AP-42 Section ____ Reference ____ Report Sect. 4 Reference 14

AP-42 Section 10.8 Reference 12 Report Sect. 2 Reference 12

TTL, Inc. PRACTICING IN THE GEOSCIENCES

3516 Greensboro Avenue • P.O. Drawer 1128 • Tuscaloosa, Alabama 35403 • Telephone 205-345-0816 • FAX 205-345-0992

PRELIMINARY

May 16, 1994

Mr. Bill Sheridan
Allied Signal, Inc.
Research and Technology
50 East Algonguin Road
P.O. Box 6018
Des Plaines, Illinois 60017-5018

Re: Gaseous Organic Compounds Emission Study

Dear Mr. Sheridan:

This report documents the Gaseous Organic Compounds Emission Study performed on Naphthalene Knock-Out Tank and Water Scrubber at Birmingham Wood, Incorporated, in Warrior, Alabama.

If you or any of your associates have any questions, do not hesitate to call.

Sincerely,

TTL, Inc.

PRELIMINARY

Jack E. Davis, CIH
Vice President

Garry C. Pearson
Chief Industrial Technologist

JED/GCP/rmr
wpdocs\pearson\allsig.nap

PRELIMINARY

GASEOUS ORGANIC COMPOUNDS EMISSION STUDY

PRELIMINARY

NAPHTHALENE KNOCK-OUT TANK AND WATER SCRUBBER

BIRMINGHAM WOOD, INC.

WARRIOR, ALABAMA

PRELIMINARY

PRELIMINARY

ALLIED SIGNAL, INC.

