¹¹	206590	10 ⁻¹¹	173600	
	418	10 ⁻¹¹	211850	10 ⁻¹¹	146990	
		10 ⁻¹¹	204380	10 ⁻¹¹	146890	
		X	207607			170.8

To Page No. _____

Witnessed & Understood by me,

Date

Invented by

Date

Recorded by

6-87

Project No. _____

Book No. _____

TITLE _____

18

m Page No. _____

6-29-81

Sample	P ₁ = P ₂	Range	Area Cl ₂	C ₁ (ppm)	Range	Area (B ₁)
-2-SI-B(air)						
Tank #11	585mm	10"	84511		10"	140730
	474mm	10"	78316		10"	145910
		10"	81896		10"	137710
		$\bar{x}$	81570	6.7		
5-2-SO-A						C ₁ (ppm)
Tank 23	648mm	10"	2386200		10"	419730
	532mm	10"	224000		10"	41578
		10"	238420		10"	44524
						41776
						12995
						28780
Tank 18	547mm	10"	177470		10"	145380
	440	10"	184600		10"	133720
		10"	157240		10"	138410
		$\bar{x}$	173103	142		
Tank 65	637mm	10"	138240		10"	101400
	474mm	10"	131940			
		10"	120380		10"	126670
		$\bar{x}$	13019	10.7		
11. Carrier Gas Blank						
Tank 4	300mm	10"	—		10"	121860
	233	10"	52260 (1st total pk)		10"	113220
		10"	—		10"	108140

* the sample was separated by BE at 13 minutes. Only 1 pk found = contaminant

Some DF after 2 CO₂ samples

To Page No. _____

Witnessed & Understood by me,

Date

6-88

Invented by

Date

run Page No.

6-30-81

Daily Calibration

Mixed Std	Range	Area	
1.95% CO ₂	10 ⁻⁹	236070 ✓	DRF _{CO₂} = 12052
		235790 ✓	
		271710	RF _{CO₂} = 12911
		233200 ✓	%diff = 6.6%
		$\bar{x} = 235020$	

17.3 ppm C ₃ H ₈	10 ⁻¹¹	70212 ✓	DRF _{NMO} = 14382
		70078 ✓	
		78601 ✓	RF _{NMO} = 13465
		79673 ✓	%diff = 6.8%
		$\bar{x} = 74641$	

1.0% CO ₂	10 ⁻⁹	10430	BF _{10⁻¹¹} 151290
	↓	120230	128910
	10 ⁻¹¹	1.1587 × 10 ⁷	143530
		$\bar{x} = 112243$	$\bar{x} = 141243$
			141243 × 10 = 1412430
			- 1299500
			1122930

2.6 ppm C₃H₈

Project No. _____

Book No. _____

TITLE _____

ge No. _____

6-30-81

Sample	PI = PF =	Range	Area CO ₂	Range	Area BF	ppm C _i
-SO-B			C _i (ppm)			
nk 60	644mm	10 ⁻¹¹	5538200	10 ⁻¹¹	447420	
	361mm	10 ⁻¹⁰	568720	10 ⁻¹¹	477790	
		10 ⁻¹⁰	554010	10 ⁻¹⁰	—	
		10 ⁻¹⁰	548060	10 ⁻¹¹	492850	
				$\bar{x}$ 10 ⁻¹¹	47269	-12095
					=34274	238
nk 3	500mm	10 ⁻¹¹	136090	10 ⁻¹¹	147640	
	~~361mm~~	10 ⁻¹¹	114600			
	380mm	10 ⁻¹¹	110440	10 ⁻¹¹	180960	x one BF at 12
	10 ⁻¹⁰	$\bar{x}$	12036			500mm
			100			
nk 59	542mm	10 ⁻¹¹	305890	10 ⁻¹¹	129710	
	390mm	10 ⁻¹¹	307490			
		10 ⁻¹¹	295640	10 ⁻¹¹	163790	
		$\bar{x}$	30301			251
3-ST-B						
nk 19	640mm	10 ⁻¹¹	4718800	10 ⁻¹¹	554230	
	346mm	10 ⁻¹⁰	479740	10 ⁻¹¹	511560	
		10 ⁻¹⁰	426520	10 ⁻¹¹	523430	
				10 ⁻¹¹	52974	$\bar{x}$ -12095
					=39979	
nk 12	662mm	10 ⁻¹¹	414220			
	488	10 ⁻¹⁰	40209			
		10 ⁻¹⁰	38837			
		10 ⁻¹¹	383260	10 ⁻¹¹	216980	-1 BF for 4 mg
		10 ⁻¹⁰	39698			$\bar{x}$

To Page No. _____

Used & Understood by me,

Date

G 90

Invented by

Date

From Page No. _____

6-30-81

Sample	PI = PFs	Range	Area CM^2	Range	Area BF
25-3-SI-B (cont)					
Tank 17	400mm	10"-	230750		
	310mm	10"-	221590		
		10"-	217340	10"-	325810
			22322		
25-3-SI-A					
Tank 14	780mm	10"-	396620	10"-	518730
	409mm		368420		501830
		10"-	36264		500020
					50686" - 12995
					= 376910
Tank 74	528mm	10"-	229280		
	398mm	10"-	194270 ✓		
		10"-	187630 ✓	10"-	(223830)
		10"-	186580 ✓	10"-	143410
			18949		
Tank 6	446	10"-	164350		
	345mm	10"-	162950		
		10"-	157550	10"-	171610
			16162		
Tank 53	411	10"-	26076	10"-	339250
	325mm	10"-	265080	10"-	382080 ✓
		10"-	258010	10"-	399580 ✓
					39103
					- 12995
					26108

To Page No. _____

Witnessed & Understood by me, _____

Date _____

Invented by _____

Date _____

Recorded by _____

6-91

Project No. _____

Book No. _____

TITLE _____

Page No. _____

6-30-81

Sample	P.I. P.F.	Range	Area CO ₂	Range	Area BF
ink 20	600mm	10"	239200		
	402mm	10"	190630		
		10"	195410	10"	160900
		10"	206200		
			<u>19741</u> $\bar{x}$		
ink 64	470mm	10"	98662		
	366mm	↓	90764		
			95683	10"	178490
			$\bar{x} = 950363$		
ink 1	600mm	10"	222220	10"	104750
	0 mm	10"	226250	10"	107690
		10"	212970	10"	98125 < 129950
ink 66	360	10"	108150	10"	(x3) 147490
			106510		
			110470		
			$\bar{x} = 1083767$		
ink 63	330	10"	253900		
			258450		
			256270		
			$\bar{x} = 2562167$		(x3) 185760

To Page No. _____

nessed & Understood by me,

Date

6-97

Invented by

Date

From Page No.

7-1-81

Sample	Pf	Range	Area CO ₂	ppm C ₁	Range	Area MMO	-Corr	ppm C ₁
✓ 25-3-50-C		10 ⁻⁹	59204		10 ⁻¹¹			
Tank 54	340mm	10 ⁻⁹	58515			300050	170100	126 × 10 ⁻¹²
		10 ⁻⁹	55585		10 ⁻¹¹	317480	187530	138 × 10 ⁻¹²
		10 ⁻¹¹	5574000		10 ⁻¹¹	330750	200800	148 × 10 ⁻¹²
						$\bar{x} =$	1561435	137 × 10 ⁻¹²
Tank 62	340mm	10 ⁻¹¹	149620	12400				
		10 ⁻¹¹	129070	111 × 10 ⁻¹²				
		10 ⁻¹¹	127100	109 × 10 ⁻¹²				
		10 ⁻¹¹	115020	98.6 × 10 ⁻¹²				
		$\bar{x} =$	1237300	106 × 10 ⁻¹²	10 ⁻¹¹ (x4)	317020		
Tank 5 (Largest tank)		10 ⁻¹¹	98747	77 × 10 ⁻¹²				
		10 ⁻¹¹	89790	79.2 × 10 ⁻¹²				
		10 ⁻¹¹	92386	75.3 × 10 ⁻¹²				
		10 ⁻¹¹	87772	↓	10 ⁻¹¹ (x4)	143150		
		$\bar{x} =$	899827	77.2 × 10 ⁻¹²				

To Page No.

Witnessed & Understood by me,

Date

Invented by

Date

Recorded by

6-93

APPENDIX G.2.3
NCASI LABORATORY DATA AND NOTEBOOK

DATA SHEET VESSEL ANALYSIS

mill G.P. (S.E.)

Source U.D.

Calibration 3.02512×10^{-4}

Vessel	Count
<u>5</u>	<u>7508526</u>
	<u>7553784</u>
	<u>7496356</u>
Avg.	<u>7519555</u>
Ppm.	<u>2274.7</u>
$\pm \%$	<u>1.0%</u>

Vessel #	Count
<u>Blank</u>	<u> </u>
	<u> </u>
	<u> </u>
	<u> </u>
	<u> </u>

Sample # 810610-1

Sample # 810610-2

<u>6</u>	<u>4734147</u>
	<u>4675002</u>
	<u>4663409</u>
Avg.	<u>4690653</u>
ppm.	<u>1419.0</u>
$\pm \%$	<u>2.0%</u>

Sample # 810610-3

<u>4</u>	<u>4116979</u>
	<u>4100970</u>
	<u>4037335</u>
Avg.	<u>4085095</u>
ppm.	<u>1235.8</u>
$\pm \%$	<u>2.6%</u>

Sample # 810610-4

<u>1</u>	<u>6651102</u>
	<u>6628721</u>
	<u>6732346</u>
Avg.	<u>6670723</u>
ppm.	<u>2018.0</u>
$\pm \%$	<u>2.0%</u>

DATA SHEET VESSEL ANALYSIS

Analysis Date 6-16-81

mill C.P. SPRING FET

Source U.D.

Calibration 3.02512 x 10⁻⁴

Vessel Count

Vessel # Count

7 5357902

Sample # B10609-1

5299204

Blank

5413884

Avg.

5356998

ppm.

1620.6

± %

2.7%

8

4574008

Sample # B10609-2

4498057

4508675

Avg.

4526913

ppm.

1369.4

± %

2.3%

9

6798832

Sample # B10609-3

6892600

7875430

Avg.

6855622

ppm.

2073.9

± %

1.8%

10

7672542

Sample # B10609-4

7627972

7686960

Avg.

7662491

ppm.

2318.0

± %

1.0%

DATA SHEET VESSEL ANALYSIS

mill G.P. (S.F.)

Source D.D.

Calibration 2.952595x10⁻⁴

Vessel	Count
<u>2</u>	<u>6863113</u>
	<u>6864766</u>
	<u>6883207</u>
Avg.	<u>6870362</u>
PPm.	<u>2028.5</u>
± %	<u>0.40%</u>

Vessel	Count
<u>#</u>	<u>1240494</u>
<u>EX.</u>	<u>1283442</u>
<u>Blank</u>	<u>1177914</u>
SAMPLE LINE/25 TRAILING	<u>1200617</u>
	<u>354.5</u>
	<u>7.2%</u>

<u>10</u>	<u>6353772</u>
Sample # <u>810611-2</u>	<u>6364315</u>
	<u>6381111</u>
Avg.	<u>6366409</u>
ppm.	<u>1879.7</u>
± %	<u>0.54%</u>

<u>9</u>	<u>4843183</u>
Sample # <u>810611-3</u>	<u>4881603</u>
	<u>4846535</u>
Avg.	<u>4857102</u>
ppm.	<u>1434.1</u>
± %	<u>1.09%</u>

<u>8</u>	<u>4751907</u>
Sample # <u>810611-4</u>	<u>4730561</u>
	<u>4724766</u>
Avg.	<u>4735745</u>
ppm.	<u>1398.3</u>
± %	<u>0.75%</u>

TANK ANALYSIS

mill G.P. SPRINGFIELD

Calibration _____

source V.D.
810809-

Tank	CO		CH ₄		CO ₂		VOC	
	RT	Count	RT	Count	RT	Count	RT	Count
k <u>F</u>		<u>6.1</u>		<u>1.0</u>		<u>315.4</u>		<u>28.2</u>
pl # <u>9-1</u>		<u>5.9</u>		<u>0.4</u>		<u>308.3</u>		<u>20.7</u>
<u>6-24</u>		<u>6.2</u>		<u>1.1</u>		<u>318.4</u>		<u>28.1</u>
Aug.								
ppm		<u>6.1</u>		<u>0.8</u>		<u>314.0</u>		<u>25.7</u>
± %		<u>6.3%</u>		<u>112.9%</u>		<u>4.1%</u>		<u>41.6%</u>
nk <u>X</u>		<u>6.0</u>		<u>1.3</u>		<u>241.4</u>		<u>33.8</u>
uplet # <u>9-2</u>		<u>5.4</u>		<u>0.5</u>		<u>234.4</u>		<u>34.0</u>
<u>6-24</u>		<u>5.1</u>		<u>0.4</u>		<u>233.9</u>		<u>36.0</u>
Aug.								
ppm		<u>5.5</u>		<u>0.7</u>		<u>236.6</u>		<u>34.6</u>
± %		<u>20.7%</u>		<u>167.1%</u>		<u>4.4%</u>		<u>8.7%</u>
nk <u>G</u>		<u>6.0</u>		<u>1.2</u>		<u>276.4</u>		<u>37.7</u>
uplet # <u>9-3</u>		<u>5.9</u>		<u>1.1</u>		<u>296.4</u>		<u>21.4</u>
<u>6-24</u>		<u>5.7</u>		<u>0.5</u>		<u>290.9</u>		<u>25.0</u>
Aug.								
ppm		<u>5.9</u>		<u>0.9</u>		<u>287.9</u>		<u>28.0</u>
± %		<u>6.5%</u>		<u>100.8%</u>		<u>8.9%</u>		<u>75.9%</u>
nk <u>J</u>		<u>6.0</u>		<u>3.6</u>		<u>269.4</u>		<u>25.6</u>
uplet # <u>9-4</u>		<u>6.8</u>		<u>4.1</u>		<u>269.1</u>		<u>30.8</u>
<u>6-25</u>		<u>5.7</u>		<u>1.3</u>		<u>292.2</u>		<u>20.3</u>
Aug.								
ppm		<u>6.2</u>		<u>3.0</u>		<u>276.9</u>		<u>25.6</u>
± %		<u>22.9%</u>		<u>123.7%</u>		<u>11.9%</u>		<u>51.0%</u>

TANK ANALYSIS

mill WEYER (S.F.)calibration 8source B.L.O.
810224

Tank	CO		CH ₄		CO ₂		VOC	
	RT	Count	RT	Count	RT	Count	RT	Count
H		5.6		2.1		219.6		27.3
10-1		5.2		0.9		221.7		25.6
6-25		5.5		1.6		239.3		28.2
Aug.								
ppm		5.4		1.5		226.9		27.0
±%		9.5%		97.7%		11.8%		12.1%
C		4.6		1.1		219.7		51.9
10-2		5.2		3.2		224.6		49.6
6-25		5.5		0.9		230.3		63.1
Aug.								
ppm		5.4		1.7		225.5		58.9
±%		36.7%		182.6%		5.9%		25.7%
R		3.9		0.0		300.2		25.3
10-3		3.8		1.5		308.8		22.9
6-25		2.6		0.6		308.2		21.0
Aug.								
ppm		3.4		0.7		305.7		23.1
±%		52.3%		267.9%		3.9%		23.2%
K		6.5		2.4		6609.0		60
10-4		5.8		1.3		6513.0		61.9
6-26		5.4		0.1		6561		74.4
Aug.								
ppm		5.9		1.3		6561.0		65.4
±%		23.4%		2256%		1.8%		29.7

TANK ANALYSIS

mill G.P. SPRINGsource U.D.
810614

Calibration _____

Tank	CO		CH ₄		CO ₂		VOC	
	RT	Count	RT	Count	RT	Count	RT	Count
nk <u>L</u>		<u>5.0</u>		<u>1.0</u>		<u>234.5</u>		<u>79.1</u>
uplet # <u>10-1</u>		<u>5.6</u>		<u>1.2</u>		<u>244.9</u>		<u>81.3</u>
<u>6-26</u>		<u>5.6</u>		<u>1.2</u>		<u>250.8</u>		<u>66.3</u>
Aug.								
ppm		<u>5.4</u>		<u>1.1</u>		<u>256.7</u>		<u>75.6</u>
±%		<u>15.9%</u>		<u>25.3%</u>		<u>15.2%</u>		<u>26.6%</u>
nk <u>I</u>		<u>6.6</u>		<u>1.6</u>		<u>205.6</u>		<u>132.6</u>
uplet # <u>10-2</u>		<u>5.5</u>		<u>1.0</u>		<u>202.2</u>		<u>119.4</u>
<u>6-26</u>		<u>5.2</u>		<u>0.6</u>		<u>2011.7</u>		<u>101.8</u>
Aug.								
ppm		<u>5.8</u>		<u>1.1</u>		<u>2043.8</u>		<u>117.9</u>
±%		<u>31.8%</u>		<u>117.2%</u>		<u>3.4%</u>		<u>32.6%</u>
nk <u>B</u>		<u>3.2</u>		<u>1.5</u>		<u>250.9</u>		<u>37.1</u>
uplet # <u>10-3</u>		<u>4.9</u>		<u>0.9</u>		<u>262.4</u>		<u>33.7</u>
<u>6-26</u>		<u>4.5</u>		<u>1.3</u>		<u>275.8</u>		<u>62.6</u>
Aug.								
ppm		<u>4.2</u>		<u>1.2</u>		<u>263.0</u>		<u>44.5</u>
±%		<u>52.6%</u>		<u>61.5%</u>		<u>11.8%</u>		<u>88.2%</u>
nk <u>A</u>		<u>4.1</u>		<u>0.4</u>		<u>258.8</u>		<u>58.5</u>
uplet # <u>11-4</u>		<u>3.7</u>		<u>0.6</u>		<u>244.4</u>		<u>58.2</u>
<u>6-26</u>		<u>4.5</u>		<u>1.3</u>		<u>250.6</u>		<u>48.0</u>
Aug.								
ppm		<u>4.1</u>		<u>0.8</u>		<u>251.3</u>		<u>54.9</u>
±%		<u>24.2%</u>		<u>153.1%</u>		<u>7.1%</u>		<u>27.0%</u>

VOC CALCULATIONS

Sample # 810609-1
 Sample Date 6-9-81
 Analysis Date OPEN
 Mill B. P. SPRINGFIELD
 Source U. D. (BEFORE)
 Tank F
 Vessel 7
 trap # 23

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124 \times 17.50) \left(\frac{16.79}{295.5} - \frac{0.22}{296.0} \right)$$

$$\text{Sample Vol} = \underline{8.954}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}$$

$$\text{Vessel Volume} = \frac{(3.998) (55.49 +) (9.124)}{(296.5)} = \underline{6.818}$$

$$\text{Tank Volume} = \frac{(17.50) (40.97 +) (9.124)}{(296.5)} = \underline{22.063}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Container Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(1620.6 - 3.4) (6.818)}{(8.954)} = \underline{1231.4} \text{ ppm}$$

$$\text{VOC tank} = \frac{(25.7 - 1.0) (22.063)}{(8.954)} = \underline{60.9} \text{ ppm}$$

$$\text{Ethylene tank} = \frac{() (22.063)}{(8.954)} = \underline{\quad} \text{ ppm}$$

$$\text{VOC Total} = \underline{1292.3} \quad \% \text{ vessel } \underline{95.3} \quad \% \text{ tank } \underline{4.7}$$

$$\text{CO}_2 \text{ tank} = \frac{(314.0 - 325) ()}{()} = \underline{693.6} \text{ ppm}$$

$$\text{CH}_4 \text{ tank} = \frac{(0.8 - 0) ()}{()} = \underline{2.0} \text{ ppm}$$

$$\text{CO tank} = \frac{(6.1 - 0) ()}{()} = \underline{15.0} \text{ ppm}$$

$$\text{Ethane tank} = \frac{() ()}{()} = \underline{\quad} \text{ ppm}$$

VOC CALCULATIONS

Sample # 810609-2
 Sample Date 6-9-81
 Analysis Date OPEN
 Mill G.P. SPRING FIELD
 Source U.D. (BEFORE)
 Tank X
 Vessel 8
 trap # 11

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124)(17.46) \times \left(\frac{16.81}{295.5} - \frac{0.17}{296.0} \right)$$

$$\text{Sample Vol} = \underline{8.971}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}$$

$$\text{Vessel Volume} = \frac{(4.007) \left(\frac{55.50 +}{295.5} \right) (9.124)}{(295.5)} = \underline{6.867}$$

$$\text{Tank Volume} = \frac{(17.46) \left(\frac{40.78 +}{295.5} \right) (9.124)}{(295.5)} = \underline{21.985}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(1369.4 - 3.4) (6.867)}{(8.971)} = \underline{1045.6 \text{ ppm}}$$

$$\text{VOC tank} = \frac{(34.6 - 1.0) (21.985)}{(8.971)} = \underline{82.3 \text{ ppm}}$$

$$\text{Ethylene tank} = \frac{(-) (21.985)}{(8.971)} = \underline{\text{ppm}}$$

$$\text{VOC Total} = \underline{1127.9} \quad \% \text{ vessel } \underline{92.7} \quad \% \text{ tank } \underline{7.3}$$

$$\text{CO}_2 \text{ tank} = \frac{(2366 - 325) (-)}{(-)} = \underline{500.2 \text{ ppm}}$$

$$\text{CH}_4 \text{ tank} = \frac{(0.7 - 0) (-)}{(-)} = \underline{1.7 \text{ ppm}}$$

$$\text{CO tank} = \frac{(55.0) (-)}{(-)} = \underline{13.5 \text{ ppm}}$$

$$\text{Ethane tank} = \frac{(-) (-)}{(-)} = \underline{\text{ppm}}$$

VOC CALCULATIONS

Sample # 810609-3
 Sample Date 6-9-81
 Analysis Date OPEN
 Mill G.P. SPRINGFIELD
 Source U.D. (AFTER)
 Tank 6
 Vessel 9
 Trap # 21

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124) (17.28) \left(\frac{22.37}{295.5} - \frac{.20}{296.0} \right)$$

$$\text{Sample Vol} = \underline{11.829}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}$$

$$\text{Vessel Volume} = \frac{(3.993) (57.30 +) (9.124)}{(294.0)} = \underline{7.101}$$

$$\text{Tank Volume} = \frac{(17.28) (40.12 +) (9.124)}{(293.5)} = \underline{21.552}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(2073.9 - 3.4) (7.101)}{(11.829)} = \underline{1242.9} \text{ ppm}$$

$$\text{VOC tank} = \frac{(280 - 1.0) (21.552)}{(11.829)} = \underline{49.2} \text{ ppm}$$

$$\text{Ethylene tank} = \frac{() (21.552)}{(11.829)} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{VOC Total} = \underline{1292.1} \quad \% \text{ vessel } \underline{96.2} \quad \% \text{ tank } \underline{3.8}$$

$$\text{CO}_2 \text{ tank} = \frac{(287.9 - 325) ()}{()} = \underline{465.3} \text{ ppm}$$

$$\text{CH}_4 \text{ tank} = \frac{(0.9 - 0) ()}{()} = \underline{1.6} \text{ ppm}$$

$$\text{CO tank} = \frac{(5.9 - 0) ()}{()} = \underline{10.7} \text{ ppm}$$

$$\text{Ethane tank} = \frac{() ()}{()} = \underline{\hspace{2cm}} \text{ ppm}$$

VOC CALCULATIONS

Sample # 810609-4
 Sample Date 6-9-81
 Analysis Date OPEN
 Mill G.P. SPRINGFIELD
 Source U.D. (AFTER)
 Tank J
 Vessel 10
 Trap # 18

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124) (16.72) \left(\frac{23.22}{295.5} - \frac{0.20}{296.0} \right)$$

$$\text{Sample Vol} = \underline{11.884}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}$$

$$\text{Vessel Volume} = \frac{(3.993) (52.61 +) (9.124)}{(292.5)} = \underline{6.553}$$

$$\text{Tank Volume} = \frac{(16.72) (40.40 +) (9.124)}{(293.5)} = \underline{20.999}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(23180 - 3.4) (6.553)}{(11.884)} = \underline{1276.3} \text{ ppm}$$

$$\text{VOC tank} = \frac{(25.6 - 0.2) (20.999)}{(11.884)} = \underline{44.9} \text{ ppm}$$

$$\text{Ethylene tank} = \frac{(-) (20.999)}{(11.884)} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{VOC Total} = \underline{1321.2} \quad \% \text{ vessel } \underline{96.6} \quad \% \text{ tank } \underline{3.4}$$

$$\text{CO}_2 \text{ tank} = \frac{(2769 - 224) (\text{' })}{(\text{' })} = \underline{449.7} \text{ ppm}$$

$$\text{CH}_4 \text{ tank} = \frac{(3.0 - 0) (\text{' })}{(\text{' })} = \underline{5.3} \text{ ppm}$$

$$\text{CO tank} = \frac{(6.2 - 0) (\text{' })}{(\text{' })} = \underline{11.0} \text{ ppm}$$

$$\text{Ethane tank} = \frac{(\text{' }) (\text{' })}{(\text{' })} = \underline{\hspace{2cm}} \text{ ppm}$$

VOC CALCULATIONS

Sample # 810610-1
 Sample Date 6-10-81
 Analysis Date OPEN
 Mill B.N. SPRING FIELD
 Source U.D. (BEFORE)
 Tank H
 Vessel 5
 Trap # 12