APRIL 12 & 13, 1994

TTL, Inc. PRACTICING IN THE GEOSCIENCES

3516 Greensboro Avenue • P.O. Drawer 1128 • Tuscaloosa, Alabama 35403 • Telephone (205) 345-0816 • Fax (205) 345-0992

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TABLE

FIGURES

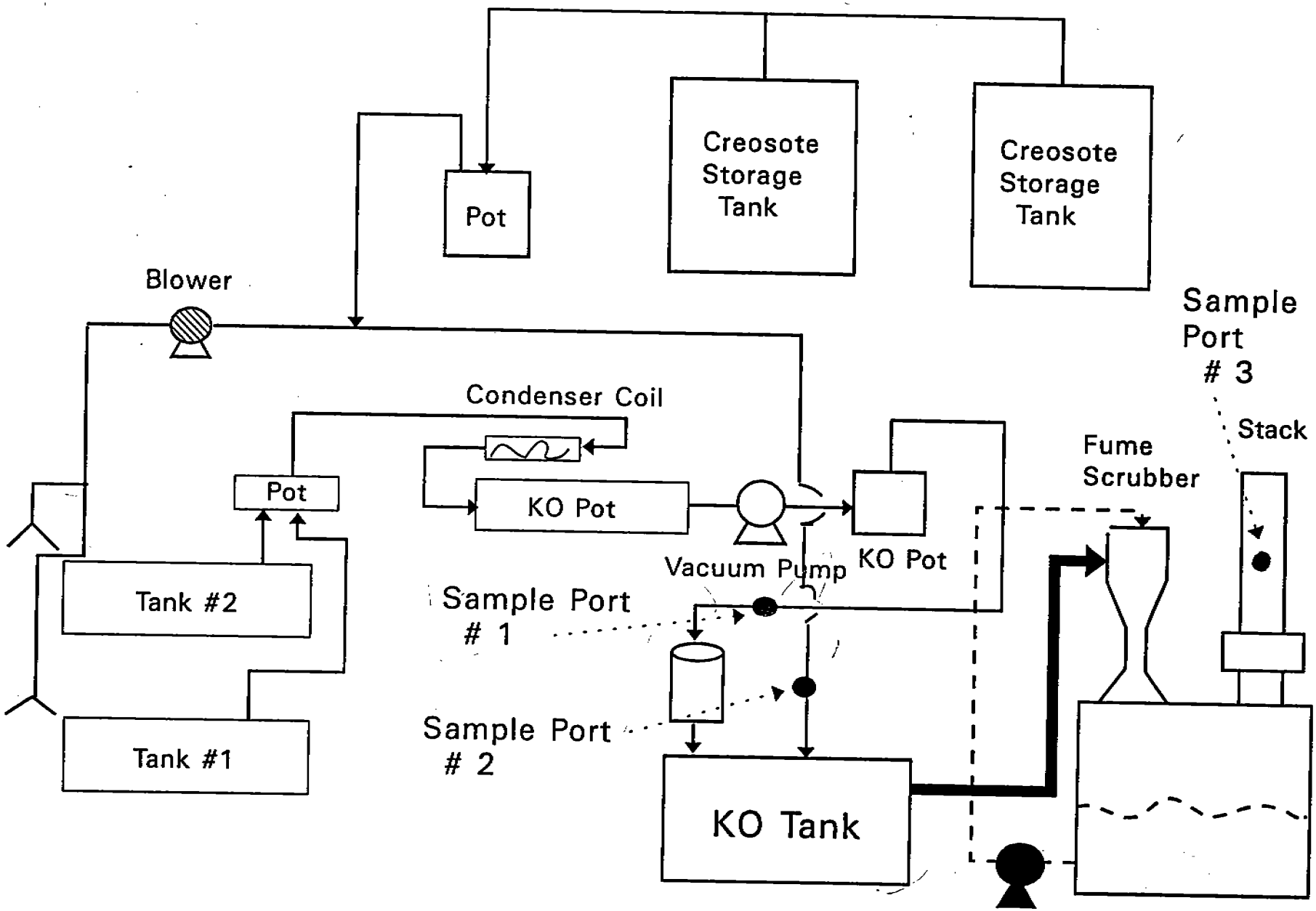
I. INTRODUCTION

This report documents the volatile organic compounds (VOC) emissions test performed on the inlet and discharge from the Naphthalene Knock-Out Tank and Water Scrubber. These tests were performed on April 12 & 13, 1994. The purpose of these tests was to measure the efficiency of the control equipment during the manufacturing processes.

Mr. Bill Sheridan of Allied Signal, Inc. was present during the test and was responsible for the operation of this equipment. Messrs. Jack Davis, Garry Pearson, and Lee Lindley performed the test for TTL, Inc., Tuscaloosa, Alabama.

II. DESCRIPTION OF PLANT OPERATION

A description of the plant processes is provided in the Fax which is enclosed in the Appendix.



BWI Emission Reduction System

III. SUMMARY OF TEST RESULTS

The results of these tests show varying concentration of VOC entering the Naphthalene Knock-Out Tank and exiting from the Water Scrubber (see Table 1).

During the No Charging or Background Period, the average concentration of VOC measured as Propane C_3H_8 entering the control system was 2288 ppmv. The average exit concentration was 1623 ppm, which resulted in a reduction of 665 ppm of VOC. The average 5 minute mass inlet rate was 7.157 lb/hr and discharge rate of 5.383 lb/hr, which resulted in a removal of 1.774 lb/hr of VOC.

During the No. 2 Cylinder Filling Period, the average concentration of VOC measured as Propane, C_3H_8 entering the control system was 1319 ppmv. The average exit concentration was 258 ppm, which resulted in a reduction of 1062 ppm of VOC. The average 5 minute mass inlet rate was 7.003 lb/hr and discharge rate of 0.494 lb/hr, which resulted in a removal of 6.509 lb/hr of VOC.

During the No. 2 Cylinder Heating Period, the average concentration of VOC measured as Propane, C_3H_8 entering the control system was 1134 ppmv. The average exit concentration was 199 ppm, which resulted in a reduction of 958 ppm of VOC. The average 5 minute mass inlet rate was 4.604 lb/hr and discharge rate of 1.184 lb/hr, which resulted in a removal of 3.42 lb/hr of VOC.

During the Cylinder #1 BV/Cylinder #2 Heating Period, the average concentration of VOC measured as Propane, C_3H_8 entering the control system was 8067 ppmv. The average exit concentration was 1306 ppm, which resulted in a reduction of 6761 ppm of VOC. The average 5 minute mass inlet rate was 15.2 lb/hr and discharge rate of 2.453 lb/hr, which resulted in a removal of 12.747 lb/hr of VOC.

During the Cylinder #1 Press/Cylinder #2 BV Period, the average concentration of VOC measured as Propane, C_3H_8 entering the control system of 11926 ppmv. The average

exit concentration was 2506 ppm, which resulted in a reduction of 9420 ppm of VOC. The average 5 minute mass inlet rate was 26.894 lb/hr and discharge rate of 6.172 lb/hr, which resulted in a removal of 20.722 lb/hr of VOC.

During the Cylinder #1 FV/Cylinder #2 Pressure Period, the average concentration of VOC measured as Propane, C_3H_8 entering the control system was 11180 ppmv. The average exit concentration was 1617 ppm, which resulted in a reduction of 9563 ppm of VOC. The average 5 minute mass inlet rate was 27.535 lb/hr and discharge rate of 4.757 lb/hr, which resulted in a removal of 22.778 lb/hr of VOC.

During the Cylinder #1 Final Drain/Cylinder #2 FV Period, the average concentration of VOC measured as Propane, C_3H_8 entering the control system was 3418 ppmv. The average exit concentration was 1644 ppm, which resulted in a reduction of 1774 ppm of VOC. The average 5 minute mass inlet rate was 8.291 lb/hr and discharge rate of 3.98 lb/hr, which resulted in a removal of 4.312 lb/hr of VOC.

The results of these tests showed the over efficiency of the control system was approximately 77% reduction of VOC concentration as Propane (see Table 2). The concentration of VOC went from an average inlet concentration of 5619 ppm to 1308 ppm at the discharge. These resulted in an overall average removal of 10.322 lb/hr of VOC, which calculates to an efficiency of 75% removal of VOC compounds from the discharge Stack.

Table 1: **Summary of Volatile Organic Compounds (VOC) Emission**

Would you like Table 1 Re-Typed?

Table 1. Summary of Volatile Organic Compounds (VOC) Emission

	No Charging/ Background			No. 2 Cylinder Filling			No. 2 Cylinder Heating to 200F			Cylinder #1 BV/ Cylinder #2 Heating		
	Inlet	Outlet	Difference	Inlet	Outlet	Difference	Inlet	Outlet	Difference	Inlet	Outlet	Difference
Stack Gas Temperature (F)	113.0	80.2	32.9	95.1	79.5	15.7	93.1	105.6	-12.4	125.2	80.9	44.3
Stack Gas Velocity (fpm)	1019	1019		1215	1215		1029	1029		528	528	
Volumetric Flow Rate (actual cfs)	556	556		663	663		561	561		288	288	
Volumetric Flow Rate (scfs)	479	479		586	586		498	498		243	243	
Volatile Organic Compounds Concentration, as Propane (ppmv)	2288	1623	665	1319	258	1062	1134	199	935	8067	1306	6761
Volatile Organic Compounds Concentration, as Carbon (ppmv)	6865	4869	1996	3958	258	3701	3401	596	2805	24201	3918	20283
Volatile Organic Compounds Emission Rate, as Propane (g/min)	54.102	40.693	13.410	52.942	3.775	49.167	34.807	8.955	25.852	114.908	18.542	96.366
Emission Rate, as Propane (lb/hr)	7.157	5.383	1.774	7.003	0.499	6.504	4.604	1.184	3.420	15.200	2.453	12.747
Volatile Organic Compounds Emission Rate, as Carbon (g/min)	43.639	32.823	10.816	42.704	3.045	39.658	28.076	7.223	20.853	92.686	14.956	77.730
Emission Rate, as Carbon (lb/hr)	5.773	4.342	1.431	5.649	0.403	5.246	3.714	0.955	2.758	12.260	1.978	10.282

Table 2: Overall Summary of Volatile Organic Compounds (VOC) Emission

	INLET	OUTLET	DIFFERENCE
Stack Gas Temperature (F)	120.2	86.9	33.3
Stack Gas Velocity (fpm)	850	850	
Volumetric Flow Rate (actual cfm)	464	464	
Volumetric Flow Rate (scfm)	396	396	
Volatile Organic Compounds Concentration, as Propane (ppmv)	5619	1308	4311
Volatile Organic Compounds Concentration, as Carbon (ppmv)	16857	3849	13008
Volatile Organic Compounds			
Emission Rate, as Propane (g/min)	104.417	26.382	78.035
Emission Rate, as Propane (lb/hr)	13.812	3.490	10.322
Volatile Organic Compounds			
Emission Rate, as Carbon (g/min)	84.224	21.280	62.944
Emission Rate, as Carbon (lb/hr)	11.141	2.815	8.326

Table 1. Summary of Volatile Organic Compounds (VOC) Emission (continued)

	Cylinder #1 Press/ Cylinder #2 BV			Cylinder #1 FV/ Cylinder #2 Pressure			Cylinder #1 Final Drain/ Cylinder #2 FV		
	Inlet	Outlet	Difference	Inlet	Outlet	Difference	Inlet	Outlet	Difference
Stack Gas Temperature (F)	142.0	85.0	57.0	140.8	91.9	49.0	132.3	85.4	46.9
Stack Gas Velocity (fpm)	690	690		765	765		709	709	
Volumetric Flow Rate (actual cfs)	376	376		417	417		386	386	
Volumetric Flow Rate (scfs)	307	307		342	342		321	321	
Volatile Organic Compounds Concentration, as Propane (ppmv)	11926	2506	9420	11180	1617	9563	3418	1644	1774
Volatile Organic Compounds Concentration, as Carbon (ppmv)	35779	7518	28261	33540	4851	28689	10253	4932	5321
Volatile Organic Compounds Emission Rate, as Propane (g/min)	203.319	46.663	156.656	208.160	35.962	172.198	62.682	30.086	32.596
Emission Rate, as Propane (lb/hr)	26.894	6.172	20.722	27.535	4.757	22.778	8.291	3.980	4.312
Volatile Organic Compounds Emission Rate, as Carbon (g/min)	163.999	37.639	126.360	167.904	29.007	138.897	50.560	24.268	26.292
Emission Rate, as Carbon (lb/hr)	21.693	4.979	16.715	22.210	3.837	18.373	6.688	3.210	3.478

IV. SAMPLING AND ANALYTICAL PROCEDURES

The test for VOC emissions from these discharge stacks was conducted by the method specified in the Code of Federal Regulations, Title 40, Section 60.503, EPA Method 25A, as modified and adopted by the Alabama Department of Environmental Management.