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124) (16.73) \left(\frac{18.19}{297.0} - \frac{0.99}{295.0} \right)$$

$$\text{Sample Vol} = \underline{8.837}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}$$

$$\text{Vessel Volume} = \frac{(4.010) (48.36 +) (9.124)}{(297.0)} = \underline{5.957}$$

$$\text{Tank Volume} = \frac{(16.73) (40.09 +) (9.124)}{(293.0)} = \underline{20.886}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(2274.7 - 3.4) (5.957)}{(8.837)} = \underline{1531.1} \text{ ppm}$$

$$\text{VOC tank} = \frac{(27.0 - 0.2) (20.886)}{(8.837)} = \underline{63.3} \text{ ppm}$$

$$\text{Ethylene tank} = \frac{() (20.886)}{(8.837)} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{VOC Total} = \underline{1594.4} \quad \% \text{ vessel } \underline{96.0} \quad \% \text{ tank } \underline{4.0}$$

$$\text{CO}_2 \text{ tank} = \frac{(226.9 - 22.4) ()}{()} = \underline{483.3} \text{ ppm}$$

$$\text{CH}_4 \text{ tank} = \frac{(1.5 - 0) ()}{()} = \underline{3.5} \text{ ppm}$$

$$\text{CO tank} = \frac{(5.4 - 0) ()}{()} = \underline{12.8} \text{ ppm}$$

$$\text{Ethane tank} = \frac{() ()}{()} = \underline{\hspace{2cm}} \text{ ppm}$$

VOC CALCULATIONS

Sample # B10610-2
 Sample Date 6-10-81
 Analysis Date OPEN
 Mill G.P. SPRING FIELD
 Source U.D. CREEK
 Tank C
 Vessel 6
 Trap # 17

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124)(17.25) \left(\frac{10.63}{296.0} - \frac{0.56}{295.0} \right)$$

$$\text{Sample Vol} = \underline{9.607}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure}}{\text{Container Pressure}} \right) (9.124)}{(\text{Temperature of Container})}$$

$$\text{Vessel Volume} = \frac{(3.997)(47.71 +) (9.124)}{(297.0)} = \underline{5.858}$$

$$\text{Tank Volume} = \frac{(17.25)(40.21 +) (9.124)}{(293.0)} = \underline{21.599}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Container Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(1419.0 - 3.4)(5.858)}{(9.607)} = \underline{863.2} \text{ ppm}$$

$$\text{VOC tank} = \frac{(589 - 0.2)(21.599)}{(9.607)} = \underline{155132.0} \text{ ppm}$$

$$\text{Ethylene tank} = \frac{() (21.599)}{(9.607)} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{VOC Total} = \underline{995.2} \quad \% \text{ vessel } \underline{86.7} \quad \% \text{ tank } \underline{13.3}$$

$$\text{CO}_2 \text{ tank} = \frac{(225.5 - 221)()}{()} = \underline{456.6} \text{ ppm}$$

$$\text{CH}_4 \text{ tank} = \frac{(1.7 - 0)()}{()} = \underline{3.8} \text{ ppm}$$

$$\text{CO tank} = \frac{(5.4 - 0)()}{()} = \underline{12.1} \text{ ppm}$$

$$\text{Ethane tank} = \frac{() ()}{()} = \underline{\hspace{2cm}} \text{ ppm}$$

VOC CALCULATIONS

Sample # 810610-3
 Sample Date 6-10-81
 Analysis Date OPEN
 Mill G.P. SPRINGFIELD
 Source U.D. (AFTER)
 Tank R
 Vessel 4
 Trap # 22

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124) (17.65) \left(\frac{10.08}{296.0} - \frac{0.26}{295.0} \right)$$

$$\text{Sample Vol} = \underline{5.342}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}$$

$$\text{Vessel Volume} = \frac{(4.005) (44.75 +) (9.124)}{(297.0)} = \underline{5.506}$$

$$\text{Tank Volume} = \frac{(17.65) (39.68 +) (9.124)}{(295.5)} = \underline{21.618}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Container Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(1235.8 -) (5.506)}{(5.342)} = \underline{1270.2} \text{ ppm}$$

$$\text{VOC tank} = \frac{(23.1 - 0.2) (21.618)}{(5.342)} = \underline{23.6} \text{ ppm}$$

$$\text{Ethylene tank} = \frac{(- 10) (21.618)}{(5.342)} = \underline{\quad} \text{ ppm}$$

$$\text{VOC Total} = \underline{1293.8} \quad \% \text{ vessel } \underline{98.2} \quad \% \text{ tank } \underline{1.8}$$

$$\text{CO}_2 \text{ tank} = \frac{(305.7 - 229) ()}{()} = \underline{292.0} \text{ ppm}$$

$$\text{CH}_4 \text{ tank} = \frac{(0.7 - 0) ()}{()} = \underline{0.7} \text{ ppm}$$

$$\text{CO tank} = \frac{(3.4 - 0) ()}{()} = \underline{3.5} \text{ ppm}$$

$$\text{Ethane tank} = \frac{() ()}{()} = \underline{\quad} \text{ ppm}$$

VOC CALCULATIONS

Sample # 810610-41

Sample Date 6-10-81

Analysis Date OPEN

Mill G.P. SPRINGFIELD

Source O.D. (AFTER)

Tank K

Vessel 1

Trap # 24

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124) (16.80) \left(\frac{21.69}{296.0} - \frac{0.36}{295.0} \right)$$

$$\text{Sample Vol} = \underline{11.058}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}$$

$$\text{Vessel Volume} = \frac{(4.005) (46.08 +) (9.124)}{(295.0)} = \underline{5.708}$$

$$\text{Tank Volume} = \frac{(16.80) (42.13 +) (9.124)}{(295.5)} = \underline{21.854}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Container Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(2018.0 - 3.4) (5.708)}{(11.058)} = \underline{1039.9 \text{ ppm}}$$

$$\text{VOC tank} = \frac{(65.4 - 10.5) (21.854)}{(11.058)} = \underline{108.5 \text{ ppm}}$$

$$\text{Ethylene tank} = \frac{() (21.854)}{(11.058)} = \underline{\text{ppm}}$$

$$\text{VOC Total} = \underline{1148.4} \quad \% \text{ vessel } \underline{90.6} \quad \% \text{ tank } \underline{9.4}$$

$$\text{CO}_2 \text{ tank} = \frac{(6561.0 - 28.9) ()}{()} = \underline{1.29\% \text{ ppm}}$$

$$\text{CH}_4 \text{ tank} = \frac{(1.3 - 0) ()}{()} = \underline{2.6 \text{ ppm}}$$

$$\text{CO tank} = \frac{(5.9 - 0) ()}{()} = \underline{11.7 \text{ ppm}}$$

$$\text{Ethane tank} = \frac{() ()}{()} = \underline{\text{ppm}}$$

VOC CALCULATIONS

Sample # 810611-1
 Sample Date 6-11-81
 Analysis Date OPEN
 Mill G.P. SPRINGFIELD
 Source U.D. (BEFORE)
 Tank L
 Vessel 2
 Trap # 22

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124)(17.60) \left(\frac{22.02}{291.0} - \frac{0.22}{297.0} \right)$$

$$\text{Sample Vol} = \underline{12.032}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}$$

$$\text{Vessel Volume} = \frac{(4.005) \left(\frac{54.73 + }{294.5} \right) (9.124)}{ } = \underline{6.791}$$

$$\text{Tank Volume} = \frac{(17.60) \left(\frac{54.62 + }{294.5} \right) (9.124)}{ } = \underline{29.783}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(20285 - 3.3) (6.791)}{(12.032)} = \underline{1143.1} \text{ ppm}$$

$$\text{VOC tank} = \frac{(75.6 - 10.5) (29.783)}{(12.032)} = \underline{161.1} \text{ ppm}$$

$$\text{Ethylene tank} = \frac{(-) (29.783)}{(12.032)} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{VOC Total} = \underline{1304.2} \quad \% \text{ vessel } \underline{87.6} \quad \% \text{ tank } \underline{12.4}$$

$$\text{CO}_2 \text{ tank} = \frac{(256.7 - 28.9) (-)}{(-)} = \underline{563.9} \text{ ppm}$$

$$\text{CH}_4 \text{ tank} = \frac{(1.1 - 0) (-)}{(-)} = \underline{2.7} \text{ ppm}$$

$$\text{CO tank} = \frac{(5.4 - 0) (-)}{(-)} = \underline{13.4} \text{ ppm}$$

$$\text{Ethane tank} = \frac{(-) (-)}{(-)} = \underline{\hspace{2cm}} \text{ ppm}$$

VOC CALCULATIONS

Sample # 810611-2
 Sample Date 6-11-81
 Analysis Date OPEN
 Mill G.P. SPRING FEED
 Source U.D. C BEFORE
 Tank I
 Vessel 10
 Trap # 24

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124)(16.90) \times \left(\frac{20.72}{297.0} - \frac{0.28}{297.0} \right)$$

$$\text{Sample Vol} = \underline{10.834}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}$$

$$\text{Vessel Volume} = \frac{(3.993) (54.10 +) (9.124)}{(295.5)} = \underline{6.670}$$

$$\text{Tank Volume} = \frac{(16.90) (40.42 +) (9.124)}{(295.0)} = \underline{21.127}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(1879.7 - 3.3) (6.670)}{(10.834)} = \underline{1155.2} \text{ ppm}$$

$$\text{VOC tank} = \frac{(117.9 - 10.5) (21.127)}{(10.834)} = \underline{209.4} \text{ ppm}$$

$$\text{Ethylene tank} = \frac{() (21.127)}{(10.834)} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{VOC Total} = \underline{1364.6} \quad \% \text{ vessel } \underline{84.7} \quad \% \text{ tank } \underline{15.3}$$

$$\text{CO}_2 \text{ tank} = \frac{(2043.8 - 28.4) ()}{()} = \underline{0.3990} \text{ ppm}$$

$$\text{CH}_4 \text{ tank} = \frac{(1.1 - 0) ()}{()} = \underline{2.1} \text{ ppm}$$

$$\text{CO tank} = \frac{(5.8 - 0) ()}{()} = \underline{11.3} \text{ ppm}$$

$$\text{Ethane tank} = \frac{() ()}{()} = \underline{\hspace{2cm}} \text{ ppm}$$

VOC CALCULATIONS

Sample # 810611-3
 Sample Date 6-11-81
 Analysis Date OPEN
 Mill G.P. SPRINGFIELD
 Source U.D. (BETER)
 Tank B
 Vessel 9
 Trap # 12

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124)(16.76) \left(\frac{20.19}{291.0} - \frac{0.19}{297.0} \right)$$

$$\text{Sample Vol} = \underline{10.512}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}$$

$$\text{Vessel Volume} = \frac{(3.993) (56.67 +) (9.124)}{(296.0)} = \underline{6.975}$$

$$\text{Tank Volume} = \frac{(16.76) (41.03 +) (9.124)}{(296.0)} = \underline{21.197}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(1434.1 - 3.3) (6.975)}{(10.512)} = \underline{949.4} \text{ ppm}$$

$$\text{VOC tank} = \frac{(44.5 - 10.5) (21.197)}{(10.512)} = \underline{68.6} \text{ ppm}$$

$$\text{Ethylene tank} = \frac{(-) (21.197)}{(10.512)} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{VOC Total} = \underline{1018.0} \quad \% \text{ vessel } \underline{93.3} \quad \% \text{ tank } \underline{6.7}$$

$$\text{CO}_2 \text{ tank} = \frac{(263.0 - 28.9) (-)}{(-)} = \underline{472.1} \text{ ppm}$$

$$\text{CH}_4 \text{ tank} = \frac{(1.2 - 0) (-)}{(-)} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{CO tank} = \frac{(4.2 - 0) (-)}{(-)} = \underline{8.5} \text{ ppm}$$

$$\text{Ethane tank} = \frac{(-) (-)}{(-)} = \underline{\hspace{2cm}} \text{ ppm}$$

VOC CALCULATIONS

Sample # 810611-41
 Sample Date 6-11-81
 Analysis Date OPEN
 Mill G.P. SPRING FIELD
 Source U.D. (AFTER)
 Tank A
 Vessel 8
 Trap # 17

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124 \times 17.10) \times \left(\frac{22.65}{291.0} - \frac{0.21}{297.0} \right)$$

$$\text{Sample Vol} = \underline{12.034}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}$$

$$\text{Vessel Volume} = \frac{(4.007) (51.48 +) (9.124)}{(293.5)} = \underline{6.413}$$

$$\text{Tank Volume} = \frac{(17.10) (43.57 +) (9.124)}{(294.5)} = \underline{23.083}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Container Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(1398.3 - 3.3) (6.413)}{(12.034)} = \underline{743.4} \text{ ppm}$$

$$\text{VOC tank} = \frac{(54.9 - 10.9) (23.083)}{(12.034)} = \underline{85.2} \text{ ppm}$$

$$\text{Ethylene tank} = \frac{(-) (23.083)}{(12.034)} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{VOC Total} = \underline{828.6} \quad \% \text{ vessel } \underline{89.7} \quad \% \text{ tank } \underline{10.3}$$

$$\text{CO}_2 \text{ tank} = \frac{(251.3 - 28.9) (-)}{(-)} = \underline{426.6} \text{ ppm}$$

$$\text{CH}_4 \text{ tank} = \frac{(0.8 - 0) (-)}{(-)} = \underline{1.5} \text{ ppm}$$

$$\text{CO tank} = \frac{(41 - 0) (-)}{(-)} = \underline{7.9} \text{ ppm}$$

$$\text{Ethane tank} = \frac{(-) (-)}{(-)} = \underline{\hspace{2cm}} \text{ ppm}$$

VOC CALCULATIONS

Sample # (B100)10-11-12

Sample Date 6-10/11/12

Analysis Date 6-18-12

Mill O.P. SPRINGFIELD

Source U.D. (BEFORE) EXT.

Tank /

Vessel 7

Trap # /

$$\text{Sample Vol} = 9.124 (\text{Tank Vol}) \left[\frac{P_2}{T_2} - \frac{P_1}{T_1} \right]$$

$$\text{Sample Vol} = (9.124) \left(\frac{0}{0} \right)$$

$$\text{Sample Vol} = \underline{\hspace{2cm}}$$

$$\text{Pressurized Container Volume} = \frac{(\text{Container Volume}) \left(\frac{\text{Atm. Pressure} + \text{Container Pressure}}{\text{Temperature of Container}} \right) (9.124)}{}$$

$$\text{Vessel Volume} = \frac{(3.998) (44.70 +) (9.124)}{(295.0)} = \underline{5.527}$$

$$\text{Tank Volume} = \frac{() () (9.124)}{()} = \underline{\hspace{2cm}}$$

$$\text{Stack Concentration} = \frac{(\text{Container Concentration} - \text{Blank}) (\text{Container Volume})}{\text{Sample Volume}}$$

$$\text{VOC vessel} = \frac{(354.5 - 3.3) (1.0)}{(5.527)} = \underline{63.5} \text{ ppm/l. / l.}$$

$$\text{VOC tank} = \frac{() ()}{()} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{Ethylene tank} = \frac{() ()}{()} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{VOC Total} = \underline{\hspace{2cm}} \% \text{ vessel } \underline{\hspace{2cm}} \% \text{ tank } \underline{\hspace{2cm}}$$

$$\text{CO}_2 \text{ tank} = \frac{() ()}{()} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{CH}_4 \text{ tank} = \frac{() ()}{()} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{CO tank} = \frac{() ()}{()} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\text{Ethane tank} = \frac{() ()}{()} = \underline{\hspace{2cm}} \text{ ppm}$$

$$\frac{(354)(5.527)}{24} =$$

$$= 81 \text{ ppm}$$

CALIBRATION FORM

Date 4-15-81

DIRECT

5ml CH₄ Std
gas conc 1068

counts

3483176

3451047

3478673

Avg 3470965

±% 1.2%

Calibration Factor 3.07695×10^{-4}

THROUGH

5ml CH₄ Std
gas conc 1068

counts

3478022

34635048

3475219

Avg. 3472263

±% 0.5%

Calibration Factor 3.07580×10^{-4}

Column Flush

CO

CH₄

CO₂

VOC

count

ppm

Column Blank

CO

CH₄

CO₂

VOC

count

81769

36579

ppm

25.2

11.3

Zero Air (5ml)

Avg. count

ppm

±%

CALIBRATION FORM

Date 6-16-81

DIRECT

5ml CH₄ Std
gas conc 1063

counts

3536976

3515116

3539271

Aug 3530454

±% 0.94%

THROUGH

counts

5ml CH₄ Std
gas conc _____

✓

Aug. _____

±% _____

Calibration Factor 3.02512×10^{-4}

Calibration Factor _____

Column Flush

CO

CH₄

CO₂

VOC

count

ppm

Column Blank

CO

CH₄

CO₂

VOC

count

ppm

Zero Air (5ml)

10891

11665

11034

Aug. count

11197

ppm

3.4

±%

9.1%

CALIBRATION FORM

Date 6-17-81

DIRECT

5ml CH₄ Std
gas conc 1068

counts

3621154

3649259

3609835

3635136

Avg 3628846

±% 0.75%

THROUGH

counts

5ml CH₄ Std
gas conc 1068

Avg. _____

±% _____

Calibration Factor 2.94308×10^{-4}

Calibration Factor _____

Column Flush

CO

CH₄

CO₂

VOC

count _____

ppm _____

Column Blank

CO

CH₄

CO₂

VOC

count _____

ppm _____

Zero Air (5ml)

10522

12237

10399

Avg. count

11053

ppm

3.25

±%

23.1%

CALIBRATION FORM

Date 6-24-81

DIRECT

5ml CH₄ Std
gas conc _____

counts

Aug

±%

THROUGH

counts

5ml CH₄ Std
gas conc 1068
RT

2,6562 × 10⁷

2,6372 × 10⁷

2,6297 × 10⁷

Aug. 2,641 × 10⁷

±% 1.390

Calibration Factor _____

Calibration Factor 4.04387 × 10⁻⁵

Column Flush

CO

CH₄

CO₂

VOC

count

ppm

Column Blank

CO

CH₄

CO₂

VOC

count

ppm

0 0 803830 2598.7
- - ~~32.5~~ ~~1.0~~

Zero Air (5ml)

Avg. count

ppm

±2

CALIBRATION FORM

Date 6-25-81

DIRECT

counts

5ml CH₄ Std
gas conc _____

Avg _____

±% _____

THROUGH

counts

5ml CH₄ Std
gas conc 1068
RT.

2.7589×10^7
 2.7624×10^7
 2.7890×10^7

Avg. 2.7701×10^7

±% 1.5%

Calibration Factor _____

Calibration Factor 3.85546×10^{-5}

Column Flush

CO

CH₄

CO₂

VOC

count _____
ppm _____

Column Blank

CO

CH₄

CO₂

VOC

count _____
ppm _____

582150
22.4

5138
0.2

Zero Air (5ml)

Avg. count _____

ppm _____

±2 _____

CALIBRATION FORM

Date 6-26-81

DIRECT

5ml CH₄ Std
gas conc _____

counts

Avg _____

±% _____

THROUGH

counts

5ml CH₄ Std
gas conc 1068

2.8083×10^7

2.8504×10^7

2.8302×10^7

Avg. 2.8296×10^7

±% 1.9%

Calibration Factor _____

Calibration Factor 3.77434×10^{-5}

Column Flush

CO

CH₄

CO₂

VOC

count

ppm

Column Blank

CO

CH₄

CO₂

VOC

count

ppm

0

0

~~28.9~~ 28.9

~~10.5~~ 10.5

Zero Air (5ml)

Avg. count

ppm

±2

APPENDIX G.2.4
PCS LABORATORY DATA AND NOTEBOOK

TABLE G-6

PCS METHOD 25 SAMPLING TRAIN DATA

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run No.	Sample Tank										H ₂ O Ice Trap Intermediate Tank										Dry Ice Trap Intermediate Tank									
	Pt1 (mm Hg)	Tt1 (k)	Pt (mm Hg)	Tt (k)	V (l)	V _a (l)	Pf (mm Hg)	Tf (k)	C _{tm} (ppm Cl)	C _t (ppm Cl)	V _{v1} (l)	Pf1 (mm Hg)	Tf1 (k)	Cc ml (ppm Cl)	C cl (ppm Cl)	V _{v2} (l)	Pf2 (mm Hg)	Tf2 (k)	Cc m2 (ppm Cl)	Cc2 (ppm Cl)										
Inlet																														
Run 1																														
Sample C1	12.6	284	432	295	4.850	2.658	1347	296	7.8	25.0	4.82	1347	296	136		4.82	1347	294	83.4	267										
Sample D																														
Sample D	18.6	284	456	295	4.865	2.779	1347	296	7.3	22.4	4.82	1354	296	235.0	720	4.82	1646	297	44.2	164										
Inlet																														
Run 2																														
Sample C	10.6	290	343	294	4.855	2.118	1373	298	106	432	4.82	1373	298	133	539	4.82	1341	298	89.0	352										
Sample D	10.6	290	433	294	4.840	2.683	1408	297	164	541	4.82	1392	297	169	549	4.82	1385	298	114	367										
Inlet																														
Run 3																														
Sample C	10.1	288	507	295	4.845	3.146	1354	298	59.0	159	4.82	1398	298	179	496	4.82	1394	298	198	547										
Sample D	9	288	555	298	4.850	3.428	1350	298	41.9	104	4.82	1350	298	237	583	4.82	1456	297	120	319										
Outlet																														
Run 1																														
Sample C	12.6	284	402	295	4.867	2.477	1344	298	94.5	323	4.82	1344	298	348	1179	4.82	1344	299	120	405										
Sample D	12.6	284	480	295	4.835	2.954	1347	295	50.4	145	4.82	1407	295	301	905	4.82	1347	297	40.7	117										
Outlet																														
Run 2																														
Sample C	13.6	290	439	294	4.855	2.710	1346	297	101	316	4.82	1346	297	192	598	4.82	1358	297	37.4	117										
Sample D	10.6	290	591	294	4.865	3.706	1345	297	773	177	4.82	1345	297	251	571	4.82	1345	297	45.0	102										
Outlet																														
Run 3																														
Sample A	10.0	288	507	295	4.830	3.139	1367	295	<2	<5.5	4.82	1351	295	198	537	4.82	1356	296	65.1	177										
Sample B	9.1	288	487	295	4.850	3.031	1418	298	13.3	39.0	4.82	2336	299	86.4	414	4.82	1354	290	230	641										

TABLE G-7

PCB DAILY CALIBRATION SUMMARY

Georgia-Pacific Plywood Plant, Springfield, Oregon

Analysis Date	Type	Calibration Compound	Conc. ppm	Injection		Area Counts	Response Factor		Area/ppm	System Dev. (%)	NMO Oxidation System Efficiency (%)
				Run	Time		U-volt-seconds	Rel. Std. (%)			
6-19-81	NMO	Propane	298	1	09:16	14,019	47.11				
				2	09:36	15,323	51.49				
				3	09:46	14,783	49.67				
				Avg.		14,708	49.42	4.45		+2.04	
6-19-81	CO ₂	CO ₂	199	1	09:56	11,088	55.65				
				2	10:09	10,764	54.04				
				3	10:21	10,773	54.08				
				Avg.		10,875	54.58	1.82		+2.27	99.1
6-22-81	NMO	Propane	298	1		15,130	50.84				
				2		14,882	50.01				
				3		14,795	49.71				
				Avg.		14,936	50.19	1.17		+3.63	
6-22-81	CO ₂	CO ₂	199	1		9,943	49.96				
				2		9,877	49.63				
				3		10,096	50.72				
				Avg.		9,971	50.10	1.20		-5.96	99.4
6-23-81	NMO	Propane	298	1	11:09	14,370	48.29				
				2	11:19	14,364	48.27				
				3	11:29	14,350	48.22				
				Avg.		14,361	48.26	0.07		-0.35	
6-23-81	CO ₂	CO ₂	199	1	11:58	10,307	51.79				
				2	12:09	10,569	53.11				
				3	12:20	10,425	52.39				
				Avg.		10,434	52.93	1.26		-0.82	99.4
6-24-81	NMO	Propane	298	1	10:49	14,362	48.19				
				2	10:57	14,298	47.98				
				3	11:05	14,095	47.30				
				Avg.		14,252	47.89	0.98		-1.12	
6-24-81	CO ₂	CO ₂	199	1	09:45	10,189	51.20				
				2	10:01	10,052	50.51				
				3	10:11	10,134	50.92				
				Avg.		10,125	50.88	1.40		-4.67	99.4
6-25-81	NMO	Propane	298	1	14:19	13,410	45.00				
				2	14:28	13,222	44.37				
				3	14:38	13,352	44.81				
				Avg.		13,328	44.78	0.74		-7.54	

TABLE G-7 (Continued)

PCS DAILY CALIBRATION SUMMARY

Georgia-Pacific Plywood Plant, Springfield, Oregon

Analysis Date	Type	Calibration Compound	Conc. ppm	Injection		Area Counts	Response Factor		Area/ppm	Rel. Std. (%)	Dev. (%)	System Deviation (%)	NH ₃ Oxidation System Efficiency (%)
				Run	Time		U-volt-seconds	Area/ppm					
6-25-81	CO ₂	CO ₂	199	1	11:09	10,021	50.36						
				2		10,208	51.30						
				3		10,210	51.31						
				4		10,352	52.02						
				5		10,493	52.73						
				Avg.		10,257	51.54		0.80			-3.43	99.5
6-26-81	NH ₃	Propane	298	1	11:15	14,322	48.06						
				2	11:36	14,835	49.78						
				3	11:40	14,532	48.77						
				Avg.		14,563	48.93		1.78			+1.03	
6-26-81	CO ₂	CO ₂	199	1	10:09	10,649	53.51						
				2	10:22	10,580	53.17						
				3	10:32	10,109	50.80						
				Avg.		10,446	52.49		2.81			-1.65	99.0

TABLE C-8

PCS METHOD 25 ANALYTICAL RESULTS (SCRUBBER INLET)

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run No.	PCS No.	Tank No.	H ₂ O* Trap No.	CO ₂ * Trap No.	Sample Analysis No.	Analyzed Date	Time	Area Counts				Uncorrected Results			
								H ₂ O Trap		CO ₂ Trap		H ₂ O Trap		CO ₂ Trap	
								Tank	A	B	CO ₂ Trap	Tank	A	B	CO ₂ Trap
Inlet 1 C Sample	13766	8	207 (41) (85)	227 (43)	C1 C2 C3 Average	6-22-81	3:14	239	7146	1271	4006	4.8	130.9	23.3	80.0
			488	7305	1326			4173	9.9	135.3	24.3	83.2			
			427	7772	1324			4353	8.6	142.4	24.3	86.5			
			385	7434	1307			4177	7.8	136	23.9	81.4			
Inlet 1 D Sample	13767	67	232 (8)	107 (30)	D1 D2 D3 Average	6-22-81	13:07	259	12520	-	2162	5.2	-	229.4	41.2
			489	12851	-			2196	9.9	-	235.5	43.8			
			343	13104	-			2293	6.9	-	240.1	45.8			
			364	12825	-			2217	7.3	-	235.0	44.2			
Inlet 2 C Sample	13770	58	101 (77)	209 (7)	C1 C2 C3 Average	6-22-81	16:34	-	7123	-	4268	void	130.5	-	85.2
			5277	7245	-			4517	105.1	132.7	-	90.2			
			5334	7364	-			4594	106.3	134.9	-	91.7			
			5306	7244	-			4460	105.7	132.7	-	89.0			
Inlet 2 D Sample	13771	51	27 (66)	201 (2)	D1 D2 D3 Average	6-22-81	08:23	-	9012	-	10018	void	175	-	109.8
			8333	8456	-			5759	166.3	168.8	-	114.9			
			8141	8523	-			5865	162.0	170.1	-	117.0			
			8237	8450	-			5708	164.2	168.7	-	113.9			
Inlet 3 C Sample	13774	71	213 (39)	214 (26)	C1 C2 C3 Average	6-26-81	08:23	-	9012	-	10018	void	175	-	194
			2533	9288	-			10361	56.6	180	-	201			
			2750	9315	-			10190	61.4	181	-	198			
			2642	9205	-			10217	59.0	178.7	-	198.3			
Inlet 3 D Sample	13775	7	217 (55)	203 (60)	D1 D2 D3 Average	6-26-81	15:06	2416	12405	-	6305	41.2	263.3	-	120.1
			2391	12493	-			6327	40.6	238.0	-	120.5			
			2554	12365	-			6316	44.0	235.6	-	120.3			
			2454	12421	-			6316	41.9	236.6	-	120.3			
Tank near atmosphere press when attached for trap purge.															