The sampling equipment comprised the following: Stainless steel probe, and Model 51 Total Hydrocarbon Analyzer.

The effluent gas from the discharge stack was analyzed by pumping directly to the Model 51 Hydrocarbon Analyzer, which contains a flame ionization detector (FID) (see Figure 1). The output data from the Model 51 was printed with a Panasonic KX-P1180 matrix printer.

The GC calibration standards were manufactured and certified by Scott Specialty Gas. The concentration of the standards were 8.7 ppm, 100.5 ppm, 1,006 ppm, 10,000 ppm propane (C_3H_8) with balance air.

All Model 51 Total Hydrocarbon Analyzer data and raw field data is recorded in the appendix.

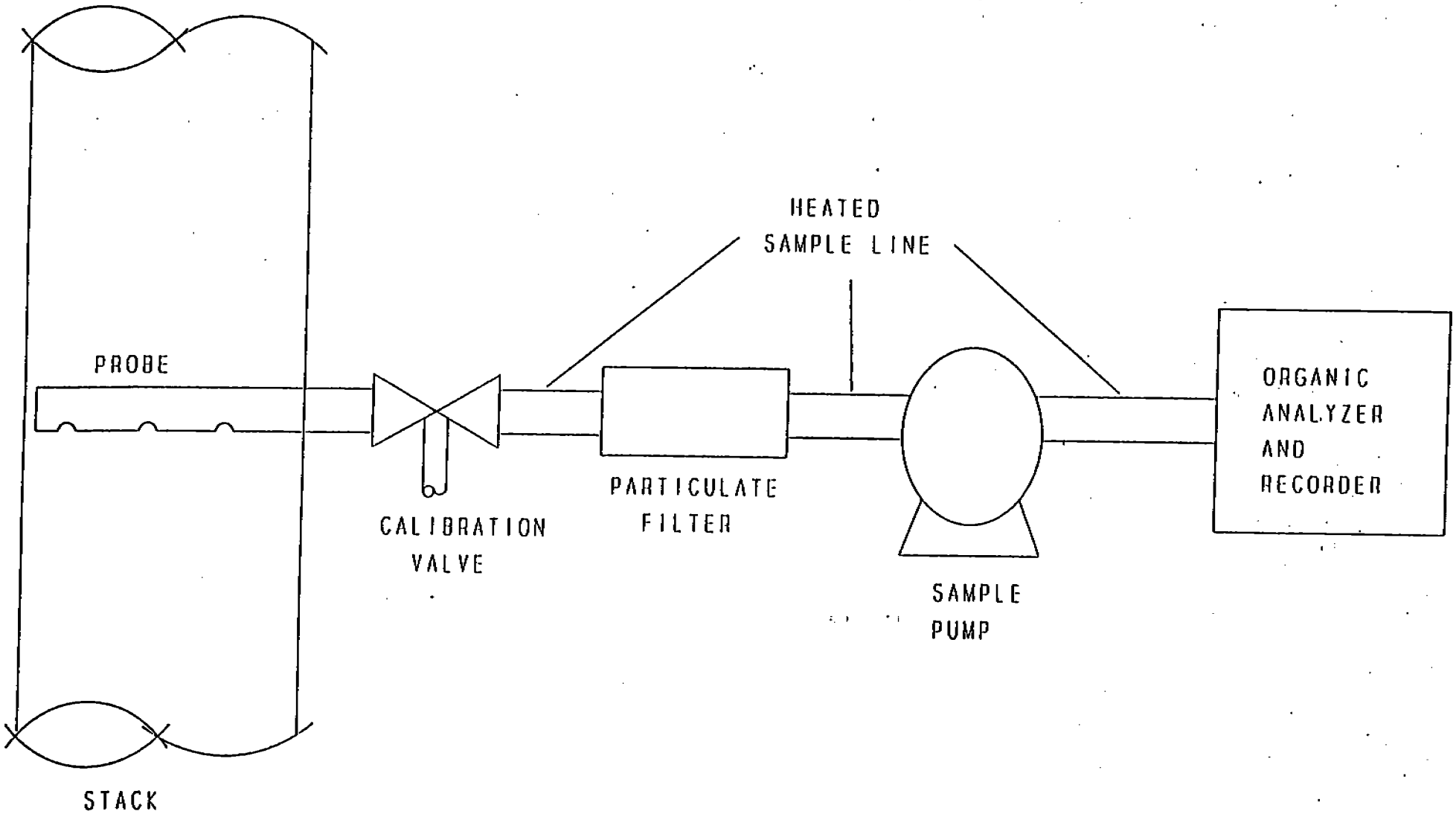


Figure 1 Organic Concentration Measurement System

APPENDIX

TABULAR TEST DATA, CALCULATIONS, AND SUPPORTING DOCUMENTS

NOMENCLATURE

Form as follows: Parameter Sheet = Equation Sheet = Definition

ts	=	t_s	=	Average temperature of stack, °C
As	=	A_s	=	Area of stack, ft^2
vs	=	v_s	=	Average stack gas velocity, ft/min
Qa	=	Q_a	=	Volumetric flow rate, ACFM
Qstd	=	Q_s	=	Volumetric flow rate, SDCFM
Cc	=	C_c	=	Concentration of volatile organic compounds at the atmospheric vent, ppm_v as carbon
Cmeas	=	C_{meas}	=	Concentration of volatile organic compounds at the atmospheric vent, ppm_v as propane (C_3H_8)
K	=	K	=	Carbon equivalent correction factor = 3 for propane (C_3H_8)
OMR-C	=	OMR_c	=	Average volatile organic carbon mass discharge, g/Hr
OMR-P	=	OMR_P	=	Average volatile organic compounds mass discharge, as propane (C_3H_8), g/Hr

Standard Conditions are 0°C, 760 mm. Hg.

CFM - Cubic feet per minute
SCFM - Standard cubic feet per minute
SDCFM - Standard dry cubic feet per minute
SCF - Standard cubic feet

EQUATIONS

The following equations were used in the computer calculations of the raw data:

1. $T_s = t_s + 273.15$

2. $Q_s = \frac{v_s A_s}{60}$

3. $Q_{std} = Q_s \left(\frac{273.15}{T_s}\right)\left(\frac{P_s}{760}\right)$

4. $C_c = KC_{meas}$

5. $OMR\text{-}_P = C_{meas}\, Q_{std}\left[\frac{(28.32)(44.033)(60)(60)}{(1000)(1000)(22.4)(453.59)}\right]$

6. $OMR\text{-}_C = OMR\text{-}_P\left[\frac{(36.033)}{(44.033)}\right]$

METHOD 25A—DETERMINATION OF TOTAL GASEOUS ORGANIC CONCENTRATION USING A FLAME IONIZATION ANALYZER