*Trap nos. in parentheses represent Intermediate tank number.

TABLE G-9

PCS METHOD 25 ANALYTICAL RESULTS (SCRUBBER OUTLET)

Georgia-Pacific Plywood Plant, Springfield, Oregon

Run No.	PCS No.	Tank No.	H ₂ O* Trap No.	CO ₂ * Trap No.	Sample Analysis No.	Analyzed Date	Time	Area Counts			Uncorrected Results		
								Tank	H ₂ O Trap	CO ₂ Trap	Tank	H ₂ O Trap	CO ₂ Trap
Outlet 1 C Sample	13764	72	115	104	C1	6-19-81		4442	19041	-	89.9	349	-
			(62)	(54)	C2			4520	18939	-	91.5	347	-
					C3			5035	18924	-	102	347	-
					Average			4666	18968	-	94.5	347.7	-
Outlet 1 D Sample	13765	2	114	108	D1	6-22-81	13:01	-	14840	-	-	296.2	-
			(34)	(63)	D2			2633	14977	-	53.3	298.9	-
					D3			2346	15189	-	47.5	307.2	-
					Average			2490	15069	-	50.4	300.8	-
Outlet 2 C Sample	13768	61	106	112	C1	6-19-81		5294	10307	-	120	188.8	-
			(16)	(37)	C2			4578	10302	-	92.6	192.4	-
					C3			4485	10662	-	90.8	195.3	-
					Average			4996	10490	-	101	192.2	-
Outlet 2 D Sample	13769	13	231	103	D1	6-19-81		-	13235	-	-	242.5	-
			(50)	(1)	D2			3696	13949	-	74.8	255.6	-
					D3			3942	13866	-	79.8	254.0	-
					Average			3891	13863	-	77.3	250.7	-
Outlet 3 A Sample	13772	24	105	204	A1	6-24-81	14:56	-	10057	-	-	198	-
			(12)	(40)	A2			94	9863	-	<2	194	-
			Trap plugged on purge		A3			89	10138	-	<2	199	-
					Average			92	10043	-	<2	197.5	-
Outlet 3 B Sample	13773	57	212	234	B1	6-26-81	08:19	-	4405	-	-	88.6	-
			(45)	(35)	B2			632	4465	-	14.1	87.0	-
			ICV-45 to atmosphere repressured to 600		B3			562	4339	-	11974	12.6	-
					Average			597	4430	-	11843	86.4	-

*Trap nos. in parentheses represent intermediate tank number.

EPA METHOD 25 ANALYSIS

TRC ENVIRONMENTAL
CONSULTANTS, INC.

August 5, 1981

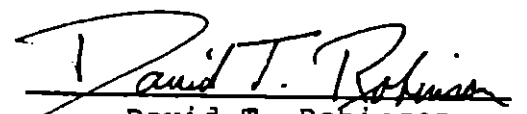
for

TRC Environmental Consultants, Inc.
125 Silas Deane Highway
Wethersfield, Connecticut 06109

TRC P.O.# 8196/Project # 1460-E80-32

by

POLLUTION CONTROL SCIENCE, INC.
6015 Manning Road
Miamisburg, Ohio 45342
(513) 866-5908
TLX 288348


David T. Robinson
Group Leader, Instrumental

DAILY NMO ANALYZER CALIBRATIONS

Date	Std. Conc. (ppm C ₁)		(1) RF (Area/ppm)	(2) Dev. (%)	NMO Blank (ppm)	NMO ox. Eff (%)
6-19-81	199 ppm CO ₂		54.58 (1.82%)	+ 2.27	3.8	99.1
	298 ppm C ₁ ² NMO		49.42 (4.45%)	+ 2.04		
6-22-81	199 ppm CO ₂		50.10 (1.20%)	- 5.96	<2	99.4
	298 ppm C ₁ ²		50.19 (1.17%)	+ 3.63		
6-23-81	199 ppm CO ₂		52.93 (1.26%)	- 0.82	<2	99.4
	298 ppm C ₁ ² NMO		48.26 (0.07%)	- 0.35		
6-24-81	199 ppm CO ₂		50.88 (1.40%)	- 4.67	<2	99.4
	298 ppm C ₁ ² NMO		47.89 (0.98%)	- 1.12		
6-25-81	199 ppm CO ₂		51.54 (0.80%)	- 3.43	<2	99.5
	298 ppm C ₂ ² NMO		44.78 (0.74%)	- 7.54		
6-26-81	199 ppm CO ₂		52.49 (2.81%)	- 1.65	5.7	99.0
	298 ppm C ₁ ² NMO		48.93 (1.78%)	+ 1.03		

(1) Area units in u-volt-seconds; the number in parentheses is the relative standard deviation of the individual injections.

(2) % deviation from the system performance check response factors. For the six days of calibration, the average deviation of the CO₂ response factors was - 2.38%, and the average deviation of NMO response factors was - 0.38%.

EPA METHOD 25 DATA SUMMARY

PCS #	SAMPLE ID	TRAP #		TANK #	SAMPLE VOLUME	TRAP* ppm C ₁		TANK ppm C ₁	TOTAL ppm C ₁
		H ₂ O	CO ₂			H ₂ O	CO ₂		
13764	25-1-SO-C	115	104	72	2.471	1180	406	323	1901
13765	25-1-SO-D	114	108	2	2.947	905	117	146	1168
13766	25-1-SI-C	207	227	8	2.652	510	268	25.0	803
13767	25-1-SI-D	232	107	67	2.773	720	164	22.0	906
13768	25-2-SO-C	106	112	61	2.704	598	118	317	1033
13769	25-2-SO-D	231	103	13	3.698	571	102	178	851
13770	25-2-SI-C	101	209	58	2.112	539	352	433	1324
13771	25-2-SI-D	27	201	51	2.677	550	368	542	1460
13772	25-3-SO-A	105	204	24	3.135	535	177	0	712
13773	25-3-SO-B	212	234	57	3.028	414	641	39.0	1094
13774	25-3-SI-C	213	214	71	3.145	496	551	159	1206
13775	25-3-SI-D	217	203	7	3.459	577	316	103	996

* Note: The H₂O column designates the ice-water traps and the column designated CO₂ the dry-ice traps.

STRAIGHT FID ANALYSES OF METHOD 25 TANKS

PCS #	TEST #	TANK #	STRAIGHT FID RELATIVE CONCENTRATION	APPROXIMATE ppm C ₁
13764	25-1-SO-C	72	46	23
13765	25-1-SO-D	2	18	9
13766	25-1-SI-C	8	0	-
13767	25-1-SI-D	67	0	-
13768	25-2-SO-C	61	23	11.5
13769	25-2-SO-D	13	40	20
13770	25-2-SI-C	58	48	24
13771	25-2-SI-D	51	64	32
13772	25-3-SO-A	24	0	-
13773	25-3-SO-B	57	0	-
13774	25-3-SI-C	71	0	-
13775	25-3-SI-D	7	0	-



July 10, 1981

Mr. Eugene A. Brackbill
TRC ENVIRONMENTAL CONSULTANTS
125 Silas Deane Highway
Wethersfield CT 06109

Dear Skip:

SUBJECT: PCS PN 172-001; INTERMEDIATE COLLECTION VESSELS

Enclosed are the 24 intermediate collection vessels you requested for analysis from the recent Method 25 testing performed in Oregon. I have also enclosed a list of the sample ID's and the corresponding collection vessel numbers. I will send you a list of the measured CO₂ concentrations with the final report.

Sincerely,

POLLUTION CONTROL SCIENCE, INC.

A handwritten signature in cursive script that reads 'Dave'.

David T. Robinson
Group Leader, Instrumental

DR/bg
Enclosures
Inv. #5353
PCS Sample #13764-13775

Pollution Control Science, Inc.

6016 Manning Road, Miamisburg, Ohio 45342
(513) 866-6908/TLX 288-348

G-128

INTERMEDIATE CARRIER VESSEL IDENTIFICATION

<u>PCS #</u>	<u>Sample ID</u>	<u>Volume Tank</u>	<u>Intermediate Collection Vessel #</u>	<u>Trap #</u>	<u>Tank #</u>
13764	25-1-SO-C	4.82 L	ICV 62	115	72
13764	25-1-SO-C	4.82 L	ICV 54	104	72
13765	25-1-SO-D	4.82 L	ICV 34	114	2
13765	25-1-SO-D	4.82 L	ICV 63	108	2
13766	25-1-SI-C	4.82 L	ICV 41, ICV 85	207	8
13766	25-1-SI-C	4.82 L	ICV 43	227	8
13767	25-1-SI-C	4.82 L	ICV 8	232	67
13767	25-1-SI-C	4.82 L	ICV 30	107	67
13768	25-2-SO-C	4.82 L	ICV 16	106	61
13768	25-2-SO-C	4.82 L	ICV 37	112	61
13769	25-2-SO-D	4.82 L	ICV 50	231	13
13769	25-2-SO-D	4.82 L	ICV 1	103	13
13770	25-2-SI-C	4.82 L	ICV 77	101	52
13770	25-2-SI-C	4.82 L	ICV 7	209	58
13771	25-2-SI-D	4.82 L	ICV 66	27	51
13771	25-2-SI-D	4.82 L	ICV 2	201	51
13772	25-3-SO-A	4.82 L	ICV 12	105	24
13772	25-3-SO-A	4.82 L	ICV 40	204	24
13773	25-3-SO-B	4.82 L	ICV 45	212	57
13773	25-3-SO-B	4.82 L	ICV 35	234	57
13774	25-3-SI-C	4.82 L	ICV 39	213	71
13774	25-3-SI-C	4.82 L	ICV 26	214	71
13775	25-3-SI-D	4.82 L	ICV 55	217	7
13775	25-3-SI-D	4.82 L	ICV 60	203	7

PCS# 13764

INVESTED FUND DATA SHEET

[illegible]

.....
POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGMND SAMPLE DATA

DATE : ~~10-1-1978~~ 6/19/81
TIME: 2:33:42

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13764
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-1-SO-C
TRAP # 115
TANK # 72

.....
TOTAL TGMND CONCENTRATION 1503.5 PPM C1
= .751 MG/L C1

TANK CONCENTRATION 323.3 PPM
TRAP CONCENTRATION 1180.2 PPM

SAMPLE VOLUME 2.471 LITERS
.....

PRE-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 743 MM HG
TEMPERATURE 11 DEG C

POST-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 354 MM HG
TEMPERATURE 22 DEG. C

LAB BAROMETRIC 744 MM HG
LAB TEMPERATURE 25 DEG. C
TANK VOLUME 4.867 LITERS
FINAL TANK PRESSURE 600 MM HG

AVG. MEAS. TANK CONC. 94.4 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC 744 MM HG
TEMPERATURE 25 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 600 MM HG

AVG. MEAS. ICV CONC. 348 PPM C1
.....

POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : ~~10/1/1978~~ 6/19/81
TIME: 2:36:11

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13764
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-1-SO-C
TRAP # 104
TANK # 72

TOTAL TGNMO CONCENTRATION 405.6 PPM C1
= .203 MG/L C1

TANK CONCENTRATION 0 PPM
TRAP CONCENTRATION 405.6 PPM

SAMPLE VOLUME 2.471 LITERS

PRE-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 743 MM HG
TEMPERATURE 11 DEG C

POST-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 354 MM HG
TEMPERATURE 22 DEG. C

LAB BAROMETRIC 744 MM HG
LAB TEMPERATURE 25 DEG. C
TANK VOLUME 4.867 LITERS
FINAL TANK PRESSURE 600 MM HG

AVG. MEAS. TANK CONC. 0 PPM C1

♦DATA FOR FIRST ICV♦
LAB BAROMETRIC 744 MM HG
TEMPERATURE 26 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PPESSURE 600 MM HG

AVG. MEAS. ICV CONC. 120 PPM C1

Rec'd 6/15/81

Trap No. 115(420) Tank No. 72

PCS SAMPLE NO. 13764 DATE TRAP BURNOUT/ANALYST 6/16/81 JS
 CLIENT TRC 172.001 DATE TRAP ANALYSIS/ANALYST 6/19/81 JS
 TEST NO. 25-1-50-C DATE TANK ANALYSIS/ANALYST 6/19/81 JS

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE 755.6 mm Hg POST-TEST BAROMETRIC PRESSURE 755.6 mm Hg
 PRE-TEST TANK VACUUM 743 mm Hg POST-TEST TANK VACUUM 354 mm Hg
 PRE-TEST TEMPERATURE 11 °C POST-TEST TEMPERATURE 22 °C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE 744 mm Hg TANK VOLUME 4.867 L
 LAB TEMPERATURE 25 °C FINAL TANK PRESSURE VAC mm Hg

TRAP BURNOUT

RUN A

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE 62 mm Hg COLLECTION VESSEL VOLUME 4.82 L
 LAB TEMPERATURE 744 °C INITIAL VACUUM 200 mm Hg
 LAB TEMPERATURE 25 °C FINAL PRESSURE 600 mm Hg

RUN B

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE 62 mm Hg COLLECTION VESSEL VOLUME 4.82 L
 LAB TEMPERATURE 744 °C INITIAL VACUUM 200 mm Hg
 LAB TEMPERATURE 25 °C FINAL PRESSURE 600 mm Hg

RUN C

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE 62 mm Hg COLLECTION VESSEL VOLUME 4.82 L
 LAB TEMPERATURE 744 °C INITIAL VACUUM 200 mm Hg
 LAB TEMPERATURE 25 °C FINAL PRESSURE 600 mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) 89.9 91.5 102 Average 94.4 C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 349, 347, 347 Average 348 C_{VOC}(4)

Run B: 419, 120, 122 Average 120 C_{VOC}(4)

Run C: 120, 122, 122 Average 120 C_{VOC}(4)

T.G.N.M.O. DATA SHEET

Trap No. 104 (Co₂) Tank No. 72

PCS SAMPLE NO. 13764 DATE TRAP BURNOUT/ANALYST 6/16/81 72
 CLIENT TRC 172.001 DATE TRAP ANALYSIS/ANALYST _____
 TEST NO. 25-1-30-C DATE TANK ANALYSIS/ANALYST _____

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _{B(1)}	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _{B(2)}	mm Hg
PRE-TEST TANK VACUUM	P _{T(1)}	mm Hg	POST-TEST TANK VACUUM	P _{T(2)}	mm Hg
PRE-TEST TEMPERATURE	T ₁	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _{B(3)}	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	T ₃	°C	FINAL TANK PRESSURE	P _{T(3)}	mm Hg

TRAP BURNOUT

RUN A
 COLLECTION VESSEL NO. _____
 LAB BAROMETRIC PRESSURE _____
 LAB TEMPERATURE _____
 COLLECTION VESSEL VOLUME _____
 INITIAL VACUUM _____
 FINAL PRESSURE _____

RUN B

LAB BAROMETRIC PRESSURE _____
 LAB TEMPERATURE _____
 COLLECTION VESSEL NO. _____
 COLLECTION VESSEL VOLUME _____
 INITIAL VACUUM _____
 FINAL PRESSURE _____

RUN C

LAB BAROMETRIC PRESSURE _____
 LAB TEMPERATURE _____
 COLLECTION VESSEL NO. _____
 COLLECTION VESSEL VOLUME _____
 INITIAL VACUUM _____
 FINAL PRESSURE _____

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) _____, _____, _____ Average _____ C_{VOC(1)}

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 119, 120, 122, 120 Average 120 C_{VOC(4)}
 Run B: _____, _____, _____ Average _____ C_{VOC(4)}
 Run C: _____, _____, _____ Average _____ C_{VOC(4)}

6-135

.....
POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 / 22 / 1981

TIME: 13 : 1 : 32

CLIENT: TRC

LOCATION: WETHERSFIELD CT

PCS SAMPLE # 13765

PCS PROJECT # 172.001

PROCESS I.D. CODE: 25-1-SO-D

TRAP # 114

TANK # 2

.....
TOTAL TGNMO CONCENTRATION 1050.5 PPM C1
= .525 MG/L C1

TANK CONCENTRATION 145.5 PPM
TRAP CONCENTRATION 905.0 PPM

SAMPLE VOLUME 2.947 LITERS
.....

PRE-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 743 MM HG
TEMPERATURE 11 DEG C

POST-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 276 MM HG
TEMPERATURE 22 DEG. C

LAB BAROMETRIC 747 MM HG
LAB TEMPERATURE 22 DEG. C
TANK VOLUME 4.835 LITERS
FINAL TANK PRESSURE 600 MM HG

AVG. MEAS. TANK CONC. 50.4 PPM C1

DATA FOR FIRST ICV

LAB BAROMETRIC 747 MM HG
TEMPERATURE 22 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 660 MM HG

AVG. MEAS. ICV CONC. 301 PPM C1
.....

.....
POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 /22 /1981
TIME: 13 :4 :13

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13765
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-1-SO-D
TRAP # 108
TANK # 2

.....
TOTAL TGNMO CONCENTRATION 116.6 PPM C1
= .058 MG/L C1

TANK CONCENTRATION 0 PPM
TRAP CONCENTRATION 116.6 PPM

SAMPLE VOLUME 2.947 LITERS
.....

PRE-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 743 MM HG
TEMPERATURE 11 DEG C

POST-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 276 MM HG
TEMPERATURE 22 DEG. C

LAB BAROMETRIC 747 MM HG
LAB TEMPERATURE 22 DEG. C
TANK VOLUME 4.835 LITERS
FINAL TANK PRESSURE 600 MM HG

AVG. MEAS. TANK CONCO. 0 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC 747 MM HG
TEMPERATURE 24 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 600 MM HG

AVG. MEAS. ICV CONCO. 40.8 PPM C1
.....

Trap No. 114 (H₂O) Tank No. Z

PCS SAMPLE NO. 137165 DATE TRAP BURNOUT/ANALYST 6/17/81, AB
 CLIENT TRC P/N 172.001 DATE TRAP ANALYSIS/ANALYST 6/19/81, AB
 TEST NO. 25-1-SO-D DATE TANK ANALYSIS/ANALYST 6/19/81, AB

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _{B(1)}	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _{B(2)}	mm Hg
PRE-TEST TANK VACUUM	P _{T(1)}	mm Hg	POST-TEST TANK VACUUM	P _{T(2)}	mm Hg
PRE-TEST TEMPERATURE	T ₁	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _{B(3)}	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	T ₃	°C	FINAL TANK PRESSURE	P _{T(3)}	mm Hg

TRAP BURNOUT

RUN A

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
			FINAL PRESSURE	P _{CV(2)}	mm Hg

RUN B

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
			FINAL PRESSURE	P _{CV(2)}	mm Hg

RUN C

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
			FINAL PRESSURE	P _{CV(2)}	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) 53.3, 47.5 Average 50.4 C_{VOC(1)}

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 296.2, 298.9, 307.2 Average 301 C_{VOC(4)}

Run B: _____ Average _____ C_{VOC(4)}

Run C: _____ Average _____ C_{VOC(4)}

Trap No. 108 (CO₂) Tank No. _____

PCS SAMPLE NO. 13765 DATE TRAP BURNOUT/ANALYST 6/17/81
CLIENT TRC P/N: 172.001 DATE TRAP ANALYSIS/ANALYST _____
TEST NO. 25-1-50-D DATE TANK ANALYSIS/ANALYST _____

FIELD DATA
PRE-TEST BAROMETRIC PRESSURE 755.6 mm Hg POST-TEST BAROMETRIC PRESSURE 755.6 mm Hg
PRE-TEST TANK VACUUM 743 mm Hg POST-TEST TANK VACUUM 276 mm Hg
PRE-TEST TEMPERATURE 11 °C POST-TEST TEMPERATURE 22 °C

TANK PRESSURIZATION DATA
LAB BAROMETRIC PRESSURE 747 mm Hg TANK VOLUME 4.835 L
LAB TEMPERATURE 22 °C FINAL TANK PRESSURE 600 mm Hg

TRAP BURNOUT
RUN A
COLLECTION VESSEL NO. 63
LAB BAROMETRIC PRESSURE 747 mm Hg COLLECTION VESSEL VOLUME 4.82 L
LAB TEMPERATURE 24 °C INITIAL VACUUM 730 mm Hg
FINAL PRESSURE 600 mm Hg

RUN B
COLLECTION VESSEL NO. _____
LAB BAROMETRIC PRESSURE _____ mm Hg COLLECTION VESSEL VOLUME _____ L
LAB TEMPERATURE _____ °C INITIAL VACUUM _____ mm Hg
FINAL PRESSURE _____ mm Hg

RUN C
COLLECTION VESSEL NO. _____
LAB BAROMETRIC PRESSURE _____ mm Hg COLLECTION VESSEL VOLUME _____ L
LAB TEMPERATURE _____ °C INITIAL VACUUM _____ mm Hg
FINAL PRESSURE _____ mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) _____ Average C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)
Run A: 39.8, 41.1, 41.2 Average 40.8 C_{VOC}(4)
Run B: _____, _____, _____ Average _____ C_{VOC}(4)
Run C: _____, _____, _____ Average _____ C_{VOC}(4)

PCS# 13768

~~UNCLASSIFIED~~ ~~CONFIDENTIAL~~ ~~SECRET~~

[illegible]

.....

POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGMND SAMPLE DATA

DATE : ~~10-1-1978~~ 6/19/81
TIME: 1:48:21

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13768
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-2-SO-C
TRAP # 106
TANK # 61

.....

TOTAL TGMND CONCENTRATION	914.6 PPM C1
	= .457 MG/L C1

TANK CONCENTRATION	316.8 PPM
TRAP CONCENTRATION	597.9 PPM

SAMPLE VOLUME	2.704 LITERS

.....

PRE-TEST BAROMETRIC	754.6 MM HG
TANK VACUUM	741 MM HG
TEMPERATURE	17 DEG C

POST-TEST BAROMETRIC	754.6 MM HG
TANK VACUUM	316 MM HG
TEMPERATURE	21 DEG. C

LAB BAROMETRIC	746 MM HG
LAB TEMPERATURE	24 DEG. C
TANK VOLUME	4.855 LITERS
FINAL TANK PRESSURE	600 MM HG

AVG. MEAS. TANK CONC.	101 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC	746 MM HG
TEMPERATURE	24 DEG. C
ICV VOLUME	4.82 LITERS
FINAL ICV PRESSURE	600 MM HG

AVG. MEAS. ICV CONC.	192 PPM C1

.....

POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGMND SAMPLE DATA

DATE : ~~10/1/1978~~
TIME: 2 :17 :17

6/19/81

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13768
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-2-SO-C
TRAP # 112
TANK # 61

TOTAL TGMND CONCENTRATION 117.5 PPM C1
= .059 MG/L C1

TANK CONCENTRATION 0 PPM
TRAP CONCENTRATION 117.5 PPM

SAMPLE VOLUME 2.704 LITERS

PRE-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 741 MM HG
TEMPERATURE 17 DEG C

POST-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 316 MM HG
TEMPERATURE 21 DEG. C

LAB BAROMETRIC 746 MM HG
LAB TEMPERATURE 24 DEG. C
TANK VOLUME 4.855 LITERS
FINAL TANK PRESSURE 600 MM HG

AVG. MEAS. TANK CONC. 0 PPM C1

♦DATA FOR FIRST ICV♦
LAB BAROMETRIC 746 MM HG
TEMPERATURE 24 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 612 MM HG

AVG. MEAS. ICV CONC. 37.4 PPM C1

Trap No. 106(H₂O) Tank No. 61

PCS SAMPLE NO. 13768 DATE TRAP BURNOUT/ANALYST 6/18/81 RB
 CLIENT TRC P/N: 172.001 DATE TRAP ANALYSIS/ANALYST 6/19/81 RB
 TEST NO. 25-2-50-C DATE TANK ANALYSIS/ANALYST 6/19/81 RB

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _B (1)	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _B (2)	mm Hg
PRE-TEST TANK VACUUM	P _T (1)	mm Hg	POST-TEST TANK VACUUM	P _T (2)	mm Hg
PRE-TEST TEMPERATURE	T ₁	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _B (3)	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	T ₃	°C	FINAL TANK PRESSURE	P _T (3)	mm Hg

TRAP BURNOUT

RUN A					
COLLECTION VESSEL NO.			COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN B

COLLECTION VESSEL NO.			COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN C

COLLECTION VESSEL NO.			COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) 120, 92.8, 90.8. Average 101 C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 188.8, 192.4, 195.3. Average 192 C_{VOC}(4)

Run B: _____, _____, _____. Average _____ C_{VOC}(4)

Run C: _____, _____, _____. Average _____ C_{VOC}(4)

T.G.N.M.O. DATA SHEET

Trap No. 112 (CO₂) Tank No. _____

PCS SAMPLE NO. 13768 DATE TRAP BURNOUT/ANALYST 6/18/81 AB
 CLIENT TRC P/N: 172.001 DATE TRAP ANALYSIS/ANALYST _____
 TEST NO. 25-2-50-c DATE TANK ANALYSIS/ANALYST _____

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _{B(1)}	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _{B(2)}	mm Hg
PRE-TEST TANK VACUUM	P _{T(1)}	mm Hg	POST-TEST TANK VACUUM	P _{T(2)}	mm Hg
PRE-TEST TEMPERATURE	T ₁	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _{B(3)}	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	T ₃	°C	FINAL TANK PRESSURE	P _{T(3)}	mm Hg

TRAP BURNOUT

RUN A
 COLLECTION VESSEL NO. _____
 LAB BAROMETRIC PRESSURE
 LAB TEMPERATURE

RUN B

COLLECTION VESSEL NO. _____
 LAB BAROMETRIC PRESSURE
 LAB TEMPERATURE

RUN C

COLLECTION VESSEL NO. _____
 LAB BAROMETRIC PRESSURE
 LAB TEMPERATURE

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) _____, _____, _____, Average _____ C_{VOC(1)}

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 35.5, 37.2, 39.6, Average 37.4 C_{VOC(4)}
 Run B: _____, _____, _____, Average _____ C_{VOC(4)}
 Run C: _____, _____, _____, Average _____ C_{VOC(4)}

PCS #: 13769

~~REMOVE FIELD DATA SHEET~~

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCRAMBER OUTLET</u>	
PROCESS TYPE <u>EPA / PLYWOOD</u>		OPERATOR <u>SOP</u>	
DATE <u>10 JUNE 81</u>		RUN NUMBER <u>25-2-50-D</u>	
TANK I.D. (s) <u>13</u>		TRAP I.D. (s) <u>H₂O-231</u> FILTER I.D. (s) <u>Day-103</u>	
TANK VACUUM, in Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	AIRLINE TEMPERATURE, °F
<u>378+316</u> PRETEST (in Hg)	<u>29.2</u> GAGE (in Hg)	<u>29.71</u>	<u>62°F</u>
<u>88+76</u> POST TEST (in Hg)	<u>16.7</u> GAGE (in Hg)	<u>29</u>	<u>21°C / 70°F</u>
LEAK RATE, in Hg/10 min.:	TANK	TRAP	FLOW REGULATOR SETTING cc/min.
PRETEST	<u>0</u>	<u>0</u>	
POST TEST	<u>X</u>	<u>0</u>	REGULATOR I.D. <u>1</u>
TIME	GAGE VACUUM, Inches Hg	COMMENTS	
<u>1420</u>	<u>29.0</u>	TRAIN ASSEMBLED	
<u>1427</u>	<u>27.3</u>	~20 MIN PRIOR	
<u>1435</u>	<u>25.5</u>	TO SAMPLE	
<u>1443</u>	<u>23.8</u>		
<u>1450</u>	<u>22.3</u>	STOP TEST PORT CHANGE	
<u>1552</u>	<u>22.3</u>	START	
<u>1608</u>	<u>19.7</u>		
<u>1609</u>	<u>17.8</u>		
<u>1615</u>	<u>16.1</u>		
<u>1622</u>	<u>14.9</u>	STOP TEST	

G-145

POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : ~~10-1-1978~~
TIME: 1:41:23

6/19/31

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13769
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-2-SO-D
TRAP # 231
TANK # 13

TOTAL TGNMO CONCENTRATION 748.5 PPM C1
= .374 MG/L C1

TANK CONCENTRATION 177.5 PPM
TRAP CONCENTRATION 571.0 PPM

SAMPLE VOLUME 3.598 LITERS

PRE-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 744 MM HG
TEMPERATURE 17 DEG C

POST-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 164 MM HG
TEMPERATURE 21 DEG. C

LAB BAROMETRIC 745 MM HG
LAB TEMPERATURE 24 DEG. C
TANK VOLUME 4.865 LITERS
FINAL TANK PRESSURE 600 MM HG

AVG. MEAS. TANK CONC. 77.3 PPM C1

♦DATA FOR FIRST ICV♦
LAB BAROMETRIC 745 MM HG
TEMPERATURE 24 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 600 MM HG

AVG. MEAS. ICV CONC. 251 PPM C1

POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGMND SAMPLE DATA

DATE : 10/1/1978
TIME: 1:45:15

6/19/81

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13769
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-2-30-D
TRAP # 103
TANK # 13

TOTAL TGMND CONCENTRATION 102.4 PPM C1
= .051 MG/L C1

TANK CONCENTRATION 0 PPM
TRAP CONCENTRATION 102.4 PPM

SAMPLE VOLUME 3.698 LITERS

PRE-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 744 MM HG
TEMPERATURE 17 DEG. C

POST-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 164 MM HG
TEMPERATURE 21 DEG. C

LAB BAROMETRIC 745 MM HG
LAB TEMPERATURE 24 DEG. C
TANK VOLUME 4.865 LITERS
FINAL TANK PRESSURE 600 MM HG

AVG. MEAS. TANK CONC. 0 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC 745 MM HG
TEMPERATURE 24 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 600 MM HG

AVG. MEAS. ICV CONC. 45 PPM C1

Trap No. 231(420) Tank No. 13

PCS SAMPLE NO. 13769 DATE TRAP BURNOUT/ANALYST 6/19/81, RB
 CLIENT TRC P/N: 172.001 DATE TRAP ANALYSIS/ANALYST _____
 TEST NO. 25-2-50-D DATE TANK ANALYSIS/ANALYST 6/19/81, RB

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _B (2)	mm Hg
PRE-TEST TANK VACUUM	mm Hg	POST-TEST TANK VACUUM	P _T (2)	mm Hg
PRE-TEST TEMPERATURE	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	°C	FINAL TANK PRESSURE	P _T (3)	mm Hg

TRAP BURNOUT

RUN A	
COLLECTION VESSEL NO.	
LAB BAROMETRIC PRESSURE	mm Hg
LAB TEMPERATURE	°C

RUN B

COLLECTION VESSEL NO.	
LAB BAROMETRIC PRESSURE	mm Hg
LAB TEMPERATURE	°C

RUN C

COLLECTION VESSEL NO.	
LAB BAROMETRIC PRESSURE	mm Hg
LAB TEMPERATURE	°C

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) 74.2, 79.8, Average 77.3 C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 242.5, 255.6, 254.0, Average 251 C_{VOC}(4)

Run B: _____, _____, _____, Average _____ C_{VOC}(4)

Run C: _____, _____, _____, Average _____ C_{VOC}(4)

Trap No. 103(CO₂) Tank No. _____

PCS SAMPLE NO. 13769 DATE TRAP BURNOUT/ANALYST 6/19/81 JP
 CLIENT TRC PA: 172.001 DATE TRAP ANALYSIS/ANALYST _____
 TEST NO. 25-2-50-D DATE TANK ANALYSIS/ANALYST _____

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE 754.6 mm Hg POST-TEST BAROMETRIC PRESSURE 754.6 mm Hg
 PRE-TEST TANK VACUUM 744 mm Hg POST-TEST TANK VACUUM 164 mm Hg
 PRE-TEST TEMPERATURE 17 °C POST-TEST TEMPERATURE 21 °C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE 745 mm Hg TANK VOLUME 4.865 L
 LAB TEMPERATURE 24 °C FINAL TANK PRESSURE 600 mm Hg

TRAP BURNOUT

RUN A
 COLLECTION VESSEL NO. _____
 LAB BAROMETRIC PRESSURE 745 mm Hg COLLECTION VESSEL VOLUME 4.82 L
 LAB TEMPERATURE 24 °C INITIAL VACUUM 730 mm Hg
 FINAL PRESSURE 600 mm Hg

RUN B

COLLECTION VESSEL NO. _____
 LAB BAROMETRIC PRESSURE _____ mm Hg COLLECTION VESSEL VOLUME _____ L
 LAB TEMPERATURE _____ °C INITIAL VACUUM _____ mm Hg
 FINAL PRESSURE _____ mm Hg

RUN C

COLLECTION VESSEL NO. _____
 LAB BAROMETRIC PRESSURE _____ mm Hg COLLECTION VESSEL VOLUME _____ L
 LAB TEMPERATURE _____ °C INITIAL VACUUM _____ mm Hg
 FINAL PRESSURE _____ mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) _____, _____, _____ Average _____ C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 439, 45.6, 45.6 Average 45.0 C_{VOC}(4)

Run B: _____, _____, _____ Average _____ C_{VOC}(4)

Run C: _____, _____, _____ Average _____ C_{VOC}(4)

FIELD DATA SHEET

FACILITY G-P SPRINGFIELD SAMPLE LOCATION SCRUBBER OUTLET
 PROCESS TYPE EPA-PLYWOOD OPERATOR SDF
 DATE 11 JUNE 81 EST NUMBER 25-3-50-A
 TANK I.D. (s) 24 TRAP I.D. (s) H₂O 105 FILTER I.D. (s) 024 204

TANK VACUUM, in Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	AIR TEMP. TEMPERATURE, °C
$\frac{379+365}{2} = 372$ PRETEST (in Hg) <u>74.3</u> GAGE <u>30+</u> (in Hg) (in Hg)	<u>296</u> 168	<u>29.65</u>	<u>15°C / 59°F</u>
$\frac{129+117}{2} = 123$ POST TEST (in Hg) <u>24</u> GAGE <u>12.1</u> (in Hg) (in Hg)	<u>30</u> 170	<u>11</u>	<u>22°C / 71°F</u>

LEAK RATE, in Hg/10 min.: TANK TRAP FLOW RESTRICTOR SETTING
 PRETEST 0 0 50 cc/min.
 POST TEST X -0.3 RESTRICTOR I.D. 6

MILLER	GAGE VACUUM, Inches Hg	COMMENTS
1200	30+	START TEST
12067	28.9	
1214	26.7	
1223	23.7	
1230	21.2	STOP PORT CHANGE
1352	21.2	RESTART
1403	17.8	
1412	14.9	STOP
1417	14.9	RESTART
1424	12.8	STOP TEST
1428	12.0	STOP TEST

5 min

POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGMND SAMPLE DATA

DATE : 6 / 24 / 1981
TIME : 14 : 56 : 34

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13772
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-3-SO-A
TRAP # 105
TANK # 24

TOTAL TGMND CONCENTRATION 534.6 PPM C1
= .267 MG/L C1

TANK CONCENTRATION 0 PPM
TRAP CONCENTRATION 534.6 PPM

SAMPLE VOLUME 3.135 LITERS

PRE-TEST BAROMETRIC 753.1 MM HG
TANK VACUUM 743 MM HG
TEMPERATURE 15 DEG C

POST-TEST BAROMETRIC 753.1 MM HG
TANK VACUUM 246 MM HG
TEMPERATURE 22 DEG. C

LAB BAROMETRIC 746.8 MM HG
LAB TEMPERATURE 22 DEG. C
TANK VOLUME 4.83 LITERS
FINAL TANK PRESSURE 620 MM HG

AVG. MEAS. TANK CONC. 0 PPM C1

◆DATA FOR FIRST ICV◆
LAB BAROMETRIC 746.8 MM HG
TEMPERATURE 22 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 604 MM HG

AVG. MEAS. ICV CONC. 197 PPM C1

.....
POLLUTION CONTROL SCIENCE, INC.
EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 /24 /1981
TIME: 15 :36 :7

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13772
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-3-SO-A
TRAP # 204
TANK # 24

.....
TOTAL TGNMO CONCENTRATION 176.8 PPM C1
= .088 MG/L C1
TANK CONCENTRATION 0 PPM
TRAP CONCENTRATION 176.8 PPM
SAMPLE VOLUME 3.135 LITERS
.....

PRE-TEST BAROMETRIC 753.1 MM HG
TANK VACUUM 743 MM HG
TEMPERATURE 15 DEG C

POST-TEST BAROMETRIC 753.1 MM HG
TANK VACUUM 246 MM HG
TEMPERATURE 22 DEG. C

LAB BAROMETRIC 746.1 MM HG
LAB TEMPERATURE 23 DEG. C
TANK VOLUME 4.83 LITERS
FINAL TANK PRESSURE 620 MM HG

AVG. MEAS. TANK CONC. 0 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC 746.1 MM HG
TEMPERATURE 23 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 610 MM HG

AVG. MEAS. ICV CONC. 65.1 PPM C1
.....

T.G.N.M.O. DATA SHEET

Trap No. 105 (H₂O) Tank No. 24

PCS SAMPLE NO.	13772	DATE TRAP	BURNOUT/ANALYST	6/24/81	DR/WID
CLIENT	TRC P/N 172.001	DATE TRAP	ANALYSIS/ANALYST	6/24/81	" "
TEST NO.	25-3-SO-A	DATE TANK	ANALYSIS/ANALYST	6/24/81	" "

FIELD DATA	
PRE-TEST BAROMETRIC PRESSURE	P _{B(1)} mm Hg
PRE-TEST TANK VACUUM	P _{T(1)} mm Hg
PRE-TEST TEMPERATURE	T ₁ °C
POST-TEST BAROMETRIC PRESSURE	P _{B(2)} mm Hg
POST-TEST TANK VACUUM	P _{T(2)} mm Hg
POST-TEST TEMPERATURE	T ₂ °C

TANK PRESURIZATION DATA			
LAB BAROMETRIC PRESSURE	$P_{B(3)}$	mm Hg	TANK VOLUME
LAB TEMPERATURE	T_3	°C	FINAL TANK PRESSURE
			V_T
			$P_{T(3)}$
			L
			mm Hg

TRAP BURNOUT		COLLECTION VESSEL NO.		LAB BAROMETRIC PRESSURE		LAB TEMPERATURE	
RUN A							
COLLECTION VESSEL VOLUME	INITIAL VACUUM	FINAL VACUUM	INITIAL PRESSURE	FINAL PRESSURE	INITIAL TEMPERATURE	FINAL TEMPERATURE	
V_{CV}	$P_{CV(1)}$	$P_{CV(2)}$	$P_B(4)$	T_4			
L	mm Hg	mm Hg	mm Hg	°C			
4.82	736	604	12	746.8	22		

RUN B
 COLLECTION VESSEL NO.
 LAB BAROMETRIC PRESSURE
 LAB TEMPERATURE

RUN C		COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME		V _{CV}		L	
LAB BAROMETRIC PRESSURE		P _{B(4)}		mm Hg		INITIAL VACUUM		mm Hg	
LAB TEMPERATURE		T ₄		°C		FINAL PRESSURE		mm Hg	

MEASURED TANK CONCENTRATIONS (as PPM CH₄ , NOT DILUTION CORRECTED) _____, < 2 , < 2 . Average < 2 . C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄ , NOT DILUTION CORRECTED)

Run A: 198 199 , 194 , 199 . Average 197 C_{VOC}(4)

Run B: _____ , _____ , _____ . Average _____ C_{VOC}(4)

Run C: _____ , _____ , _____ . Average _____ C_{VOC}(4)

Trap 105 - plugged on purge

T.G.N.M.O. DATA SHEET

Trap No. 204 (CO₂) Tank No. _____

PCS SAMPLE NO. 13772 P/N: 172.001 DATE TRAP BURNOUT/ANALYST 6/24/81 DR
 CLIENT TRC DATE TRAP ANALYSIS/ANALYST " " "
 TEST NO. 25-3-SO-A DATE TANK ANALYSIS/ANALYST " " "

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _{B(1)}	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _{B(2)}	mm Hg
PRE-TEST TANK VACUUM	P _{T(1)}	mm Hg	POST-TEST TANK VACUUM	P _{T(2)}	mm Hg
PRE-TEST TEMPERATURE	T ₁	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _{B(3)}	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	T ₃	°C	FINAL TANK PRESSURE	P _{T(3)}	mm Hg

TRAP BURNOUT

RUN A

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
			FINAL PRESSURE	P _{CV(2)}	mm Hg

RUN B

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
			FINAL PRESSURE	P _{CV(2)}	mm Hg

RUN C

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
			FINAL PRESSURE	P _{CV(2)}	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) _____ Average _____ C_{VOC(1)}

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 63.6, 66.3, 65.6, 64.8 Average 65.1 C_{VOC(4)}

Run B: _____ Average _____ C_{VOC(4)}

Run C: _____ Average _____ C_{VOC(4)}

SECRET

[illegible]

.....
POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 / 26 / 1981

TIME : 8 : 17 : 11

CLIENT: TRC

LOCATION: WETHERSFIELD CT

PCS SAMPLE # 13773

PCS PROJECT # 172.001

PROCESS I.D. CODE: 25-3-SO-B

TRAP # 212

TANK # 57

.....
TOTAL TGNMO CONCENTRATION 453.2 PPM C1
= .226 MG/L C1

TANK CONCENTRATION 39.0 PPM
TRAP CONCENTRATION 414.3 PPM

SAMPLE VOLUME 3.028 LITERS
.....

PRE-TEST BAROMETRIC 753.1 MM HG
TANK VACUUM 744 MM HG
TEMPERATURE 15 DEG C

POST-TEST BAROMETRIC 753.1 MM HG
TANK VACUUM 266 MM HG
TEMPERATURE 22 DEG. C

LAB BAROMETRIC 746.3 MM HG
LAB TEMPERATURE 26 DEG. C
TANK VOLUME 4.85 LITERS
FINAL TANK PRESSURE 672 MM HG

AVG. MEAS. TANK CONC. 13.3 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC 746.3 MM HG
TEMPERATURE 26 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 1590 MM HG

AVG. MEAS. ICV CONC. 86.4 PPM C1
.....

ENTER PCS SAMPLE NUMBER

.....
POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 /26 /1981
TIME: 8 :19 :29

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13773
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-3-SO-B
TRAP # 234
TANK # 57

.....
TOTAL TGNMO CONCENTRATION 641.1 PPM C1
= .320 MG/L C1

TANK CONCENTRATION 0 PPM
TRAP CONCENTRATION 641.1 PPM

SAMPLE VOLUME 3.028 LITERS
.....

PRE-TEST BAROMETRIC 753.1 MM HG
/ / TANK VACUUM 744 MM HG
/ / TEMPERATURE 15 DEG C

POST-TEST BAROMETRIC 753.1 MM HG
/ / TANK VACUUM 266 MM HG
/ / TEMPERATURE 22 DEG. C

LAB BAROMETRIC 745.6 MM HG
LAB TEMPERATURE 25 DEG. C
TANK VOLUME 4.85 LITERS
FINAL TANK PRESSURE 672 MM HG

AVG. MEAS. TANK CONC. 0 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC 745.6 MM HG
TEMPERATURE 25 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 608 MM HG

AVG. MEAS. ICV CONC. 230 PPM C1
.....

T.G.N.M.O. DATA SHEET

	Trap No.	Tank No.
	212 (H_2O)	57

PCS SAMPLE NO.	13773	DATE	TRAP BURNOUT/ANALYST
CLIENT	TRC P/N 172.001	DATE	TRAP ANALYSIS/ANALYST
TEST NO.	75-3-SO-B	DATE	TANK ANALYSIS/ANALYST

FIELD DATA	
PRE-TEST BAROMETRIC PRESSURE	mm Hg
PRE-TEST TANK VACUUM	mm Hg
PRE-TEST TEMPERATURE	°C
POST-TEST BAROMETRIC PRESSURE	mm Hg
POST-TEST TANK VACUUM	mm Hg
POST-TEST TEMPERATURE	°C

TANK PRESSURIZATION DATA			
LAB BAROMETRIC PRESSURE	$P_B(3)$	mm Hg	TANK VOLUME
LAB TEMPERATURE	T_3	°C	FINAL TANK PRESSURE
			V_T
			$P_T(3)$
			L
			mm Hg

TRAP BURNOUT					
RUN A					
<u>COLLECTION VESSEL NO.</u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
			FINAL PRESSURE	P _{CV(2)}	mm Hg
RUN B					
<u>COLLECTION VESSEL NO.</u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
			FINAL PRESSURE	P _{CV(2)}	mm Hg
RUN C					
<u>COLLECTION VESSEL NO.</u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
			FINAL PRESSURE	P _{CV(2)}	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄ , NOT DILUTION CORRECTED) _____, State, 644. Average 69.0 C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄ , NOT DILUTION CORRECTED)

Run A: 88.6, 84.2, 87.0 , 86.0 . Average 86.4 C_{VOC}(4)

Run B: _____, _____, _____, _____ . Average _____ C_{VOC}(4)

Run C: _____, _____, _____, _____ . Average _____ C_{VOC}(4)

ICV-45 → Atmospheric
then repressurized to 600
Red peak shape on backsheet

T.G.N.M.O. DATA SHEET

Trap No. 234 (02) Tank No. 57

PCS SAMPLE NO. 13773 DATE TRAP BURNOUT/ANALYST 6-25-84
 CLIENT TARC PN # 172-001 DATE TRAP ANALYSIS/ANALYST /
 TEST NO. 25-3-50-B DATE TANK ANALYSIS/ANALYST /

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _B (1)	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _B (2)	mm Hg
PRE-TEST TANK VACUUM	P _T (1)	mm Hg	POST-TEST TANK VACUUM	P _T (2)	mm Hg
PRE-TEST TEMPERATURE	T ₁	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _B (3)	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	T ₃	°C	FINAL TANK PRESSURE	P _T (3)	mm Hg

TRAP BURNOUT

RUN A					
COLLECTION VESSEL NO.			COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg
RUN B					
COLLECTION VESSEL NO.			COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg
RUN C					
COLLECTION VESSEL NO.			COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) _____, _____, _____, Average _____ C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A:	<u>228</u>	<u>229</u>	<u>232</u>	Average	<u>230</u>	C _{VOC} (4)
Run B:	_____	_____	_____	Average	_____	C _{VOC} (4)
Run C:	_____	_____	_____	Average	_____	C _{VOC} (4)

FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCAVENGER INLET</u>	
PROCESS TYPE <u>EPA-PLYWOOD</u>		OPERATOR <u>SDP</u>	
DATE <u>9-JUN-81</u>		KEY NUMBER <u>25-1-SI-C</u>	
DATE I.D. (s) <u>8</u>	TRAP I.D. (s) <u>H₂O-207</u>	FILTER I.D. (s) <u>DRY-227</u>	

GAGE VACUUM, in Hg	SPACE TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	AMBIENT TEMPERATURE, °C
PRETEST (MANOMETER) <u>743</u> GAGE ^{29.0} (in Hg) (in Hg)	226	29.75	11°C/62°F
168 + 156 POST TEST (MANOMETER) <u>324</u> GAGE ^{17.2} (in Hg) (in Hg)	313	11	22°C/66°F

LEAK RATE, in Hg/10 min.:	DATE	TIME	FLOW REGULATOR SETTING cc/min.
	PRETEST	0	
POST TEST		0	REGULATOR I.D. <u>1</u>

TIME	GAGE VACUUM, Inches Hg	COMMENTS
1529	28	
1534	27	
1539	26	
1544	24.5	
1549	23	
1554	21.5	
1559	20	Port Change
1645	20	Restart
1649	19	
1654	17.5	
1659	16	
1704	15	
1709	13	

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POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 / 22 / 1981

TIME: 13 : 14 : 36

CLIENT: TRC

LOCATION: WETHERSFIELD CT

PCS SAMPLE # 13766

PCS PROJECT # 172.001

PROCESS I.D. CODE: 25-1-SI-C

TRAP # 207

TANK # 8

.....
TOTAL TGNMO CONCENTRATION 534.8 PPM C1
= .267 MG/L C1

TANK CONCENTRATION 25.0 PPM
TRAP CONCENTRATION 509.7 PPM

SAMPLE VOLUME 2.652 LITERS
.....