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate organic calibration gas) or in terms of carbon.

1.2 Principle. A gas sample is extracted from the source through a heated sample line, if necessary, and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

2. *Definitions*

2.1 Measurement System. The total equipment required for the determination of the gas concentration. The system consists of the following major subsystems:

2.1.1 Sample Interface. That portion of the system that is used for one or more of the following: sample acquisition, sample transportation, sample conditioning, or protection of the analyzer from the effects of the stack effluent.

2.1.2 Organic Analyzer. That portion of the system that senses organic concentration and generates an output proportional to the gas concentration.

2.2 Span Value. The upper limit of a gas concentration measurement range that is specified for affected source categories in the applicable part of the regulations. The span value is established in the applicable regulation and is usually 1.5 to 2.5 times the applicable emission limit. If no span value is provided, use a span value equivalent to 1.5 to 2.5 times the expected concentration. For convenience, the span value should correspond to 100 percent of the recorder scale.

2.3 Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

2.4 Zero Drift. The difference in the measurement system response to a zero level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

2.5 Calibration Drift. The difference in the measurement system response to a mid-level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair or adjustment took place.

2.6 Response Time. The time interval from a step change in pollutant concentration at the inlet to the emission measurement system to the time at which 95 percent of the corresponding final value is reached as displayed on the recorder.

2.7 Calibration Error. The difference between the gas concentration indicated by the measurement system and the known concentration of the calibration gas.

3. *Apparatus*

A schematic of an acceptable measurement system is shown in Figure 25A–1. The essential components of the measurement system are described below:

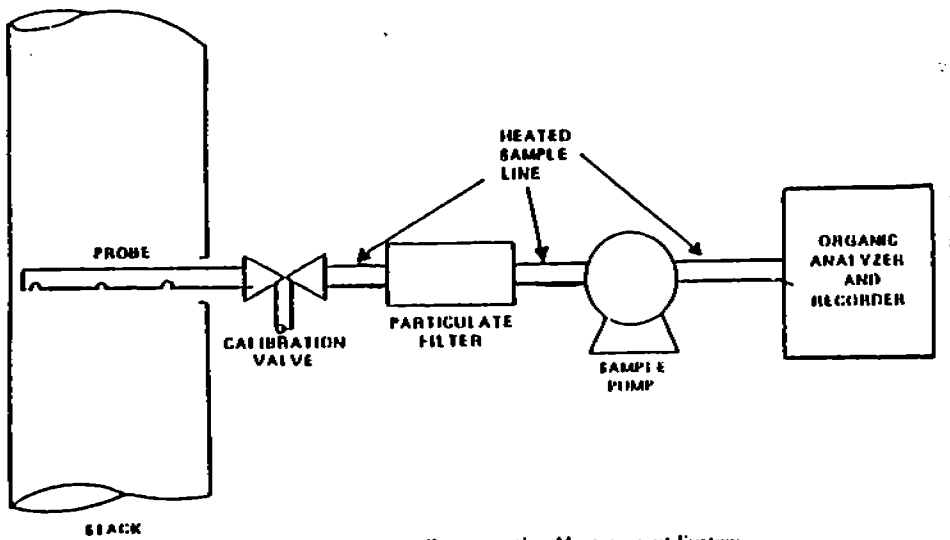


Figure 25A–1. Organic Concentration Measurement System.

3.1 Organic Concentration Analyzer. A flame ionization analyzer (FIA) capable of meeting or exceeding the specifications in this method.

3.2 Sample Probe. Stainless steel, or equivalent, three-hole rake type. Sample holes shall be 4 mm in diameter or smaller and located at 16.7, 50, and 83.3 percent of the equivalent stack diameter. Alternatively, a single opening probe may be used so that a gas sample is collected from the centrally located 10 percent area of the stack cross-section.

3.3 Sample Line. Stainless steel or Teflon* tubing to transport the sample gas to the analyzer. The sample line should be heated, if necessary, to prevent condensation in the line.

3.4 Calibration Valve Assembly. A three-way valve assembly to direct the zero and calibration gases to the analyzers is recommended. Other methods, such as quick-connect lines, to route calibration gas to the analyzers are applicable.

3.5 Particulate Filter. An in-stack or an out-of-stack glass fiber filter is recommended if exhaust gas particulate loading is significant. An out-of-stack filter should be heated to prevent any condensation.

3.6 Recorder. A strip-chart recorder, analog computer, or digital recorder for recording measurement data. The minimum data recording requirement is one measurement value per minute. Note: This method is often applied in highly explosive areas. Caution and care should be exercised in choice of equipment and installation.

4. *Calibration and Other Gases*

Gases used for calibrations, fuel, and combustion air (if required) are contained in compressed gas cylinders. Preparation of calibration gases shall be done according to the procedure in Protocol No. 1, listed in Citation 2 of Bibliography. Additionally, the manufacturer of the cylinder should provide a recommended shelf life for each calibration gas cylinder over which the concentration does not change more than ±2 percent from the certified value. For calibration gas values not generally available (i.e., organics between 1 and 10 percent by volume), alternative methods for preparing calibration gas mixtures, such as dilution systems, may be used with prior approval of the Administrator.

Calibration gases usually consist of propane in air or nitrogen and are determined in terms of the span value. Organic compounds other than propane can be used following the above guidelines and making the appropriate corrections for response factor.

*Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

4.1 Fuel. A 40 percent H_2/60 percent He or 40 percent H_2/60 percent N_2 gas mixture is recommended to avoid an oxygen synergism effect that reportedly occurs when oxygen concentration varies significantly from a mean value.

4.2 Zero Gas. High purity air with less than 0.1 parts per million by volume (ppmv) of organic material (propane or carbon equivalent) or less than 0.1 percent of the span value, whichever is greater.

4.3 Low-level Calibration Gas. An organic calibration gas with a concentration equivalent to 25 to 35 percent of the applicable span value.

4.4 Mid-level Calibration Gas. An organic calibration gas with a concentration equivalent to 45 to 55 percent of the applicable span value.

4.5 High-level Calibration Gas. An organic calibration gas with a concentration equivalent to 80 to 90 percent of the applicable span value.

5. *Measurement System Performance Specifications*

5.1 Zero Drift. Less than ±3 percent of the span value.

5.2 Calibration Drift. Less than ±3 percent of span value.

5.3 Calibration Error. Less than ±5 percent of the calibration gas value.

6. *Pretest Preparations*

6.1 Selection of Sampling Site. The location of the sampling site is generally specified by the applicable regulation or purpose of the test; i.e., exhaust stack, inlet line, etc. The sample port shall be located at least 1.5 meters or 2 equivalent diameters upstream of the gas discharge to the atmosphere.

6.2 Location of Sample Probe. Install the sample probe so that the probe is centrally located in the stack, pipe, or duct and is sealed tightly at the stack port connection.

6.3 Measurement System Preparation. Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing the sample interface and the organic analyzer. Make the system operable.

FIA equipment can be calibrated for almost any range of total organics concentrations. For high concentrations of organics (>1.0 percent by volume as propane) modifications to most commonly available analyzers are necessary. One accepted method of equipment modification is to decrease the size of the sample to the analyzer through the use of a smaller diameter sample capillary. Direct and continuous measurement of organic concentration is a necessary consideration when determining any modification design.