PRE-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 743 MM HG
TEMPERATURE 11 DEG C

POST-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 324 MM HG
TEMPERATURE 22 DEG. C

LAB BAROMETRIC 747 MM HG
LAB TEMPERATURE 23 DEG. C
TANK VOLUME 4.85 LITERS
FINAL TANK PRESSURE 600 MM HG

AVG. MEAS. TANK CONC. 7.8 PPM C1

♦DATA FOR FIRST ICV♦
LAB BAROMETRIC 747 MM HG
TEMPERATURE 23 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 600 MM HG

AVG. MEAS. ICV CONC. 136 PPM C1

♦DATA FOR SECOND ICV♦
LAB BAROMETRIC 747 MM HG
TEMPERATURE 23 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 600 MM HG

AVG. MEAS. ICV CONC. 23.9 PPM C1
.....

POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 /22 /1981
TIME: 13 :17 :30

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13766
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-1-SI-C
TRAP # 227
TANK # 8

TOTAL TGNMO CONCENTRATION 267.7 PPM C1
= .134 MG/L C1

TANK CONCENTRATION 0 PPM
TRAP CONCENTRATION 267.7 PPM

SAMPLE VOLUME 2.652 LITERS

PRE-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 743 MM HG
TEMPERATURE 11 DEG C

POST-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 324 MM HG
TEMPERATURE 22 DEG. C

LAB BAROMETRIC 747 MM HG
LAB TEMPERATURE 21 DEG. C
TANK VOLUME 4.85 LITERS
FINAL TANK PRESSURE 600 MM HG

AVG. MEAS. TANK CONC. 0 PPM C1

♦DATA FOR FIRST ICV♦
LAB BAROMETRIC 747 MM HG
TEMPERATURE 21 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 600 MM HG

AVG. MEAS. ICV CONC. 83.4 PPM C1

Trap No. 207(H₂O) Tank No. 8

Rec'd 6/15/81

PCS SAMPLE NO. 13766 DATE TRAP BURNOUT/ANALYST 6/17/81 RB
CLIENT TRC P/N: 172.001 DATE TRAP ANALYSIS/ANALYST 6/19/81 RB
TEST NO. 25-1-SI-C DATE TANK ANALYSIS/ANALYST 6/19/81 RB

FIELD DATA			
PRE-TEST BAROMETRIC PRESSURE	mm Hg	POST-TEST BAROMETRIC PRESSURE	mm Hg
<u>755.6</u>		<u>755.6</u>	
PRE-TEST TANK VACUUM	mm Hg	POST-TEST TANK VACUUM	mm Hg
<u>743</u>		<u>324</u>	
PRE-TEST TEMPERATURE	°C	POST-TEST TEMPERATURE	°C
<u>11</u>		<u>22</u>	

TANK PRESSURIZATION DATA			
LAB BAROMETRIC PRESSURE	mm Hg	TANK VOLUME	L
<u>747</u>		<u>4.850</u>	
LAB TEMPERATURE	°C	FINAL TANK PRESSURE	mm Hg
<u>23</u>		<u>20</u>	

TRAP BURNOUT

RUN A			
COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME	L
<u>41</u>		<u>4.82</u>	
LAB BAROMETRIC PRESSURE	mm Hg	INITIAL VACUUM	mm Hg
<u>747</u>		<u>728</u>	
LAB TEMPERATURE	°C	FINAL PRESSURE	mm Hg
<u>23</u>		<u>600</u>	

RUN B			
COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME	L
<u>85</u>		<u>4.82</u>	
LAB BAROMETRIC PRESSURE	mm Hg	INITIAL VACUUM	mm Hg
<u>747</u>		<u>720</u>	
LAB TEMPERATURE	°C	FINAL PRESSURE	mm Hg
<u>23</u>		<u>600</u>	

RUN C			
COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME	L
LAB BAROMETRIC PRESSURE	mm Hg	INITIAL VACUUM	mm Hg
LAB TEMPERATURE	°C	FINAL PRESSURE	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) 4.8, 9.9, 8.6. Average 7.8 C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run	Concentration	Average	C _{VOC}
Run A:	<u>120.9</u> , <u>135.3</u> , <u>142.4</u>	<u>136</u>	C _{VOC} (4)
Run B:	<u>23.3</u> , <u>24.3</u> , <u>24.3</u>	<u>23.9</u>	C _{VOC} (4)
Run C:			C _{VOC} (4)

T.G.N.M.O. DATA SHEET

Trap No. 227(CO₂) Tank No. _____

PCS SAMPLE NO. 13766 DATE TRAP BURNOUT/ANALYST 6/18/81 783
 CLIENT TRC PN: 172.001 DATE TRAP ANALYSIS/ANALYST _____
 TEST NO. 25-1-SI-C DATE TANK ANALYSIS/ANALYST _____

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _B (1)	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _B (2)	mm Hg
PRE-TEST TANK VACUUM	P _T (1)	mm Hg	POST-TEST TANK VACUUM	P _T (2)	mm Hg
PRE-TEST TEMPERATURE	T ₁	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _B (3)	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	T ₃	°C	FINAL TANK PRESSURE	P _T (3)	mm Hg

TRAP BURNOUT

RUN A

COLLECTION VESSEL NO.	<u>43</u>	COLLECTION VESSEL VOLUME	V _{CV}	L	
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN B

COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME	V _{CV}	L	
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN C

COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME	V _{CV}	L	
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) _____, _____, _____, Average _____ C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 80.0, 83.2, 86.9, Average 83.4 C_{VOC}(4)

Run B: _____, _____, _____, Average _____ C_{VOC}(4)

Run C: _____, _____, _____, Average _____ C_{VOC}(4)

PCS# 13767

FIELD DATA SHEET

[illegible]

B-165

POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 /22 /1991
TIME: 13 :7 :16

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13767
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-1-SI-D
TRAP # 232
TANK # 67

TOTAL TGNMO CONCENTRATION 742.6 PPM C1
= .371 MG/L C1

TANK CONCENTRATION 22.5 PPM
TRAP CONCENTRATION 720.1 PPM

SAMPLE VOLUME 2.773 LITERS

PRE-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 737 MM HG
TEMPERATURE 11 DEG C

POST-TEST BAROMETRIC 755.6 MM HG
TANK VACUUM 300 MM HG
TEMPERATURE 22 DEG. C

LAB BAROMETRIC 747 MM HG
LAB TEMPERATURE 23 DEG. C
TANK VOLUME 4.865 LITERS
FINAL TANK PRESSURE 600 MM HG

AVG. MEAS. TANK CONC. 7.3 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC 746 MM HG
TEMPERATURE 23 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 608 MM HG

AVG. MEAS. ICV CONC. 235 PPM C1

EPA METHOD 25 - TGNMO SAMPLE DATA

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13767
PCS PROJECT # 172:001
PROCESS I.D. CODE: 25-1-SI-D
TRAP # 107
TANK # 67

TOTAL TGMMD CONCENTRATION	164.1 PPM C1
=	.092 MG/L C1
TANK CONCENTRATION	.0 PPM
TRAP CONCENTRATION	164.1 PPM
SAMPLE VOLUME	2.773 LITERS