6.4 Calibration Error Test. Immediately prior to the test series, (within 2 hours of the start of the test) introduce zero gas and high-level calibration gas at the calibration valve assembly. Adjust the analyzer output

to the appropriate levels, if necessary. Calculate the predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level responses. Then introduce low-level and mid-level calibration gases successively to the measurement system. Record the analyzer responses for low-level and mid-level calibration gases and determine the differences between the measurement system responses and the predicted responses. These differences must be less than 5 percent of the respective calibration gas value. If not, the measurement system is not acceptable and must be replaced or repaired prior to testing. No adjustments to the measurement system shall be conducted after the calibration and before the drift check (Section 7.3). If adjustments are necessary before the completion of the test series, perform the drift checks prior to the required adjustments and repeat the calibration following the adjustments. If multiple electronic ranges are to be used, each additional range must be checked with a mid-level calibration gas to verify the multiplication factor.

6.5 Response Time Test. Introduce zero gas into the measurement system at the calibration valve assembly. When the system output has stabilized, switch quickly to the high-level calibration gas. Record the time from the concentration change to the measurement system response equivalent to 95 percent of the step change. Repeat the test three times and average the results.

7. Emission Measurement Test Procedure

7.1 Organic Measurement. Begin sampling at the start of the test period, recording time and any required process information as appropriate. In particular, note on the recording chart periods of process interruption or cyclic operation.

7.2 Drift Determination. Immediately following the completion of the test period and hourly during the test period, reintroduce the zero and mid-level calibration gases, one at a time, to the measurement system at the calibration valve assembly. (Make no adjustments to the measurement system until after both the zero and calibration drift checks are made.) Record the analyzer response. If the drift values exceed the specified limits, invalidate the test results preceding the check and repeat the test following corrections to the measurement system. Alternatively, recalibrate the test measurement system as in Section 6.4 and report the results using both sets of calibration data (i.e., data determined prior to the test period and data determined following the test period).

8. Organic Concentration Calculations

Determine the average organic concentration in terms of ppmv as propane or other calibration gas. The average shall be determined by the integration of the output recording over the period specified in the applicable regulation.

If results are required in terms of ppmv as carbon, adjust measured concentrations using Equation 25A–1.

$$C_c = K\ C_{meas} \qquad \text{Eq. 25A-1}$$

Where:

C_c=Organic concentration as carbon, ppmv.

C_{meas}=Organic concentration as measured, ppmv.

K=Carbon equivalent correction factor,

K=2 for ethane.

K=3 for propane.

K=4 for butane.

K=Appropriate response factor for other organic calibration gases.

9. Bibliography

1. Measurement of Volatile Organic Compounds—Guideline Series. U.S. Environmental Protection Agency. Research Triangle Park, NC. Publication No. EPA–450/2–78–041. June 1978. p. 46–54.

2. Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Continuous Source Emission Monitors (Protocol No. 1). U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory. Research Triangle Park, NC. June 1978.

3. Gasoline Vapor Emission Laboratory Evaluation—Part 2. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC. EMB Report No. 75–GAS–6. August 1976.

METHOD 25B—DETERMINATION OF TOTAL GASEOUS ORGANIC CONCENTRATION USING A NONDISPERSIVE INFRARED ANALYZER

1. Applicability and Principle

1.1 Applicability. This method applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes. (Other organic materials may be measured using the general procedure in this method, the appropriate calibration gas, and an analyzer set to the appropriate absorption band.) The concentration is expressed in terms of propane (or other appropriate organic calibration gas) or in terms of carbon.

1.2 Principle. A gas sample is extracted from the source through a heated sample line, if necessary, and glass fiber filter to a nondispersive infrared analyzer (NDIR). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

2. Definitions

The terms and definitions are the same as for Method 25A.

3. Apparatus

The apparatus is the same as for Method 25A with the exception of the following:

3.1 Organic Concentration Analyzer. A nondispersive infrared analyzer designed to measure alkane organics and capable of meeting or exceeding the specifications in this method.

4. Calibration Gases

The calibration gases are the same as required for Method 25A, Section 4. No fuel gas is required for an NDIR.

5. Measurement System Performance Specifications

5.1 Zero Drift. Less than ±3 percent of the span value.

5.2 Calibration Drift. Less than ±3 percent of the span value.

5.3 Calibration Error. Less than ±5 percent of the calibration gas value.

6. Pretest Preparations

6.1 Selection of Sampling Site. Same as in Method 25A, Section 6.1.

6.2 Location of Sample Probe. Same as in Method 25A, Section 6.2.

6.3 Measurement System Preparation. Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing the sample interface and the organic analyzer. Make the system operable.