PRE-TEST BAROMETRIC	755.6 MM HG
TANK VACUUM	737 MM HG
TEMPERATURE	11 DEG C

POST-TEST BAROMETRIC	755.6 MM HG
" TANK VACUUM	300 MM HG
" TEMPERATURE	22 DEG. C

LAB BAROMETRIC	747 MM HG
LAB TEMPERATURE	23 DEG. C
TANK VOLUME	4.865 LITERS
FINAL TANK PRESSURE	600 MM HG

AVG. MEAS. TANK CONC. 0 PPM C1

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♦DATA FOR FIRST ICV♦
LAB BAROMETRIC          746 MM HG
TEMPERATURE             24 DEG. C
ICV VOLUME              4.82 LITERS
FINAL ICV PRESSURE     900 MM HG
```

AVG. MEAS. ICV CONC. 44.2 PPM C1

G-167

Trap No. 232(H₂O) Tank No. 67

PCS SAMPLE NO. 13767 DATE TRAP BURNOUT/ANALYST 6/18/81, RS
 CLIENT TRC P/N: 172.001 DATE TRAP ANALYSIS/ANALYST 6/19/81, RS
 TEST NO. 25-1-SI-D DATE TANK ANALYSIS/ANALYST 6/19/81, RS

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _B (1)	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _B (2)	mm Hg
PRE-TEST TANK VACUUM	P _T (1)	mm Hg	POST-TEST TANK VACUUM	P _T (2)	mm Hg
PRE-TEST TEMPERATURE	T ₁	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _B (3)	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	T ₃	°C	FINAL TANK PRESSURE	P _T (3)	mm Hg

TRAP BURNOUT

RUN A

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV} (1)	mm Hg
			FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN B

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV} (1)	mm Hg
			FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN C

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV} (1)	mm Hg
			FINAL PRESSURE	P _{CV} (2)	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) 5.2, 9.9, 6.9 · Average 7.3 C_{VOC}(1)MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)Run A: 130.5, 132.7, 134.9 · Average 133 C_{VOC}(4)Run B: 229.4, 229.5, 240.1 · Average 235.0 C_{VOC}(4)Run C: , , · Average C_{VOC}(4)

Trap No. 107(CO₂) Tank No. _____

PCS SAMPLE NO. 13767 DATE TRAP BURNOUT/ANALYST 6/18/81 AB
CLIENT TRC P/N: 172.001 DATE TRAP ANALYSIS/ANALYST _____
TEST NO. 25-1-ST-D DATE TANK ANALYSIS/ANALYST _____

FIELD DATA
PRE-TEST BAROMETRIC PRESSURE 755.6 mm Hg POST-TEST BAROMETRIC PRESSURE 755.6 mm Hg
PRE-TEST TANK VACUUM 737 mm Hg POST-TEST TANK VACUUM 300 mm Hg
PRE-TEST TEMPERATURE 11 °C POST-TEST TEMPERATURE 22 °C

TANK PRESSURIZATION DATA
LAB BAROMETRIC PRESSURE 747 mm Hg TANK VOLUME 4.865 L
LAB TEMPERATURE 23 °C FINAL TANK PRESSURE 600 mm Hg

TRAP BURNOUT
RUN A
COLLECTION VESSEL NO. _____
LAB BAROMETRIC PRESSURE 30 mm Hg COLLECTION VESSEL VOLUME 4.82 L
LAB TEMPERATURE 746 °C INITIAL VACUUM 730 mm Hg
LAB TEMPERATURE 24 °C FINAL PRESSURE 900 mm Hg

RUN B
COLLECTION VESSEL NO. _____
LAB BAROMETRIC PRESSURE _____ mm Hg COLLECTION VESSEL VOLUME _____ L
LAB TEMPERATURE _____ °C INITIAL VACUUM _____ mm Hg
LAB TEMPERATURE _____ °C FINAL PRESSURE _____ mm Hg

RUN C
COLLECTION VESSEL NO. _____
LAB BAROMETRIC PRESSURE _____ mm Hg COLLECTION VESSEL VOLUME _____ L
LAB TEMPERATURE _____ °C INITIAL VACUUM _____ mm Hg
LAB TEMPERATURE _____ °C FINAL PRESSURE _____ mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) _____, _____, _____, Average _____ C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 43.15, 43.83, 45.77, Average 44.2 C_{VOC}(4)
Run B: _____, _____, _____, Average _____ C_{VOC}(4)
Run C: _____, _____, _____, Average _____ C_{VOC}(4)

PCS# 13770

FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCRUBBER INLET</u>	
PROCESS TYPE <u>EPA/PLYWOOD</u>		OPERATOR <u>SOP</u>	
DATE <u>10 JUNE 81</u>		RUN NUMBER <u>25-2-SI-C</u>	
TANK I.D. (s) <u>58</u>		TRAP I.D. (s) <u>40 101</u> DAY <u>209</u>	

TANK VACUUM, in Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	Ambient TEMPERATURE, °C
378 + 366 PRETEST (MANOMETER) (in Hg)	29.8 GAGE (in Hg)	311	29.7 / 62°F
212 + 200 POST TEST (MANOMETER) (in Hg)	16.8 GAGE (in Hg)	317	11 / 21°C / 70°F

LEAK RATE, in Hg/10 min.:	TANK	TRAP	FLOW REGULATOR SETTING cc/min.	
	PRETEST	0		0
	POST TEST	X	0	REGULATOR I.D. <u>7</u>

TIME	GAGE VACUUM, Inches Hg	COMMENTS
Start	29	Start
5	28	
10	27	
15	25.8	
20	24.8	
25	23.8	
30	22.5	change Port
	22.5	Restart
35	21.5	
40	20.8	
45	19.8	
50	18.5	
55	17.5	
60	16.8	

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POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGMND SAMPLE DATA

DATE : 6 / 22 / 1981
TIME : 16 : 34 : 28

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13770
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-2-SI-C
TRAP # 209
TANK # 58

.....
TOTAL TGMND CONCENTRATION 352.2 PPM C1
= .176 MG/L C1
TANK CONCENTRATION 0.0 PPM
TRAP CONCENTRATION 352.2 PPM
SAMPLE VOLUME 2.112 LITERS
.....

PRE-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 744 MM HG
TEMPERATURE 17 DEG C

POST-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 412 MM HG
TEMPERATURE 21 DEG. C

LAB BAROMETRIC 745 MM HG
LAB TEMPERATURE 25 DEG. C
TANK VOLUME 4.855 LITERS
FINAL TANK PRESSURE 628 MM HG

AVG. MEAS. TANK CONC. 0 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC 744.6 MM HG
TEMPERATURE 25 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 596 MM HG

AVG. MEAS. ICV CONC. 89 PPM C1
.....

Trap No. 101(40) Tank No. 58Rec'd 6/5/81PCS SAMPLE NO. 13770DATE TRAP BURNOUT/ANALYST 6/19/81, ABCLIENT TRC P/N: 172.001DATE TRAP ANALYSIS/ANALYST TEST NO. 25-2-SI-CDATE TANK ANALYSIS/ANALYST

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	<u>754.6</u>	mm Hg	POST-TEST BAROMETRIC PRESSURE	<u>754.6</u>	mm Hg
PRE-TEST TANK VACUUM	<u>744</u>	mm Hg	POST-TEST TANK VACUUM	<u>412</u>	mm Hg
PRE-TEST TEMPERATURE	<u>17</u>	°C	POST-TEST TEMPERATURE	<u>21</u>	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	<u>745</u>	mm Hg	TANK VOLUME	<u>4.855</u>	L
LAB TEMPERATURE	<u>25</u>	°C	FINAL TANK ~~PRESSURE~~	<u>140</u>	mm Hg

TRAP BURNOUT

RUN A					
COLLECTION VESSEL NO.	<u>77</u>		COLLECTION VESSEL VOLUME	<u>4.83</u>	L
LAB BAROMETRIC PRESSURE	<u>745</u>	mm Hg	INITIAL VACUUM	<u>730</u>	mm Hg
LAB TEMPERATURE	<u>25</u>	°C	FINAL PRESSURE	<u>628</u>	mm Hg

RUN B

COLLECTION VESSEL NO.			COLLECTION VESSEL VOLUME		L
LAB BAROMETRIC PRESSURE		mm Hg	INITIAL VACUUM		mm Hg
LAB TEMPERATURE		°C	FINAL PRESSURE		mm Hg

RUN C

COLLECTION VESSEL NO.			COLLECTION VESSEL VOLUME		L
LAB BAROMETRIC PRESSURE		mm Hg	INITIAL VACUUM		mm Hg
LAB TEMPERATURE		°C	FINAL PRESSURE		mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) , 105.1, 106.3. Average 106 C_{VOC}(1)MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)Run A: 130.5, 132.7, 134.9. Average 133 C_{VOC}(4) 543Run B: , , . Average C_{VOC}(4)Run C: , , . Average C_{VOC}(4)

Trap No. 209(CO₂) Tank No. _____

PCS SAMPLE NO. <u>13770</u>		DATE TRAP BURNOUT/ANALYST _____	
CLIENT <u>TRC</u>		DATE TRAP ANALYSIS/ANALYST _____	
TEST NO. <u>25-2-SI-C</u>		DATE TANK ANALYSIS/ANALYST _____	

FIELD DATA			
PRE-TEST BAROMETRIC PRESSURE	mm Hg	POST-TEST BAROMETRIC PRESSURE	mm Hg
<u>754.6</u>		<u>754.6</u>	
PRE-TEST TANK VACUUM	mm Hg	POST-TEST TANK VACUUM	mm Hg
<u>744</u>		<u>412</u>	
PRE-TEST TEMPERATURE	°C	POST-TEST TEMPERATURE	°C
<u>17</u>		<u>21</u>	

TANK PRESSURIZATION DATA			
LAB BAROMETRIC PRESSURE	mm Hg	TANK VOLUME	L
<u>745</u>		<u>4.855</u>	
LAB TEMPERATURE	°C	FINAL TANK PRESSURE	mm Hg
<u>25</u>		<u>628</u>	

TRAP BURNOUT			
RUN A			
COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME	L
<u>7</u>		<u>4.82</u>	
LAB BAROMETRIC PRESSURE	mm Hg	INITIAL VACUUM	mm Hg
<u>744.6</u>		<u>735</u>	
LAB TEMPERATURE	°C	FINAL PRESSURE	mm Hg
<u>25</u>		<u>596</u>	
RUN B			
COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME	L
LAB BAROMETRIC PRESSURE	mm Hg	INITIAL VACUUM	mm Hg
LAB TEMPERATURE	°C	FINAL PRESSURE	mm Hg
RUN C			
COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME	L
LAB BAROMETRIC PRESSURE	mm Hg	INITIAL VACUUM	mm Hg
LAB TEMPERATURE	°C	FINAL PRESSURE	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH ₄ , NOT DILUTION CORRECTED)		Average <u>428</u> C _{VOC} (1)	
MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH ₄ , NOT DILUTION CORRECTED)			
Run A:	<u>85.2</u>	<u>90.2</u>	<u>91.7</u>
Run B:			
Run C:			

PCS#: 13771

~~CONFIDENTIAL~~

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>CLAUSBER INLET</u>	
PROCESS TYPE <u>EPA / PLYWOOD</u>		OPERATOR <u>SOP</u>	
DATE <u>10 JUNE 81</u>		WKS NUMBER <u>25-2-SI-D</u>	
TANK I.D. (s) <u>57</u>		TANK I.D. (s) <u>H2O 27</u> FILTER I.D. (s) <u>DRY 201</u>	
TANK VACUUM, in Hg	SPACE TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	AIR TEMP. TEMPERATURE, °C
<u>378+366</u> PRETEST (MANOMETER) (in Hg)	<u>29.6</u> GAGE (in Hg)	<u>311</u>	<u>29.71</u> / <u>62°F</u>
<u>167+155</u> POST TEST (MANOMETER) (in Hg)	<u>30</u> GAGE (in Hg)	<u>317</u>	<u>11</u> / <u>51°C / 70°F</u>
LEAK RATE, in Hg/10 min.:	TANK	TANK	FLOW REGULATING SETTING cc/min.
PRETEST	<u>0</u>	<u>0</u>	
POST TEST	<u>X</u>	<u>-1</u>	REGULATOR I.D. <u>8</u>
TIME	GAGE VACUUM, Inches Hg	COMMENTS	
Start	<u>29</u>		
5	<u>27.5</u>		
10	<u>25.6</u>		
15	<u>24.7</u>		
20	<u>23</u>		
25	<u>21.8</u>		
30	<u>20</u>	Change Port	
	<u>20</u>	Restart	
35	<u>19</u>		
40	<u>17.5</u>		
45	<u>16.5</u>		
50	<u>15.2</u>		
55	<u>14.2</u>		
60	<u>13.1</u>		

POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 /22 /1981
TIME: 17 :31 :5

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13771
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-2-SI-D
TRAP # 27
TANK # 51

TOTAL TGNMO CONCENTRATION 1091.4 PPM C1
= .545 MG/L C1

TANK CONCENTRATION 541.8 PPM
TRAP CONCENTRATION 549.7 PPM

SAMPLE VOLUME 2.577 LITERS

PRE-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 744 MM HG
TEMPERATURE 17 DEG C

POST-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 322 MM HG
TEMPERATURE 21 DEG. C

LAB BAROMETRIC 739.8 MM HG
LAB TEMPERATURE 24 DEG. C
TANK VOLUME 4.84 LITERS
FINAL TANK PRESSURE 668 MM HG

AVG. MEAS. TANK CONC. 164 PPM C1

◆DATA FOR FIRST ICV◆
LAB BAROMETRIC 739.8 MM HG
TEMPERATURE 24 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 652 MM HG

AVG. MEAS. ICV CONC. 169 PPM C1

POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 /22 /1981
TIME: 17 :33 :40

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13771
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-2-SI-D
TRAP # 201
TANK # 51

.....
TOTAL TGNMO CONCENTRATION 367.9 PPM C1
= .184 MG/L C1

TANK CONCENTRATION 0 PPM
TRAP CONCENTRATION 367.9 PPM

SAMPLE VOLUME 2.577 LITERS
.....

PRE-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 744 MM HG
TEMPERATURE 17 DEG C

POST-TEST BAROMETRIC 754.6 MM HG
TANK VACUUM 322 MM HG
TEMPERATURE 21 DEG. C

LAB BAROMETRIC 739.8 MM HG
LAB TEMPERATURE 25 DEG. C
TANK VOLUME 4.84 LITERS
FINAL TANK PRESSURE 668 MM HG

AVG. MEAS. TANK CONC. 0 PPM C1

♦DATA FOR FIRST ICV♦
LAB BAROMETRIC 741.5 MM HG
TEMPERATURE 25 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 644 MM HG

AVG. MEAS. ICV CONC. 114 PPM C1
.....

Trap No. 27(H₂O) Tank No. 51

PCS SAMPLE NO. 13771 DATE TRAP BURNOUT/ANALYST 6/22 DR
 CLIENT TRC PH: 172.001 DATE TRAP ANALYSIS/ANALYST /
 TEST NO. 25-2-SI-D DATE TANK ANALYSIS/ANALYST /

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _B (2)	mm Hg
PRE-TEST TANK VACUUM	mm Hg	POST-TEST TANK VACUUM	P _T (2)	mm Hg
PRE-TEST TEMPERATURE	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	°C	FINAL TANK PRESSURE	P _T (3)	mm Hg

TRAP BURNOUT

RUN A

COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN B

COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN C

COLLECTION VESSEL NO.		COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) 166.3 162 164 Average 166 C_{VOC}(1)MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)Run A: 167.1, 168.8, 170.1 Average 169 C_{VOC}(4)Run B: _____, _____, _____ Average _____ C_{VOC}(4)Run C: _____, _____, _____ Average _____ C_{VOC}(4)

Trap plug loose
→ v. high CO₂ in purge

Trap No. 201(CO₂) Tank No. _____

DATE TRAP BURNOUT/ANALYST _____

DATE TRAP ANALYSIS/ANALYST _____

DATE TANK ANALYSIS/ANALYST _____

PCS SAMPLE NO. 13771CLIENT TRC P/N: 172:001TEST NO. 25-2-SI-D

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE

PRE-TEST TANK VACUUM

PRE-TEST TEMPERATURE

 $P_{B(1)}$ $P_{T(1)}$ T_1 754.674417

mm Hg

mm Hg

°C

POST-TEST BAROMETRIC PRESSURE

POST-TEST TANK VACUUM

POST-TEST TEMPERATURE

 $P_{B(2)}$ $P_{T(2)}$ T_2 754.632221

mm Hg

mm Hg

°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE

LAB TEMPERATURE

 $P_{B(3)}$ T_3 739.825

mm Hg

°C

TANK VOLUME

FINAL TANK PRESSURE

 V_T $P_{T(3)}$ 4.840668

L

mm Hg

TRAP BURNOUT

RUN A

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE

LAB TEMPERATURE

 $P_{B(4)}$ T_4 2741.525

mm Hg

°C

COLLECTION VESSEL VOLUME

INITIAL VACUUM

FINAL PRESSURE

 V_{CV} $P_{CV(1)}$ $P_{CV(2)}$ 4.82730644

L

mm Hg

mm Hg

RUN B

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE

LAB TEMPERATURE

 $P_{B(4)}$ T_4 2741.525

mm Hg

°C

COLLECTION VESSEL VOLUME

INITIAL VACUUM

FINAL PRESSURE

 V_{CV} $P_{CV(1)}$ $P_{CV(2)}$

L

mm Hg

mm Hg

RUN C

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE

LAB TEMPERATURE

 $P_{B(4)}$ T_4 2741.525

mm Hg

°C

COLLECTION VESSEL VOLUME

INITIAL VACUUM

FINAL PRESSURE

 V_{CV} $P_{CV(1)}$ $P_{CV(2)}$

L

mm Hg

mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) _____, _____, _____, Average $C_{VOC(1)}$ MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)Run A: 109.8, 114.9, 117.6, Average 114 $C_{VOC(4)}$ Run B: _____, _____, _____, Average _____ $C_{VOC(4)}$ Run C: _____, _____, _____, Average _____ $C_{VOC(4)}$

REPORT FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCRUBBER INLET</u>	
PROCESS TYPE <u>EPA-PL40000</u>		OPERATOR <u>SOP</u>	
DATE <u>11 JUNE 81</u>		RUN NUMBER <u>25-3-SI-C</u>	
TANK I.D.(s) <u>71</u>		TANK I.D. (s) <u>H₂O 213</u> <u>DRY 214</u>	
TANK VACUUM, in Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	AIR TEST TEMPERATURE, °C
<u>378 + 365</u> PRETEST (in Hg) (= Hg)	<u>30+</u> GAGE (in Hg)	<u>29.6</u>	<u>15°C / 59°F</u>
<u>129 + 117</u> POST TEST (in Hg) (= Hg)	<u>16</u> GAGE (in Hg)	<u>310</u>	<u>11</u> <u>22°C / 71°F</u>
LEAK RATE, in Hg/10 min.:		DATE	TIME
PRETEST		<u>0</u>	<u>0</u>
POST TEST		<u>X</u>	<u>0</u>
		FLOW REGULATOR SETTING _____ cc/min.	
		REGULATOR I.D. <u>4</u>	
TIME	GAGE VACUUM, Inches Hg	COMMENTS	
Start	<u>29.8</u>	TRAIN SHARES	
5	<u>28.3</u>	COMMON GET 1/8"	
10	<u>27</u>	HEATED SS TUBING	
15	<u>25.5</u>	WITH 25-3-SI-D	
20	<u>23.8</u>	TO DRAW SAMPLE	
25	<u>22.5</u>		
30	<u>21</u>	change Port	
Restart	<u>20.8</u>		
35	<u>19.5</u>		
40	<u>17</u>		
45	<u>16.4</u>		
50	<u>13</u>		
55	<u>12</u>		
60	<u>11</u>		

.....
POLLUTION CONTROL SCIENCE, INC..
EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 /26 /1981
TIME: 8 :23 :10

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13774
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-3-SI-C
TRAP # 213
TANK # 71

.....
TOTAL TGNMO CONCENTRATION 655.1 PPM C1
= .327 MG/L C1

TANK CONCENTRATION 159.2 PPM
TRAP CONCENTRATION 496.0 PPM

SAMPLE VOLUME 3.145 LITERS
.....

PRE-TEST BAROMETRIC 753.1 MM HG
TANK VACUUM 743 MM HG
TEMPERATURE 15 DEG C

POST-TEST BAROMETRIC 753.1 MM HG
TANK VACUUM 246 MM HG
TEMPERATURE 22 DEG. C

LAB BAROMETRIC 745.6 MM HG
LAB TEMPERATURE 25 DEG. C
TANK VOLUME 4.845 LITERS
FINAL TANK PRESSURE 608 MM HG

AVG. MEAS. TANK CONC. 59 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC 745.6 MM HG
TEMPERATURE 25 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 652 MM HG

AVG. MEAS. ICV CONC. 179 PPM C1
.....

.....
POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGNMO SAMPLE DATA

DATE : 6 /26 /1981
TIME: 8 :25 :37

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13774
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-3-SI-C
TRAP # 214
TANK # 71

.....
TOTAL TGNMO CONCENTRATION 550.8 PPM C1
= .275 MG/L C1

TANK CONCENTRATION 0 PPM
TRAP CONCENTRATION 550.8 PPM

SAMPLE VOLUME 3.123 LITERS
.....

PRE-TEST BAROMETRIC 753.1 MM HG
TANK VACUUM 743 MM HG
TEMPERATURE 15 DEG C

POST-TEST BAROMETRIC 753.1 MM HG
TANK VACUUM 246 MM HG
TEMPERATURE 24 DEG. C

LAB BAROMETRIC 745.7 MM HG
LAB TEMPERATURE 25 DEG. C
TANK VOLUME 4.845 LITERS
FINAL TANK PRESSURE 608 MM HG

AVG. MEAS. TANK CONC. 0 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC 745.6 MM HG
TEMPERATURE 25 DEG. C
ICV VOLUME 4.82 LITERS
FINAL ICV PRESSURE 648 MM HG

AVG. MEAS..ICV CONC. 198 PPM C1
.....

T.G.N.M.O. DATA SHEET

Trap No. 213(420) Tank No. 71

PCS SAMPLE NO. 13774 DATE TRAP BURNOUT/ANALYST 6-25-81, WD
 CLIENT TRC DATE TRAP ANALYSIS/ANALYST 6-26-81, JP
 TEST NO. 25-3-SI-C DATE TANK ANALYSIS/ANALYST 6-25-81, JR

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _B (1)	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _B (2)	mm Hg
PRE-TEST TANK VACUUM	P _T (1)	mm Hg	POST-TEST TANK VACUUM	P _T (2)	mm Hg
PRE-TEST TEMPERATURE	T ₁	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _B (3)	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	T ₃	°C	FINAL TANK PRESSURE	P _T (3)	mm Hg

TRAP BURNOUT

RUN A

COLLECTION VESSEL NO.			COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN B

COLLECTION VESSEL NO.			COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN C

COLLECTION VESSEL NO.			COLLECTION VESSEL VOLUME	V _{CV}	L
LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	INITIAL VACUUM	P _{CV} (1)	mm Hg
LAB TEMPERATURE	T ₄	°C	FINAL PRESSURE	P _{CV} (2)	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) 56.6, 66.4, Average 59.0 C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 175, 180, 181, Average 179 C_{VOC}(4)
 Run B: _____, _____, _____, Average _____ C_{VOC}(4)
 Run C: _____, _____, _____, Average _____ C_{VOC}(4)

*Bad peak shape on background
 was very difficult to duplicate.*

T.G.N.M.O. DATA SHEET

Trap No. 214(CO₂) Tank No. 71

PCS SAMPLE NO. 13774 DATE TRAP BURNOUT/ANALYST 6-25-81
 CLIENT TRC DATE TRAP ANALYSIS/ANALYST
 TEST NO. 25-3-SI-C DATE TANK ANALYSIS/ANALYST

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _{B(1)}	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _{B(2)}	mm Hg
PRE-TEST TANK VACUUM	P _{T(1)}	mm Hg	POST-TEST TANK VACUUM	P _{T(2)}	mm Hg
PRE-TEST TEMPERATURE	T ₁	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _{B(3)}	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	T ₃	°C	FINAL TANK PRESSURE	P _{T(3)}	mm Hg

TRAP BURNOUT

RUN A					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN B					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN C					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN D					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN E					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN F					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN G					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN H					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN I					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN J					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN K					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN L					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN M					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN N					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN O					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN P					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN Q					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN R					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN S					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN T					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN U					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN V					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN W					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN X					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN Y					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg
RUN Z					
COLLECTION VESSEL NO. <u> </u>					
LAB BAROMETRIC PRESSURE	P _{B(4)}	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV(1)}	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) , , Average C_{VOC(1)}

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)

Run A: 194,200, 201, 198 Average 198 C_{VOC(4)}
 Run B: , , Average C_{VOC(4)}
 Run C: , , Average C_{VOC(4)}

PCS# : 13775

GROUND FIELD DATA SHEET

FACILITY <u>G-P SPRINGFIELD</u>		SAMPLE LOCATION <u>SCRAMBER INLET</u>	
PROCESS TYPE <u>EPA / PLYWOOD</u>		OPERATOR <u>2DP</u>	
DATE <u>11 JUNE 81</u>		HIS NUMBER <u>25-3-SI-D</u>	
TANK I.D. (s) <u>7</u>		TRAP I.D. (s) <u>H2O 217</u> FILTER I.D. (s) <u>DRY 203</u>	

TANK VACUUM, in Hg	STACK TEMPERATURE, °F	BAROMETRIC PRESSURE, in Hg	Ambient TEMPERATURE, °C
379+365 PRETEST (MANOMETER) (in Hg)	30+ GAUGE (in Hg)	29.6	29.65
105+9.3 POST TEST (MANOMETER) (in Hg)	11.3 GAUGE (in Hg)	31.0	11

LEAK RATE: in Hg/10 min.:	DATE	TIME	FLOW REGULATOR SETTING cc/min.
PRETEST	0	0	
POST TEST	X	0	REGULATOR I.D. <u>3</u>

TIME	GAGE VACUUM, Inches Hg	COMMENTS
Start	30	TRAIN SHARES
5	28	COMMON 6 FT 1/2" HEATED
10	26.8	SS TUBING WITH
15	25	25-3-SI-C TO
20	23	DRAW SAMPLE
25	21.9	
30	21	Change Post
Restart	20.5	
35	18.3	
40	17.8	
45	15.5	
50	13	
55	12	
60	11	

.....

POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGMND SAMPLE DATA

DATE : 6 /26 /1981
TIME: 15 :3 :55

CLIENT: TRC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13775
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-3-SI-D
TRAP # 217
TANK # 7

.....

TOTAL TGMND CONCENTRATION	679.2 PPM C1
=	.339 MG/L C1

TANK CONCENTRATION	102.6 PPM
TRAP CONCENTRATION	576.7 PPM

SAMPLE VOLUME	3.459 LITERS

.....

PRE-TEST BAROMETRIC	753.1 MM HG
TANK VACUUM	744 MM HG
TEMPERATURE	15 DEG C

POST-TEST BAROMETRIC	753.1 MM HG
TANK VACUUM	198 MM HG
TEMPERATURE	22 DEG. C

LAB BAROMETRIC	745.8 MM HG
LAB TEMPERATURE	25 DEG. C
TANK VOLUME	4.85 LITERS
FINAL TANK PRESSURE	604 MM HG

AVG. MEAS. TANK CONC.	41.9 PPM C1

◆DATA FOR FIRST ICV◆

LAB BAROMETRIC	745.8 MM HG
TEMPERATURE	25 DEG. C
ICV VOLUME	4.82 LITERS
FINAL ICV PRESSURE	604 MM HG

AVG. MEAS. ICV CONC.	237 PPM C1

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POLLUTION CONTROL SCIENCE, INC.

EPA METHOD 25 - TGMNO SAMPLE DATA

DATE : 6 /26 /1981
TIME: 15 :6 :19

CLIENT: TPC
LOCATION: WETHERSFIELD CT
PCS SAMPLE # 13775
PCS PROJECT # 172.001
PROCESS I.D. CODE: 25-3-SI-D
TRAP # 203
TANK # 7

.....

TOTAL TGMNO CONCENTRATION	315.9 PPM C1
	= .158 MG/L C1

TANK CONCENTRATION	.0 PPM
TRAP CONCENTRATION	315.9 PPM

SAMPLE VOLUME	3.459 LITERS

.....

PRE-TEST BAROMETRIC	753.1 MM HG
TANK VACUUM	744 MM HG
TEMPERATURE	15 DEG C

POST-TEST BAROMETRIC	753.1 MM HG
TANK VACUUM	198 MM HG
TEMPERATURE	22 DEG. C

LAB BAROMETRIC	747.6 MM HG
LAB TEMPERATURE	24 DEG. C
TANK VOLUME	4.85 LITERS
FINAL TANK PRESSURE	604 MM HG

AVG. MEAS. TANK CONC.	0 PPM C1

♦DATA FOR FIRST ICV♦

LAB BAROMETRIC	747.6 MM HG
TEMPERATURE	24 DEG. C
ICV VOLUME	4.82 LITERS
FINAL ICV PRESSURE	708 MM HG

AVG. MEAS. ICV CONC.	120 PPM C1

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T.G.N.M.O. DATA SHEET

Trap No. 217(H₂O) Tank No. 7

PCS SAMPLE NO. 13775 DATE TRAP BURNOUT/ANALYST 6/25/81 WD
 CLIENT TRC PN: 172.001 DATE TRAP ANALYSIS/ANALYST 6/26/81 DR
 TEST NO. 25-3-SI-D DATE TANK ANALYSIS/ANALYST 6/26/81 DR

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _B (1)	<u>753.1</u>	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _B (2)	<u>753.1</u>	mm Hg
PRE-TEST TANK VACUUM	P _T (1)	<u>744</u>	mm Hg	POST-TEST TANK VACUUM	P _T (2)	<u>198</u>	mm Hg
PRE-TEST TEMPERATURE	T ₁	<u>15</u>	°C	POST-TEST TEMPERATURE	T ₂	<u>22</u>	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _B (3)	<u>745.8</u>	mm Hg	TANK VOLUME	V _T	<u>4.850</u>	L
LAB TEMPERATURE	T ₃	<u>25</u>	°C	FINAL TANK PRESSURE	P _T (3)	<u>604</u>	mm Hg

TRAP BURNOUT

RUN A							
COLLECTION VESSEL NO.		<u>55</u>		COLLECTION VESSEL VOLUME	V _{CV}	<u>4.82</u>	L
LAB BAROMETRIC PRESSURE	P _B (4)	<u>745.8</u>	mm Hg	INITIAL VACUUM	P _{CV} (1)	<u>736</u>	mm Hg
LAB TEMPERATURE	T ₄	<u>25</u>	°C	FINAL PRESSURE	P _{CV} (2)	<u>604</u>	mm Hg
RUN B							
COLLECTION VESSEL NO.				COLLECTION VESSEL VOLUME	V _{CV}		L
LAB BAROMETRIC PRESSURE	P _B (4)		mm Hg	INITIAL VACUUM	P _{CV} (1)		mm Hg
LAB TEMPERATURE	T ₄		°C	FINAL PRESSURE	P _{CV} (2)		mm Hg
RUN C							
COLLECTION VESSEL NO.				COLLECTION VESSEL VOLUME	V _{CV}		L
LAB BAROMETRIC PRESSURE	P _B (4)		mm Hg	INITIAL VACUUM	P _{CV} (1)		mm Hg
LAB TEMPERATURE	T ₄		°C	FINAL PRESSURE	P _{CV} (2)		mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) 41.16, 40.65, 43.98. Average 41.9 C_{VOC}(1)

MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) Tank was near atmospheric pressure when attached for trap purge

Run A: 236.3, 238.0, 235.6. Average 237 C_{VOC}(4)

Run B: _____, _____, _____. Average _____ C_{VOC}(4)

Run C: _____, _____, _____. Average _____ C_{VOC}(4)

T.G.N.M.O. DATA SHEET

Trap No. 203(CO₂) Tank No. 7

PCS SAMPLE NO. 13775 DATE TRAP BURNOUT/ANALYST 6/26/81 DR
CLIENT TRC P/N: 172.001 DATE TRAP ANALYSIS/ANALYST 6/26/81 in
TEST NO. 25-3-SI-D DATE TANK ANALYSIS/ANALYST 6/26/81 in

FIELD DATA

PRE-TEST BAROMETRIC PRESSURE	P _B (1)	mm Hg	POST-TEST BAROMETRIC PRESSURE	P _B (2)	mm Hg
PRE-TEST TANK VACUUM	P _T (1)	mm Hg	POST-TEST TANK VACUUM	P _T (2)	mm Hg
PRE-TEST TEMPERATURE	T ₁	°C	POST-TEST TEMPERATURE	T ₂	°C

TANK PRESSURIZATION DATA

LAB BAROMETRIC PRESSURE	P _B (3)	mm Hg	TANK VOLUME	V _T	L
LAB TEMPERATURE	T ₃	°C	FINAL TANK PRESSURE	P _T (3)	mm Hg

TRAP BURNOUT

RUN A

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV} (1)	mm Hg
			FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN B

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV} (1)	mm Hg
			FINAL PRESSURE	P _{CV} (2)	mm Hg

RUN C

COLLECTION VESSEL NO.

LAB BAROMETRIC PRESSURE	P _B (4)	mm Hg	COLLECTION VESSEL VOLUME	V _{CV}	L
LAB TEMPERATURE	T ₄	°C	INITIAL VACUUM	P _{CV} (1)	mm Hg
			FINAL PRESSURE	P _{CV} (2)	mm Hg

MEASURED TANK CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED) _____, _____, _____, Average _____ C_{VOC}(1)MEASURED COLLECTION VESSEL CONCENTRATIONS (as PPM CH₄, NOT DILUTION CORRECTED)Run A: 120.1, 120.5, 120.3 Average 120 C_{VOC}(4)Run B: _____, _____, _____ Average _____ C_{VOC}(4)Run C: _____, _____, _____ Average _____ C_{VOC}(4)

APPENDIX G.3
SCRUBBER SOLUTION DATA

TABLE G-10

Veneer Dryer Scrubber Operation Data Summary
Georgia-Pacific Plywood Plant - Springfield, Oregon

<u>Run No.</u>	<u>Date</u>	<u>Scrubber Solution</u>		<u>Average Pressure Drop (inches H₂O)</u>
		<u>Sample Volume*</u> (ml)	<u>TOC**</u> (mg/l)	
1	6-9-81	800	3010	14.2
2	6-10-81	700	3000	15.0
3	6-11-81	700	2860	13.9

• Total of 7 or 8 100-ml samples collected during each test run.

**Total Organic Carbon.



ENVIRONMENTAL LABORATORIES
7201 N.W. Eleventh Place
P.O. Drawer 1647
Gainesville, Florida 32602
904/377-2442

REPORT OF ANALYSIS

Sample No. 15715-15717

Lab ID No. 82112

Client CH2M HILL (Corvallis) TRC Enviro Project No. C15079.M6
Attention Mark Boedigheimer Received 6/15/81
Address Reported 6/18/81

Description of Sample: Water Samples--Collected by client
Scrubber liquid

#	Description	TOC (mg/l)
15715	Test 1--6/09/81 Lab #3978	3,010
15716	Test 2--6/10/81 Lab #3979	3,000
15717	Test 3--6/11/81 Lab #3977	2,860

Respectfully submitted,

Roger A. Yorton / RAS
Roger A. Yorton Chemist

The information shown on this sheet is test data only and no interpretation of the data is intended or implied.

APPENDIX H

CLEAN-UP EVALUATION RESULTS

ENVIRONMENTAL LABORATORY
1600 S.W. Western Blvd.
Corvallis, Oregon 97330

METHOD 5x SAMPLE ANALYSIS

Client Name: TRC ENVIRONMENTAL CONSULT. Date Received: JUNE 12, 1981
Location: GEORGIA - PACIFIC CORP. Date Analyzed: JUNE 15, 1981
Source: EUGENE OREGON Project No. _____

Sample Identity 5x-0-IN 5x-0-OUT Blank

FRONT HALF ANALYSIS

• Probe Wash (D.I./Dist. H₂O Rinse)

Volume, mls

Tare No.

Tare + Residue

Tare Wt.

Residue Wt.

Blk. Corr.

Residue Wt.

290	320
0-I-2	0-0-2
63.5363	65.5265
63.5023	65.5146
0.0340	0.0119
-0.0003	-0.0003
0.0337	0.0116

REFER TO

0.0001/100 ml

• Probe Wash (Acetone Rinse)

Volume, mls

Tare No.

Tare + Residue

Tare Wt.

Residue Wt.

Blk. Corr.

Residue Wt.

174	258
0-E-3	0-0-3
64.7208	66.5995
64.6755	66.5877
0.0453	0.0118
-0.0004	-0.0006
0.0449	0.0112

RUN 5x-1

PER

0.0002/100 ml

• Filter Collection (Front Filter)

Filter No.

Tare + Part.

Tare Wt.

Part. Wt.

Blk. Corr.

Particulate Wt.

TRC (4 1/2")	#9 (4 1/2") CH2M HILL
149	
0.8527	0.7620
0.8503	0.7608
0.0024	0.0012
-	-

BLACK APPLICATION

• Front Half (wt. gms)

0.0786	0.0228

786

229

NOTE: Filters were not inserted into clean-up trains.
particulate weights are ~~apparently~~ blank weights.

Indicated

H-1

METHOD 5x SAMPLE ANALYSIS

Client Name: TRC ENVIRONMENTAL CONSULTANTS Date Received: June 12, 1981
Location: GEORGIA - PACIFIC CORP Date Analyzed: June 15, 1981
Source: EUGENE OREGON Project No. _____

Sample Identity 5x-0-21 5x-0-21 Blank

BACK HALF ANALYSIS

• Impinger Water (+ H₂O Rinse)

Total Volume, ml (T)

850

800

• Organic Extraction

Volume Extracted, ml (Ex)

850

800

Tare No.

0-I-019

0-0-019

Tare + Extract

67.9300

66.6138

Tare Wt.

67.9284

66.6117

Extract Wt.

0.0016

0.0021

Blk. Corr.

-0.0002

-0.0002

0.0002 / 150 ml

Extract Wt. x (T/Ex)

0.0014

0.0019

• Residue on Evaporation

Volume Evap., ml (Ev)

100

100

Tare No.

0-I-RES

0-0-RES

Tare + Residue

77.0740

66.9330

Tare Wt.

77.0712

66.9159

Residue Wt.

0.0028

0.0171

Blk. Corr.

0.0027

0.0170

0.0001 / 100 ml

Residue Wt. x (T/Ex)

0.0230

0.1360

• Back Half Rinse (Acetone)

Volume, mls

428

240

Tare No.

0-I-5

0-0-5

Tare + Residue

63.8735

67.5415

Tare Wt.

63.8576

67.5150

Residue Wt.

0.0159

0.0265

Blk. Corr.

0.0008

0.0005

0.0002 / 100 ml

Residue Wt.

0.0151

0.0260

• Filter Collection (Back-Up Filter)

Filter No.

#10

#10

Tare + Part.

0.1940

0.1940

Tare Wt.

0.1937

0.1937

Part. Wt.

0.0003

0.0003

Blk. Corr.

-

-

Particulate Wt.

-

-

• Back Half (wt. gms)

0.0395

0.11639

• Total Sample (wt. gms)

0.1181

0.1867

The information shown on this sheet is test data only and no analysis or interpretation is intended or implied. Samples will be retained 30 days unless otherwise requested.

H-2

Reported by:

William R. Langley



Environmental Laboratory

Date: July 10, 1981

Project No.: C15079.M6

Subject: Analysis of impinger water from EPA Method 5X samples.
Samples collected by TRC Environmental Consultants at
Georgia Pacific Corporation, Springfield, Oregon.

<u>Sample Identity</u>	<u>Impinger Water</u>	
	<u>pH</u>	<u>Chromium milligrams/liter</u>
5X-0-0-4	2.80	2.50
5X-0-I-4	3.05	0.29
5X-1-0-4	3.30	0.12
5X-1-I-4	3.64	0.06
5X-2-0-4	3.77	0.04
5X-2-I-4	3.56	< 0.02
5X-3-0-4	3.42	< 0.02
5X-3-I-4	3.49	< 0.02

Note: < Indicates "less than".

All tests are performed in accordance with current Environmental Protection Agency guidelines as published in the Federal Register.

The information shown on this sheet is test data only and no analysis or interpretation is intended or implied.

Reported by:


Mark Boedigheimer

jd/LAB1H

H-3

Corvallis Office

1600 S.W. Western Blvd., P.O. Box 428, Corvallis, Oregon 97330 503/752-4271 Cable: CH2M CVO

APPENDIX I

PROCESS OPERATIONS
(Provided by RTI)

SUMMARY OF OPERATING CONDITIONS

	June 8	June 9	June 10	June 11
I Production (ft ² per hour on 3/8" basis)				
sapwood	19,935	21,604	21,509	19,847
heartwood	<u>12,090</u>	<u>14,143</u>	<u>12,863</u>	<u>14,221</u>
Total	31,424	35,747	34,372	34,068
II Redry Rate	9.7%	9.0%	9.6%	11.4%
III Steam Use (lbs per hour)	No Evaluation	51,430	50,467	51,450
IV Temperatures	No Evaluation	steady 325-375°F	steady 325-375°F	steady 325-375°F
V Fugitives	No Evaluation			
1. abort stacks		150-300 CFM* #1&4	150-300 CFM* 1,2 & #4 less than on June 9	150-300 CFM* small leaks
2. door leaks				
3. above dryers		#1 & 3 had blue haze		noticeable above all dryers
4. cooling stacks		#4	#4	#4
VI Weather	No Evaluation	cloudy, showers, mid 60's	cloudy, small showers, 60°-75°	morning fog, sunny, 54°-66°
		53-74% rel. humidity	36-70% rel. humidity	51-76% rel. humidity

*per dryer, except #4

Summary of Production for Georgia-Pacific's
Springfield, Oregon plywood plant

June 8-11, 1981

JUNE 8

sap - 19,935 ft²/hr
heartwood - 12,090 ft²/hr
total production - 31,424 ft² (3/8" basis) per hour

Redry 24,382/251,397 = 9.7 percent
dryer #1 - 24%
dryer #2 - 23%
dryer #3 - 0%
dryer #4 - 13%

Notes - The dryers were all operating Monday afternoon with no breakdown's or upsets. Weather conditions, fugitives, and dryer temperatures were not monitored.

TEST OF JUNE 9

Production: Douglas Fir

A. Total Production: ft²/hr (3/8" basis)

1. up until 3:52 p.m.

	<u>GP production figures</u>	<u>RTI (1:29 p.m. - 3:52 p.m.)</u>
<u>Total</u>	31,262*	35,747
sapwood	20,253*	21,604
heartwood	13,548	14,143
redry	9.0%	not estimated
dryer #1	8.2%	not estimated
dryer #2	4.9% (adjusted)	not estimated
dryer #3	8.9%	not estimated
dryer #4	14.6%	not estimated

2. after 3:52 p.m. when #4 dryer switched from sapwood to heartwood
1/6" veneer

	<u>GP production figure</u> information not requested	<u>RTI (3:53 p.m. - p.m.)</u>
sapwood		10,575
heartwood		31,499
<u>Total</u>		42,074
redry	7-9.5% (dryer #4 only)	

*Error in reported production from dryer number 2, adjusted according to plant records.

1. Temperature (F°)

[illegible]

2. Drying times
- Dryer #1 - 15.5 min
(1/8" sap full)
 - #2 - 16.0 min
(1/8" sap strips)
 - #3 - 6.2 min
(1/8" heartwood)
 - #4 - 11-12 min (1/6" sapwood)
6.1 min (1/6" heartwood)

JUNE 9 (Continued)

C. Fugitives

ABORT STACKS							INSIDE			
Day/time	Green End		Dry End	Cooling	Overall ¹		time	Door Seals	Elephant Ears	Above Dryers
#1 2:10	L		L	N	L 100	cfm	2:10	2M	1M	M
2:45	H 25%		M 30%	N	M 200	cfm	3:25	2L, 2T	1M 1L	M
3:40	H 30%		H 20%	N	M 200	cfm	4:15	4M	1M 2H	H
4:50	M		H 30%	N	H 250	cfm	5:05	1L	4M 1H	H
5:30	H		H 30%	N	H 300	cfm	5:40	3L	2M	M
#2 1:50	M		L	N	M 150	cfm	2:05	1L	1L	L
2:45	H		L	N	M 200	cfm	3:25	N	N	L
3:45	H		M	N	M 200	cfm	4:15	N	1M	M
4:50	L		M 10%	N	M 150	cfm	5:05	N	1L	M
5:30	H 10%		M 10%	N	M 150	cfm	5:40	N	1L	H
#3 2:00	H 10%		H 20%	N	H 250	cfm	2:05	N	N	H
2:45	H 30%		M 30%	N	H 250	cfm	3:15	N	N	H
3:45	H 30%		M 30%	N	H 250	cfm	4:13	N	N	H
4:45	H 10%		L	N	M 150	cfm	5:00	N	N	H
5:30	H 20		H 30%	N	H 300	cfm	5:40	N	N	H
#4 1:45	N	N	N	5%	L -		2:00	1M, 1L	NA	L
2:45	N	N	N	10%	L -		3:18	1L	NA	L
3:40	N	N	N	10%	L -		4:12	1H, 1L	NA	L
4:40	N	N	N	10%	VL		5:00	1H, 1L	NA	L
5:27	N	N	N	15%	L		5:40	2M	NA	M

JUNE 9 (Continued)

D. Steam Usage (for veneer dryers only)

<u>time</u>	<u>steam rate (in lbs/hr)</u>
10:17 a.m.	52,500
11:23 a.m.	51,000
1:33 p.m.	54,000
2:30 p.m.	52,000
3:30 p.m.	51,500
4:32 p.m.	49,000
5:44 p.m.	50,000

avg. 51,430 lbs/hr

E. Weather Conditions

<u>time</u>	<u>T wet bulb (°F)</u>	<u>T dry bulb (°F)</u>	<u>% Rel. Humidity</u>	<u>Comments</u>
11:00	58	64	69	Showers, heavy
1:40	57	67	53	Clouds
2:30	59	67	62	Clouds
3:40	58	64	69	Clouds, showers
4:40	60	65	74	Light showers
5:25	58	65	65	Light showers

TEST OF JUNE 10

A. Production (ft²/hr on 3/8" basis)

	<u>GP production figure</u>	<u>RTI (during testing hrs)</u>
1. Startup until 3:47 (switch from sapwood to heartwood on dryer 4)		
<u>Total</u>	29,440	34,372
sap	18,447	21,509
heartwood	10,869	12,863
Redry	9.6%	not estimated
#1	7.2%	not estimated
#2	7.1%	not estimated
#3	11.5%	not estimated
#4	10.9%	not estimated
2. After 3:47		
<u>Total</u>		40,495
sapwood		10,339
heartwood		30,156
dryer #3		12,863
dryer #4		17,293

B. Operating Parameters

1. Dryer Temperatures (see attached)

2. drying times

#1 - 16.3 min. (1/8" sapwood full)	#4 12.0 min. (1/6" sap, full)
#2 - 15.8 min. (1/8" sapwood strips)	6.0 min. (1/6" heartwood, full)
#3 - 5.8 min. (1/8" heartwood, full)	

C. Fugitives

(see attached)

D. Steam Usage, dryers only

<u>time</u>	<u>steam rate (lbs/hr)</u>
11:56	50,800
1:29	51,500
2:23	52,500
3:30	52,000
4:19	48,000
4:46	48,000

JUNE 10 (Continued)

Dryer temperatures

June 10

		1				2				3				4	
		N	S			N	S			N	S				
time	<u>12:12 pm</u>	G	325	320	<u>11:58</u>	G	325	315	<u>11:57</u>	310	315	<u>12:00</u>	G	345	
			350	340			350	350		350	355			350	
			360	360			365	360		360	360		D	375	
		D	340	335		D	335	353		D	340	325	<u>12:33</u>	G	348
	<u>1:00</u>	G	325	321	<u>12:59</u>	G	325	313	<u>12:33</u>	G	310	315			350
			350	345			350	350			348	350		D	375
			360	360			360	360			360	360	<u>12:55</u>	G	345
		D	340	335		D	337	350		D	335	325			348
	<u>2:10</u>	G	324	320	<u>2:07</u>	G	325	15	<u>12:56</u>	G		315		D	375
			348	340			350	50				352	<u>2:03</u>	G	347
			360	360			362	60				360			350
		D	340	335		D	335	50		D		325		D	375
	<u>2:47</u>	G	325	320	<u>2:45</u>	G	325	315	<u>2:04</u>	G	310	315	<u>2:42</u>	G	345
			350	340			350	350			348	355			350
			360	360			360	360			360	360		D	375
		D	340	335		D	335	350		D	340	325	<u>3:32</u>	G	345
	<u>4:08</u>	G	325	320	<u>4:16</u>	G	325	315	<u>2:43</u>	G	315	315			350
			350	345			350	350			350	350		D	375
			360	360			360	360			360	360	<u>4:03</u>	G	354
		D	350	335		D	335	350		D	340	325			360
	<u>4:38</u>	G	325	320	<u>4:36</u>	G	325	312	<u>3:33</u>	G		318			372
			350	345			350	350				352	<u>4:32</u>	G	355
			360	360			360	360				360			357
			350	335			335	350			D	325		D	375
									<u>4:04</u>	G	323	325			
											352	360			
											364	352			
											340	325			
									<u>4:33</u>		320	320			
											350	355			
											360	362			
											340	325			

JUNE 10 (Continued)

C. Fugitives

Date 6-10-81

Test Start 2:00 p.m. Stop 4:45

G. P. Springfield

Observer P. Willhite

ABORT STACKS						INSIDE APPEARANCE				
time	Green End	Dry End	Cooling	Overall		time	Door Seals	Elephant Ears	Top	Comments
#1 12:20	S 10%	M 20	N	M 150 cfm		12:10	1 VL	N	L	M @ Mid Fans
1:15	H	M	N	M 150 cfm		1:25	2 VL	N	L	
2:20	H	H 20	N	H 250 cfm		2:07	2 VL	N	L	
2:45	M 10	H 20	N	M 150 cfm		2:40	1S,1L	1 L	M	
3:45	M 15	H 30	N	M 200 cfm		3:40	2 L	1 L	M	
4:15	L 10	H 30	N	H 250 cfm		4:05	2 L	1 L	L	
4:45	L 10	M 20	N	M 200 cfm		4:38	2 L	1 L	M	
#2 12:17	H	M	N	M 300 cfm		12:08	2 M	1 S	L	Mod. around mid fans
1:15	H	S	N	M 150 cfm		1:25	2 VL	1 S	M	
2:15	H	M 10%	N	M 200 cfm		2:06	N	1 M	M	
2:50	L 10%	M 10%	N	L 150 cfm		2:40	N	1 L	H	
3:45	L	M 10	N	L 150 cfm		3:40	N	1 L	M	
4:15	L 5%	M 10	N	L 100 cfm		4:05	N	1 L	L	
4:45	L 10	M 10	N	L 150 cfm		4:35	N	1 L	L	
#3 12:15	M 20%	M 20%	N	M 200 cfm		12:05	N	N	M	H at Dry End None at Greer Large Leakage around exhaust dry end stk.
1:15	L	L	N	50 cfm		1:20	N	N	M	
2:15	M 10%	M 10%	N	M 100 cfm		2:05	N	N	H	
2:50	H 20%	M 20	N	H 250 cfm		2:40	N	N	H	
3:50	M 10	H 20	N	H 250 cfm		3:35	N	N	H	
4:15	H 20	H 20	N	H 250 cfm		4:05	N	N	M	
4:40	H 20	H 20	N	H 250 cfm		4:33	N	N	H	
#4 12:13	N	N	N	10-15	Bad at Dry End	12:03	1L,1M	NA	M	Cooling stks from this dryer and roof vents are the major roof-top emitters.
1:12	N	N	N	5	"	1:20	2 M	NA	M	
2:15	N	N	N	10%	"	2:03	1 L	NA	L	
2:48	N	N	N	10-15	"	2:38	1 L	NA	L	
3:50	N	N	N	N	"	3:35	1 L	NA	L	
4:15	N	N	N	5-10	"	4:00	1 M	NA	M	
4:40	N	N	N	5	"	4:33	1M,TR	NA	L	
907 908 909 910 911 912										
Roof Vents						KEY				
12:20	5	5	N	5	5	5	N = None	CFM Estimates are gross estimates		
1:15	5	-	-	-	5	-	T = Trace			
2:15	5	5	-	5	-	-	VL = Very light			
2:45	5	5	-	5	-	5	L = Light			
3:45	5	5	-	5	-	-	M = Moderate	% = opacity on blue plumes		
4:15	5	5	-	5	-	-	H = Heavy			
4:40	5	-	-	-	5	-	VH = Very Heavy			

JUNE 10 (Continued)

E. Weather Conditions

<u>time</u>	<u>T wet bulb</u> <u>(°F)</u>	<u>T dry bulb</u> <u>(°F)</u>	<u>% Rel. Humidity</u>	<u>Comments</u>
11:50	53	60.5	61	80% cloud cover
1:15	56.5	62	70	80% cloud, showers
2:12	56.5	66	54	50% cloud, sun
3:00	58.5	75	36	30% clouds
3:45	55.5	68	44	20% clouds
4:30	59	71	48	20% clouds

TEST OF JUNE 11

A. Production (ft²/hr on 3/8" basis)

	<u>GP production figure</u>	<u>RTI</u>
<u>Total</u>	33,708	34,068
sapwood	19,811	19,847
heartwood	13,897	14,221
Redry rate	11.4%	not estimated
#1	10.3%	not estimated
#2	11.3%	not estimated
#3	13.5%	not estimated
#4	9.8%	not estimated

B. Operating Parameters

- Dryer Temperatures - see attached
- drying times

#1	16.3 min. (1/8" sapwood, full)
#2	15.4 min. (1/8" sapwood, strips)
#3	6.0 min. (1/8" heartwood, full)
#4	8.6 min. (1/8" sapwood, full)

C. Fugitive Observations

see attached

D. Steam Usage, dryers only

<u>time</u>	<u>steam rate (lbs/hr)</u>
10:23	50,500
11:21	52,000
11:58	52,000
12:31	51,500
1:39	51,700
2:36	51,000

E. Weather Conditions

<u>time</u>	<u>T wet bulb</u>	<u>T dry bulb</u>	<u>% Rel. Humidity</u>	<u>Comments</u>
10:27	50	54	76	morning fog
11:30	52	58	67	sunny
12:00	55.5	64	58	sunny, high clouds
12:33	55	62	63	sunny, high clouds
1:41	54	64	51	sunny, 70% cloud cover
2:40	56.5	66.5	52	sunny, high overcast

JUNE 11 (Continued)

Dryer temperatures

June 11

		1				2				3				4	
		N	S			N	S			N	S				
time	<u>11:25 pm</u>	G	325	325	<u>11:22</u>	G	325	312	<u>11:21</u>		310	315	<u>11:20</u>	G	345
			350	345			350	350			315	355			350
			360	360			365	360			360	360		D	375
		D	345	335		D	335	350		D	340	325	<u>12:28</u>	G	350
	<u>12:11</u>	G	325	325	<u>12:22</u>	G	325	315	<u>12:28</u>	G	310	315			350
			350	345			345	350			345	350		D	380
			360	360			360	360			360	355	<u>1:05</u>	G	340
		D	345	340		D	330	350		D	340	325			345
	<u>1:55</u>	G	320	325	<u>1:53</u>	G	325	315	<u>1:52</u>	G	310	315		D	370
			350	345			350	350			345	350	<u>1:51</u>	G	345
			360	360			360	360			360	360			350
		D	340	335		D	335	350		D	340	325		D	375

JUNE 11 (Continued)

Date 6-11-81

Test Start 11:30 p.m. Stop 3:00 p.m.

G. P. Springfield

Observer P. Willhite

ABORT STACKS						INSIDE APPEARANCE				
time	Green End	Dry End	Cooling	Overall		time	Door Seals	Elephant Ears	Top	Comments
#1 10:50	H	H	N	300 H		10:42	3 L	1 L	L	M @ top center fans
11:46	H	H 20	N	300 H		11:32	3 L	1 L	L	
12:20	M 5	H 10	N	250 H		12:08	2 L	1 M	M	
12:55	M 5	H 10	N	250 H		12:45	2 VL	1 M	L	
1:06	M 5	H 30	N	300 H		1:26	2 VL	1 L	M	
2:28	M 10	H 20	N	250 H		2:17	2 L	1 L	H	
						2:47	1 L	1 L	M	
#2 11:10	H	M	N	350 H		10:39	N	1 L	L	M at center fans on top
11:45	H	M 10	N	300 H		11:30	N	1 L	L	
12:20	H	M 10	N	250 H		12:07	N	1 L	M	
12:55	H	L	N	150 M		12:45	N	1 L	L	
1:46	H	M 10	N	300 H		1:26	N	1 L	L	
2:28	M 10	M 10	N	200 M		2:16	N	1 L	M	
						2:47	N	1 L	M	
#3 11:10	H 30	H 20	N	350 H		10:38	N	N	H	stack leaks & middle fan high emissions
11:45	H	H 20	N	350 H		11:30	N	N	H	
12:20	H	H 20	N	350 H		12:06	N	N	H	
12:55	H 10	H 20	N	350 H		12:43	N	N	H	
1:48	H 10	H 20	N	300 H		1:27	N	N	M	
2:27	M 20	H 20	N	250 H		2:15	N	N	H	
						2:48	N	N	H	
#4 11:10	N	N	N	10%		10:37	2VL,3T	NA	L	
11:45	N	N	N	5-10		11:28	2VL	NA	L	
12:17	N	N	N	0-5		12:06	N	NA	VL	
12:55	N	N	N	5-10		12:43	N	NA	VL	
1:48	N	N	N	5		1:27	N	NA	VL	
2:26	N	N	N	5-10		2:14	N	NA	VL	
						2:47	N	NA	VL	
907 908 909 910 911 912						KEY				
Poof						N = None T = Trace VL = Very light L = Light M = Moderate H = Heavy VH = Very Heavy				
Vents										
11:10	5	-	-	5	5	-	CFM Estimates are gross estimates			
11:45	-	5	-	-	-	5				
12:19	5	-	5	-	-	-	% = opacity on blue plumes			
12:55	10	5	-	5	-	-				
1:48	5	10	-	5	-	-				
2:27	10	5	-	5	-	5				

APPENDIX J

PROJECT PARTICIPANTS

PROJECT PARTICIPANTS AT GEORGIA-PACIFIC PLYWOOD PLANT
SPRINGFIELD, OREGON, JUNE 8-11, 1981

TRC

Management:

Peter W. Kalika, P.E.
Eugene A. Brackbill, P.E.
John H. Powell

Program Manager
Work Assignment Manager
Project Scientist, Field Crew Chief

Field Crew:

S. Dexter Peirce
Edward D. Astle
David D. Ethier
Susan M. Reynolds
Mark A. Algier

Environmental Engineer
Environmental Engineer
Assistant Environmental Engineer
Technical Specialist
Technical Specialist

Laboratory:

Sam S. Cha
Stefan Wawzyniecki
Patricia Lennon
Dudley W. Alleman

Chemistry Laboratory Manager
Environmental Chemist
Environmental Chemist
Assistant Environmental Scientist

Report Preparation:

Eric A. Pearson
David E. Ringquist
Anne Cretella

Project Scientist
Environmental Engineer
Word Processing Supervisor

EPA

Gary D. McAlister
Clyde E. Riley
Edwin J. Vincent

Task Manager
Task Manager
Project Lead Engineer

GEORGIA-PACIFIC

L. Mitch Steffensen
Pete Fetter

Product Development Manager
Environmental Technician

NCASI

Victor Dallons
Ron Mesmer
Dean Hoy

Research Engineer
Research Assistant
Research Assistant

RTI

Robert Chessin
Paul Willhite (Del Green Associates)

CH2MHill

Mark Boedigheimer

Environmental Analyst

PCS

David T. Robinson

Group Leader, Instrumental

APPENDIX K

SCOPE OF WORK

- K.1 Work Assignment
- K.2 Site Test Plan
- K.3 Associated Correspondence

APPENDIX K.1
WORK ASSIGNMENT

WORK ASSIGNMENT
ENVIRONMENTAL PROTECTION AGENCY
 Research Triangle Park, N.C. 27711

*Sk. r.
from kb.1*

EPA CONTRACT NO. 68-02-3543 1460-ESD
 CONTRACTOR TRC Environmental Consultants
 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, EM8, 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 <i>Gary McAlister</i> for Gary McAlister			ORG CODE ESED/EMB	TELEPHONE (919) 541-5243	DATE 8/6/80
APPROVALS (as applicable)		SIGNATURE			DATE
BRANCH CHIEF		<i>[Signature]</i> for G. Webb			8/6/80
DIVISION CHIEF		<i>[Signature]</i>			8/6/80
PROJECT MANAGER		<i>[Signature]</i>			8/6
CONTRACTING OFFICER		<i>[Signature]</i>			8/14/80
CONTRACTOR'S REPRESENTATIVE ACKNOWLEDGMENT					
SIGNATURE		TITLE			DATE

APPENDIX K.2
SITE TEST PLAN

SECTION 1

INTRODUCTION

TRC - Environmental Consultants, Inc. will be performing emissions testing on the veneer dryer exhaust system and its pollution control, a Georgia-Pacific scrubber system, at the Georgia-Pacific Plywood Plant in Springfield, Oregon. Testing will be performed during the week of June 8, 1981 to determine the removal efficiency of the Georgia-Pacific scrubber system for particulates and volatile organic compounds (VOCs). Data acquired during this test program will be used to reflect the degree of limitation on control of veneer dryers, and if needed, establish an NSPS for that control.

The purpose of this report is to establish a plan of action for this source test program and provide complete details of the proposed sampling program. This report has been prepared in accordance with and under the provisions of EPA Contract No. 68-02-3543. Further information relating to this field test program can be found in "Pretest Survey Report for Standard Development Testing at Georgia-Pacific Plywood Plant, Springfield, Oregon", dated March, 1981; and revised June, 1981.

Research Triangle Institute (RTI), the NSS contractor, will be responsible for coordinating the overall test program with Georgia-Pacific plant officials. RTI will be responsible for assuring that process and control equipment operating conditions are suitable for testing, as well as monitoring and recording all process operating data. Fugitive emissions from the

veneer dryers and ambient temperature and relative humidity will also be monitored by RTI and their subcontractor, Del Green Associates.

TRC will be responsible for performing the emissions test program. EPA-EMB will be responsible for any coordination with the local regulatory agency deemed necessary.

The line of communication during the test program will be between Georgia-Pacific, RTI, EPA-EMB's Task Manager, and TRC's project manager. Communication to any other TRC personnel will therefore be through the TRC project manager and/or the appropriate TRC crew chief.

NCASI personnel will be drawing samples from TRC's sampling train for their research purposes and to afford a measure of quality assurance. However, if the sampling locations become too congested with equipment and personnel, TRC's project manager will decide whether or not concurrent TRC-NCASI sampling is still practical and should continue.

TRC will designate a Crew Chief-Project Scientist to fully coordinate and carry out the test program. All other technical personnel will be responsible to the Crew Chief.

Following the performance of the emission test program TRC will submit a draft of the proposed emission report to the EMB. The draft will be processed as being confidential information. EMB personnel will incorporate the process description and operations data obtained from the EPA Lead Engineer into the draft report. The EMB Task Manager will transmit the proposed emission report to the designated plant official for technical and confidential review. After receiving comments from the plant official, the EMB Task Manager will submit revision comments to TRC. Final report copies will be distributed by the EMB Task Manager to project team members, applicable plant officials, and interested parties.

SECTION 4

SCOPE OF THE SAMPLING PROGRAM BY SITE

Emissions testing will be performed to determine the efficiency of the Georgia-Pacific scrubber system according to EPA Methods 1, 2, 4, 5X, 9, 22, and 25. Details of these methods are presented in Appendix A.

Sampling train operators will be required to keep a detailed log of their test times for each site. Data sheets shall present all the necessary information in complete and concise form. Data will be recorded legibly in black ink.

Certain Method 5X data shall be calculated at the end of each test period. Data that will be available the morning following a specific test will be: percent isokinesis, percent moisture of the gas stream, stack gas flowrate (DSCFM), and average stack temperatures.

Scrubber Inlet

Prior to any emissions testing, the stack gas flowrate and percent moisture of the gas stream will be measured according to EPA Methods 1, 2, and 4. Duct diameter and sampling port configuration will also be validated at this time.

The inlet to the scrubber system will be sampled according to Methods 1, 2, 4, 5X and 25 in the 38" i.d. insulated duct at sampling ports 45° above the horizontal located 30' downstream (>8 diameters) and 24' upstream (>2

diameters) from the nearest respective flow disturbances. According to EPA Method 1, twelve traverse points will be sampled at this location. Sampling port and traverse point locations are presented in Appendix B. Triplicate 60-minute tests (5 minutes per traverse point) will be performed at this location using a Modified EPA Method 5X and six EPA Method 25 sampling trains simultaneously. This sampling will measure concentrations of particulate/condensable organics and volatile organic compounds (VOCs) entering the GP scrubber system. Particulate grain loadings at this sampling location are expected to range from 0.09 to 0.16 gr/SCF*, while the effluent is expected to be about 285°F at 25 percent H₂O. A total of three EPA Method 5X tests and eighteen EPA Method 25 tests will be performed here.

Static pressure in the duct will be measured at this location using a 0-10" inclined manometer. Data will be recorded every 30 minutes on the form presented in Appendix C - Pressure Drop Data.

Scrubber Outlet

Prior to emissions testing, the stack gas flowrate and percent moisture of the gas stream will be measured according to EPA Methods 1, 2, and 4. Duct diameters and sampling port configurations will be confirmed at this time.

The outlet of the scrubber system will be sampled concurrently with the inlet according to EPA Methods 1, 2, 4, 5X, 9, and 25 at the 9'i.d. scrubber discharge.

*Back calculated from Georgia-Pacific scrubber emission data.

emissions will be monitored concurrently with the Method 5X sampling at the scrubber outlet for 96 minutes. It may be that moisture entrained in the plume is too dense to make an accurate opacity determination. This will be determined on site by the certified observer.

Scrubber solution samples will be taken every 30 minutes during the scrubber outlet Method 5X test period. Three 100 ml samples will be taken from the scrubber solution holding tank or from the scrubber water outlet during each test. The samples will be composited for analysis.

Static pressure prior to and directly after the I.D. fan will be measured with U-tube manometers and recorded at 30 minute intervals. These measurements will be used to calculate pressure drop (ΔP) across the scrubber system.

Miscellaneous Measurements

Fugitive emissions from the veneer dryers (through doors, cracks, and abort stacks) will be monitored by RTI or their subcontractor, Del Green Associates, according to guidelines from EPA Method 22 as presented in Appendix A. Fugitive emissions will be monitored during each entire 96 minute test period.

Ambient temperatures and relative humidity outdoors will be measured and recorded at the beginning and end of each 96 minute test period.

All data will be recorded on forms provided by TRC and presented in Appendix C.

Upon conclusion of the test program, Modified EPA Method 5X samples, along with the scrubber liquor samples, will be driven to CH₂MHill - Engineers, Planners, Economists, and Scientists, in Corvallis, Oregon for

analysis. EPA Method 25 condensate traps will be packed in dry ice at the conclusion of each test. One third of the traps and one third of Method 25 sampling tanks will be packed and shipped via air freight to TRC's laboratory in Wethersfield, Connecticut for analysis. Another third of the tanks and traps will be packed in a similar fashion and sent air freight to PCS in Miamisburg, Ohio for analysis. The remaining third of the Method 25 samples will be analyzed by NCASI by methods presented in Appendix H.

All field data sheets to be used during the test program are presented in Appendix C. Sample recovery and analysis data sheets are presented in Appendix D. Sample calculations are presented in Appendix E, while Appendix F contains all calibration forms that will be used.

Sampling ports will be located 9' upstream (1 diameter) from the top of the stack and approximately 6' (2/3 diameter) downstream from the mesh pad. This sampling location is considerably less than ideal. According to Method 1, forty-eight traverse points will be sampled at this location. Sampling port and traverse point locations are presented in Appendix B. Triplicate tests will be performed using a Modified EPA Method 5X and six EPA Method 25 sampling trains. The Method 5X tests require forty-eight two-minute traverse points for a total test time of 96 minutes. Method 25 sampling will begin 18 minutes into the Method 5X test, and run for 60 minutes. Eighteen minutes of particulate/condensibles testing will still be performed after the Method 25 run is completed. The sampling traverses will alternate so as to allow full coverage of the sampling area with Method 25 for the three tests to be performed, even though full coverage will not occur during a single given test. Both 60-minute inlet tests will run simultaneously with the Method 25 test at the outlet.

Emissions testing performed at the scrubber outlet will determine concentrations of particulate/condensable organics and VOCs. Grain loadings are expected to range between 0.05 and 0.09 gr/SCF with the effluent temperature being 150°F at 18 percent H₂O. The average stack velocity was last measured to be 11 fps, which translates to a ΔP of 0.03 which will be measured with an S-type pitot and a 0-0.25" low range manometer. A total of three EPA Method 5X tests and eighteen EPA Method 25 tests will be performed at this location.

Visible emissions from the scrubber outlet will be monitored according to EPA Method 9. Readings will be taken by a certified observer at 15 second intervals to be averaged for a 6 consecutive minute period. Visible

APPENDIX K.3
ASSOCIATED CORRESPONDENCE

NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC.

October 2, 1981

Mr. Clyde E. Riley
Field Testing Section
Emission Measurement Branch
Environmental Protection Agency
Research Triangle Park, NC 27711

Dear Gene:

Mitch Steffenson of the Georgia-Pacific Corporation was good enough to forward a copy of the draft report by your contractor, TRC, covering the sampling effort at the Georgia-Pacific, Springfield, Oregon veneer dryer during the week of June 9, 1981. The following are my comments on this report, as you requested.

1. The duct diameter used by TRC in calculating the inlet gas flow to the scrubber is incorrect. TRC used a duct diameter of 38 in., whereas I measured it to be 35 1/4 in. Mitch Steffenson has told me that the nominal duct diameter is 36 in. The mass emission rates calculated in the report should be adjusted accordingly. *measure*
2. The stack flow rates reported for the scrubber outlet are questionable. During the tests the EPA-5 train operator said that negative flows were being experienced. These negative flows were not entered onto the data sheets, nor were they accounted for in the calculation. In further sampling at this source we have found that the stack velocities measured are affected by wind blowing across the large diameter stack. Because of these measurement problems, the scrubber outlet flow rates should not be considered valid. This control system is relatively free of leaks and the outlet flows are essentially the same as the inlet flows. The inlet flows should be used to calculate mass emission rates. Scrubber efficiencies should be estimated from changes in concentration of the constituents measured.
3. A thorough discussion of the potential interferences to the EPA-25 samples experienced during this sampling effort should be included in the report. The fact that outlet total organic compound concentrations were higher than the inlet concentrations needs explanation. A significant point is that only for the third test was the connection between the EPA-25 and the 5-X trains allowed to thoroughly dry after being rinsed with acetone. The third test was the only test to show a removal of total organic compounds across the scrubber, and is likely the only valid test.

C. E. Riley
October 2, 1981
Page 2

4. The TRC EPA-25 data should not be used in calculating total organic compound average emissions until it can be determined why the TRC data was significantly different than that obtained by PSC and NCASI.

For your reference, my previous comments concerning this sampling effort are enclosed.

If you should have any questions concerning my comments, please do not hesitate to call.

Sincerely,



Victor Dallons
Research Engineer

VJD:rg

cc: R. O. Blosser
A. L. Caron
H. F. Berger
C. G. Simon
M. Steffenson
V. Tretter



Georgia-Pacific Corporation

Gene
P. O. Box 1618
Eugene, Oregon 97440
Telephone (503) 689-1221

September 21, 1981

Clyde E. Riley
Field Testing Section
Emission Measurement Branch
Environmental Protection Agency
Research Triangle Park, NC 27711

Dear Mr. Riley:

Our office has conducted a preliminary assessment of the T.R.C. veneer-dryer emission report, conducted at the Georgia-Pacific Springfield Plywood plant. It is our present opinion that the report should not be quoted or cited in its present condition. The general conclusion of the Method 25 test report indicates that the system at Springfield is operating with a negative efficiency. This concept, of course, is not substantiated by daily operating results. The first physical example is that 400 to 1,000 gallons of pitch is collected and burned in the boiler each month from the dryers. The second physical example is that the exhaust flow (representative fugitives from the abort stacks were read at 30% opacity during the test) passes through the scrubber system, and when discharged is within the State standard (average 10% opacity). Therefore, we feel that this report as now written would result in substantial harmful interpretation of the sincere effort our corporation has exerted to meet and comply with Oregon's emission regulations. Secondly, the general results obtained with the Method 25 obviously indicate that this method is not yet perfected for use in evaluating this emission source. At this writing Mr. Victor Dallons has been unable to forward his viewpoint on this report to our group. Therefore, it is our judgment that these tests must not be used for development of new source standards as they do not relate to actual performance.

Following are portions of material which should be re-evaluated:

1. Page 4. Visible emission must be monitored after the dissipation of the steam, as the discharge plume is always saturated. The equipment must meet an Opacity Standard in Oregon.

*cloudy white
background*

Clyde E. Riley
Page 2
September 21, 1981

*duct leakage
low range AP
low 0.25 mm/min*

*use
inlet
flow*

2. Page 6, 7. We feel that the system efficiency is better described by using the "inlet grain loading" and "outlet grain loading" as parameters to calculate efficiency. The exhaust flow rates cannot be accurately measured under the conditions that exist at the top of the packed tower. The efficiencies are significantly different if viewed as shown on the copy of page 7.
3. Page 9. To suggest that the particulate efficiency is negative is again inconsistent with experience and all previous tests.
4. Page 9. To state that total organic compound efficiency is a -5.4% is, as stated earlier, contrary to opacity observation, and the fact that condensed organic material is physically removed from the scrubber. The information better states that Method 25 is not suited for testing these conditions.
5. Page 14, 15. All information given to the test group indicated that the gas moisture content would be greater than 20%. Therefore, the individual test measurement generally show that the gas moisture content was consistent, rather than inconsistent. The gas moisture content is consistently indicated by the saturated gas temperature of the exhaust which reflects the wet bulb measurement. This varied from 161°F to 170°F during the test (testing field data sheets outlet).
6. Page 15. The duct system has no leaks that could increase flow 3,000 SCFM. The combined openings in the spray duct (nozzle cleaning ports) would be less than four square inches. The balance of the duct is in good repair. Having no two simultaneous tests that are both isokinetic, would disallow any industry tests submitted for compliance.
7. Page 30, 33, 34. The inlet duct design diameter is 36 rather than 38 inches, and the actual two inside diameters are 35 inches. This was reconfirmed on September 18.
8. Page 39. I believe that the flexible teflon sample line should be checked to see if it is effected by the condensible organics. All gaskets made from natural synthetic rubbers are destroyed by the organic resin acids (all plasticizers are dissolved), and all gaskets made from synthetic polymers are

*per well
161-32
170-40
avg
166
166
166*

*AP
38.
38
40.*

*effects
only org.
part.
do not
break tube*

*higher condensible low
stains*

Clyde E. Riley
Page 3
September 21, 1981

swollen. Due to this one fact, all our test trains have been a combination of only stainless and glass. Our testing and the ODEQ testings have indicated grain loading on the inlet and outlet generally half of that obtained in these tests. The WSU report for the APA, on Table 14, indicated a total Gaseous and Non-Gaseous Fraction equal to 301.5 mg/m^3 which is approximately equal to the particulate and condensible fraction TRC obtained with the ODEQ Method 7.

We will continue to edit and comment on this report as time allows. But again in conclusion, this report as it stands could lead in our opinion to erroneous conclusions for new source standards and harmful interpretation of our corporate effort.

Very truly yours,



L. M. Steffensen
Product Development Manager

LMS/crr

cc: Vince Tretter, Atlanta
Phil Williams, Springfield
George Ritchie, Portland
Victor Dallons, NCASI, Corvallis

Recd 8/21/81

WEST COAST REGIONAL CENTER
Engineering Experiment Station
Oregon State University
Corvallis, OR 97331
(503) 754-2015



NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC.

August 14, 1981

Mr. C. E. Riley
Emissions Standards and
Engineering Division
ESED (MD-13)
Research Triangle Park, NC 27711

Dear Gene:

Here are the analytical results of the EPA-25 samples taken in conjunction with TRC at Georgia-Pacific Corp. in Eugene during the week of 6/9/81 through 6/11/81. Samples designated A and B are duplicate pairs.

<u>Date</u>	<u>Location</u>	<u>Results (ppm)</u>		
		<u>A</u>	<u>B</u>	<u>Ave.</u>
6/8	Scrubber inlet	1292	1128	1210
	Scrubber outlet	1292	1321	1306
6/10	Scrubber inlet	1594	995	1295
	Scrubber outlet	1294	1148	1221
6/11	Scrubber inlet	1304	1365	1334
	Scrubber outlet	1018	829	924

Although we have confidence in the analytical results for the samples analyzed; we feel the results may not be representative of the source sampled due to concerns discussed in my June 19, 1981, letter to you.

Sincerely,

A handwritten signature in cursive script that reads "Victor J. Dallons".

Victor J. Dallons
Research Engineer

VJD:rg
cc: A. L. Caron
R. O. Blosser
H. F. Berger
C. G. Simon

West Coast

NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC.

June 19, 1981

Mr. Gene Riley
Environmental Protection Agency
Office of Air Quality Planning and Standards
Emission Standards and Engineering Division
ESED, (MD-13)
Research Triangle Park, NC 27711

Dear Gene:

The forest products industry and the NCASI appreciate your efforts to include the Council in the sampling program by your contractor TRC at the Georgia-Pacific veneer dryer in Springfield, Oregon, during the week of March 6, 1981. Our cooperative efforts should produce valuable data on veneer dryer emissions, their control, as well as information on the precision and accuracy of EPA method 25 in this application. I was pleased that our sampling crews were able to work well together.

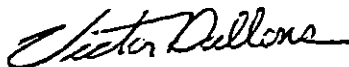
I believe that implementation of the following recommendations in the procedure would improve the precision and accuracy of the sampling effort and produce results consistent with the intent to measure organic compounds in veneer dryer emissions that are volatile at a temperature of 177°C (350°F) and lower.

- (1) All portions of the sampling train between the EPA-5 nozzle and the EPA-25 trains should be maintained at or above the filter temperature of 177°C (350°F). Cold spots between these two points could result in the condensation of organics and their loss prior to the EPA-25 trains.
- (2) All parts of the sampling train should be cleaned and heated prior to use. During the study at Georgia-Pacific, Springfield, the manifold to the EPA-25 trains was not cleaned before each use.
- (3) Vacuum grease should not be used on any sampling train where organic materials are being measured. Volatilization of the vacuum grease may contaminate the EPA-25 samples.
- (4) Care must be taken to assure that all acetone used in the cleanup of the EPA-5 train is removed before use. The acetone will constitute a positive interference in the EPA-25 analysis. The quick connect attaching in the EPA-25 manifold to the EPA-5 train is an especially difficult place to remove acetone from. The spaces in its internal mechanisms cannot be easily washed. This quick connect should be eliminated from the sampling system.
- (5) The teflon tube connecting the hot filter to the impingers should probably be brushed when washing with acetone. A simple acetone rinse may not be sufficient to thoroughly clean condensed organics from the tube.

(6) Both TRC and Pollution Control Science will be analyzing their samples according to the procedures detailed in the October 3, 1980 Federal Register. The trap burnout system shows several valves and heat traced lines between the cryogenic trap and the oxidizer. These lines were indicated to be heated to only 125°C in the TRC system. This temperature is much too low to prevent condensation of organics such as resin and fatty acids commonly found in veneer dryer emissions. During trap burnout the lines between the trap to the oxidizer should be heated to 600°C to insure complete recovery of the sample. Attached is a simple valving diagram that will allow a complete burnout of the trap, sampling lines, and piping to the oxidizer.

Implementation of the above procedures should enhance the integrity of the samples in future veneer dryer emission sampling efforts. Should you have any questions concerning these suggestions or other concerns, please feel free to contact me.

Sincerely,

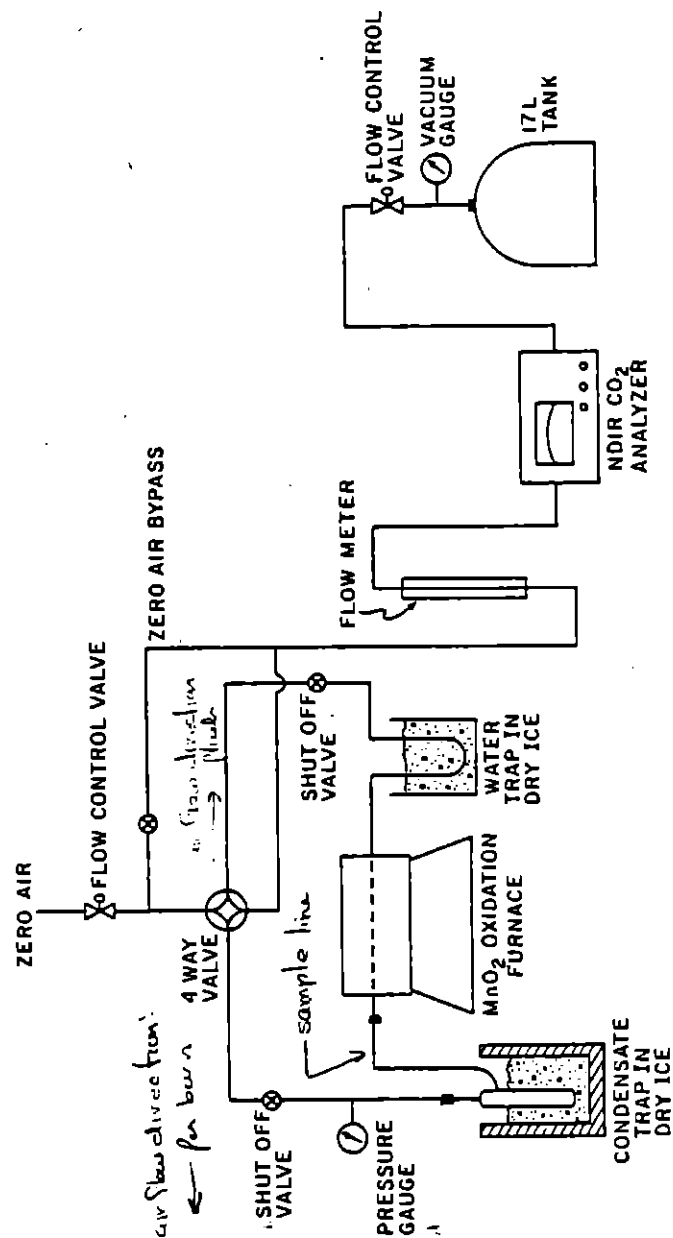


Victor Dallons
Chemical Engineer

VD:rc

Enc.

cc: R. Blosser
A. Caron
H. Berger
C. Simon
E. Brackbill
J. Emery
M. Steffensen



REVISED TRAP BURN OUT SYSTEM
FLUSH MODE

June 17, 1981

Recd
6-19-81
✓

Mr. C. E. Riley
U.S. Environmental Protection Agency
Room 730
North Carolina Mutual Building
411 West Chapel Hill Street
Durham, NC 27701

Dear Gene:

Subject: Method Development and Testing for the Plywood/Plywood Veneer
Industry
EPA Contract 68-02-3543, Work Assignment 1
ESED Project 80/02
TRC Project 1460-E80
Revisions to Georgia-Pacific, Springfield, Oregon, Site Test Plan

This letter presents for the record the revisions to the Method 5X and Method 25 analytical procedures presented in the body of the subject test plan dated June 3, 1981, and which were discussed during the tests. All future test plans will incorporate these revisions.

Method 5X

page 14: Container No. 2 - (D.I. distilled H₂O Probe Rinse) - evaporate,
desiccate, and weigh

Container No. 2a - DELETE

Container No. 4a - DELETE

Method 25

page 25: Preliminary Sample Tank Analysis

The preliminary tank analysis will be performed after both of its related condensate traps have been CO₂ purged into the tank. This procedure is being substituted for the stated pressurization to approximately 100 mm Hg with hydrocarbon free air in order to assure that both traps can be purged into their corresponding sample tank. If the tank were to be prepressurized to 100 mm Hg, the possibility exists that prior to the completion of both purges the sample tank pressure would reach system pressure ($\approx$ 760 mm Hg gauge) and result in an incomplete purge.

Mr. C. E. Riley
U.S. EPA

-2-

June 17, 1981
TRC Project 1460-E80

page 25: Nonmethane Organic Analysis Procedure

The stated condensate trap CO₂ purge procedure will be further modified also to assure that the sample tank pressure does not reach system pressure. After the trap has been bypassed, the carrier gas flow will continue through the system and into the tank for approximately five minutes. It will then be vented to atmosphere through the valve located downstream of the NDIR (Figure 3-7, page 23). This time period will be sufficient to purge the interconnecting tubing and NDIR cell volume. Prior to resuming flow through the condensate trap, the valve will be switched to again introduce the flow into the sample tank.

If you have any questions or require further clarification, don't hesitate to contact me.

Very truly yours,

TRC-Environmental Consultants, Inc.

Skip -

Eugene A. Brackbill, P.E.
Project Manager

EAB/jjs

cc: David Robinson, PCS
Stefan Wawzyniecki, TRC

RESEARCH TRIANGLE INSTITUTE

POST OFFICE BOX 12194

RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709



June 1, 1981

OPERATIONS ANALYSIS DIVISION

Mr. Paul Willhite
Del Green Associates, Inc.
1535 N. Pacific Highway
Woodburn, OR 97071

Dear Paul:

RE: Upcoming Source Tests at G-P Springfield

The enclosed Draft Test Plan was released by EPA on Friday. It is still a draft, but only minor changes will be made.

Bert Chessin is going to contact you from Montana regarding the time to meet at the plant on June 7, but I am sure it will be in the afternoon since TRC won't arrive until then. By copy of this letter, I am reviewing RTI's responsibilities for Bert also.

You and Bert will be responsible for monitoring production variables during the tests. This means:

1. Measuring actual dryer production during each test. The use of daily production figures reduced to the time frame of the test will not be close enough. You and Bert can discuss methods on Sunday, but we found that measuring the height and width of each pallet of wet veneer as it came up to the dryer was a good method. If you start measuring and counting pallets 15-30 minutes before the test starts, then we will know what is in the dryer at the start of testing. Be sure to measure the stacks of veneer being fed to the dryers at the moment testing starts. You and TRC should either agree in advance on the exact time for the start of each test, or they should notify you by walkie-talkie from the roof. Note that each test is supposed to last 96 minutes, but EMB tells me that 3 hours is more realistic given all the equipment they'll be using. I recommend that you continually count production until the test is over, even if TRC stops temporarily in mid-test. Please be sure that everyone synchronizes watches every day! You and Bert can create data forms beforehand. In addition to veneer production, you should also record for each test:

Wood type, thickness and width
temperature of each zone
steam rate to dryers (if available)
redry controller settings (% redry)
moisture level setting of redry controller
drying time

Finally, to help in interpreting the data, it would be good to know the history of each dryer: make model, type, maintenance history, rebuilds, etc.

K-21

2. Monitoring fugitive emissions. The Test Plan incorrectly states that RTI/Del Green will use EPA Method 22. Rather, you should walk around each dryer at some interval (e.g., twice per day) and make notes on fugitives from doors, skins, ends, etc. Your experience, Paul, will be helpful in assessing the relative extent of fugitives. We need to know the number of doors having significant leaks and the total number of doors and skin leaks for each dryer. You should also check for leaks at the abort stacks.
3. Notifying TRC to stop testing in even of serious process disturbance. This responsibility is ultimately Bert's. Such a disturbance would include a dryer fire. Another situation which might be serious enough to stop tests would be when one dryer was already down and a second one came down during the test. In general, avoid stopping a test if at all possible. Even if a serious plug-up occurs in one dryer and G-P opens the doors and cuts steam to cool it down, I believe the test could go on; Mitch Steffenson says the scrubber inlet flowrate and temperature would not change significantly in such a case. You and Bert should use your judgement in such a case--if the test were near completion and would already yield usable data, it might pay to stop; if several hours or a day would be lost by stopping it would probably be O.K. to continue testing.
4. Measuring ambient temperature and relative humidity. You and Bert will be responsible for measuring outside temperature and relative humidity. TRC will provide a thermometer and a sling psychrometer. These measurements can best be made before and after each test to avoid interfering with your other duties.

It is important that you and Bert run through a practice test on Monday to work out any problems before the actual tests on Tuesday. Also, please make sure you understand the line of communication. If a serious problem occurs or you have a question, please discuss it with Gene Riley of EMB and/or Skip Brackbill of TRC (See pages 1-2 of the Draft Test Plan.) Feel free to call me at work (919) 541-6796 or home (919) 929-2748 if you wish to discuss anything before or during the testing.

Thank you for your help on this test and on the other matters we have discussed.

Sincerely,

Mike

J. M. McCarthy
Project Leader

JMM:da

cc: Bert Chessin, RTI
Don Johnston, RTI
Gene Riley, EMB
Ed Vincent, CPB

May 22, 1981

Mr. Gary McAlister
U.S. Environmental Protection Agency
OAQPS/ESED/EMB
MD-19
Research Triangle Park, NC 27711

Dear Gary:

Subject: Method Development and Testing for the Plywood/Plywood Veneer Industry
EPA Contract 68-02-3543, Work Assignment 1
ESED Project 80/02
TRC Project 1460-E80
Laboratory Selection for Comparative Method 25 Analyses

This letter reviews and supplements our telephone discussion of Tuesday, May 19, regarding the selection of a laboratory to participate in the analysis of the Method 25 samples which will be collected during the first method development test program at Georgia-Pacific, Springfield, Oregon. The discussion was predicated by my telephone conversation with Gene Riley on Friday, May 15, during which he informed me that EMB had decided to select Midwest Research Institute (MRI). My letter of May 8 addressed to you had recommended Pollution Control Science, Inc. (PCS). Our conversation Tuesday seemed to indicate that a final decision has not been made. I still believe that PCS represents the better selection and would like to take the opportunity to further explain why.

My understanding is that EMB favors selecting MRI primarily because they use a somewhat different analysis approach. Specifically, they use a modified Dohrmann DC-50 water total organic carbon (TOC) analyzer, Figures 1 and 2, while TRC, and PCS, use an analyzer assembled to essentially resemble the scheme depicted in the published method, Figure 3. The intent is to compare against MRI's Method 25 "equivalent" scheme as a means for determining whether the published method is applicable. I do not believe that such an analysis comparison will necessarily be conclusive when in actuality a third variable is being introduced; that is, one sampling procedure and two different analysis procedures. If a comparison is performed with PCS, there are only two variables - the sampling procedure and essentially the same analysis procedure. This would be far more conclusive as to the published method's applicability. Isn't that in fact what we are trying to determine?

May 22, 1981

In a comparison with PCS, definitive conclusions regarding the published method could be drawn. If both show acceptable precision, the method's applicability is substantiated. Conversely, if neither show acceptable precision, there is a high probability that the published method is unsuitable. It would then seem more appropriate to investigate the MRI "equivalent" procedure should this occur. Additionally, if only the TRC or the PCS results indicated acceptable precision, one could still conclude that the published method is applicable and attribute the unacceptable results to a systematic analyzer or procedural fault. This in itself could be beneficial in that it would further add to working knowledge of the method by identifying the faults.

A comparison with the MRI "equivalent" procedure would be far less conclusive except for the case where both show acceptable precision. If MRI obtains acceptable precision but we don't, all that can be concluded is that their analysis scheme is applicable. The fundamental question regarding the published method's applicability cannot be definitively answered because the possibility of a TRC systematic error could still exist. Likewise, if TRC showed precision and MRI didn't, one could conclude that the published method is applicable but, in view of an MRI systematic error, it would be unfair to conclude that their "equivalent" method is unacceptable. A greater dilemma exists if both sets of results showed unacceptable results because I don't believe any conclusions could be substantiated.

I have continually referred to the "published" method and have therefore afforded it considerable significance. Although the MRI analyzer has been termed as "equivalent," I think it represents a radical enough departure to be termed a different method. The potential ramifications should be obvious. If a comparison with MRI indicates that the published method is unsuitable, either Method 25 has to be totally rewritten to make the modified Dohrmann analytical scheme the primary approach for all VOC sources or the plywood industry is solely subjected to the scheme. The latter isn't cost-effective since it would require companies involved in VOC sampling to have two different analyzers (three if one considers the Method 25A total hydrocarbon analyzer approach).

The foregoing has not been intended to slight the capabilities of MRI or their analytical procedure in any way. As we are all aware, their audit results and other published comparative test data are enviable. I simply believe that the attention should first be focused on the published method to more conclusively determine its applicability.

Obviously, I am willing to further discuss this matter. I look forward to receiving EMB's decision as it is of critical importance to the rapidly approaching standard development test program.

Very truly yours,

TRC-Environmental Consultants, Inc.

Eugene A. Brackbill
Eugene A. Brackbill, P.E.
Project Manager

EAB:ces

cc: Mr. C. E. Riley, USEPA

TRC