6.4 Calibration Error Test. Same as in Method 25A, Section 6.4.

6.5 Response Time Test Procedure. Same as in Method 25A, Section 6.5.

7. Emission Measurement Test Procedure

Proceed with the emission measurement immediately upon satisfactory completion of the calibration.

7.1 Organic Measurement. Same as in Method 25A, Section 7.1.

7.2 Drift Determination. Same as in Method 25A, Section 7.2.

8. Organic Concentration Calculations

The calculations are the same as in Method 25A, Section 8.

9. Bibliography

The bibliography is the same as in Method 25A.

METHOD 26—DETERMINATION OF HYDROGEN CHLORIDE EMISSIONS FROM STATIONARY SOURCES

1. Applicability, Principle, Interferences, Precision, Bias, and Stability

1.1 Applicability. This method is applicable for determining hydrogen chloride (HCl) emissions from stationary sources.

1.2 Principle. An integrated sample is extracted from the stack and passed through dilute sulfuric acid. In the dilute acid, the HCl gas is dissolved and forms chloride (Cl^-) ions. The Cl^- is analyzed by ion chromatography (IC).

1.3 Interferences. Volatile materials which produce chloride ions upon dissolution during sampling are obvious interferences. Another likely interferent is diatomic chlorine (Cl_2) gas which reacts to form HCl and hypochlorous acid (HOCl) upon dissolving in water. However, Cl_2 gas exhibits a low solubility in water and the use of acidic, rather than neutral or basic collection solutions, greatly reduces the chance of dissolving any chlorine present.

1.4 Precision and Bias. The within-laboratory relative standard deviations are 6.2 and 3.2 percent at HCl concentrations of 3.9 and 15.3 ppm, respectively. The method does not exhibit a bias to Cl_2 when sampling at concentrations less than 50 ppm.

1.5 Stability. The collected samples can be stored for up to 4 weeks before analysis.

1.6 Detection Limit. The analytical detection limit of the method is 0.1 μg/ml.

2. Apparatus

2.1 Sampling. The sampling train is shown in Figure 26–1, and component parts are discussed below.

2.1.1 Probe. Borsilicate glass, approximately 3/8-in. (9-mm) I.D. with a heating system to prevent moisture condensation. A Teflon-glass filter in a mat configuration shall be installed behind the probe to remove particulate matter from the gas stream (see section 2.1.5). A glass wool plug should *not* be used to remove particulate matter since a negative bias in the data could result.

2.1.2 Three-Way Stopcock. A borosilicate glass three-way stopcock with a heating system to prevent moisturecondensation. The heated stopcock should connect to the outlet of the heated filter and the inlet of the first impinger. The heating system shall be capable of preventing condensation up to the inlet of the first impinger. Silicone grease may be used, if necessary, to prevent leakage.

COMPILED DATA

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Inlet

No Charging/Background

Date	Time	Concentration of THC Average ppm	High ppm	Low ppm	Time	Temperature deg. F	deg. C	Velocity ft/min.	Flow actual cfm	std cond. cfm	OMR-P Average Mass g/min.	High Mass g/min.	Low Mass g/min.
12-Apr-94	9:41 am	2541	3928	576	9:40 am	110	43.3	1000	545	471	101.4	121.7	66.7
12-Apr-94	9:42 am	4348	4599	4019									
12-Apr-94	9:46 am	3417	4515	978									
12-Apr-94	9:47 am	5145	5500	4591									
12-Apr-94	9:50 am	4139	5145	1547	9:50 am	121	49.4	920	502	425	113.4	127.4	79.8
12-Apr-94	9:51 am	5439	5612	5193									
12-Apr-94	9:55 am	4328	5193	1662	9:55 am	121	49.4	900	491	416	114.6	127.3	80.3
12-Apr-94	9:56 am	5567	5795	5272									
12-Apr-94	10:00 am	4266	4987	1359	10:00 am	124	51.1	900	491	414	98.3	115.0	31.3
12-Apr-94	10:14 am	2309	2888	1416	10:10 am	127	52.8	950	518	434	55.9	69.9	34.3
12-Apr-94	10:15 am	2707	2888	2557	10:15 am	128	53.3	930	507	424	64.0	68.3	60.5
12-Apr-94	10:20 am	2145	2308	1397	10:20 am	133	56.1	880	480	398	48.0	50.5	39.1
12-Apr-94	10:22 am	2183	2246	2122									
12-Apr-94	10:27 am	2351	2875	1394	10:25 am	131	55.0	880	480	400	61.3	68.9	48.2
12-Apr-94	10:28 am	3157	3308	2930									
12-Apr-94	10:33 am	2503	2723	1268	10:30 am	131	55.0	930	507	422	62.3	65.3	47.0
12-Apr-94	10:34 am	2792	2826	2723									
12-Apr-94	10:35 am	2843	2868	2653	10:35 am	129	53.9	860	469	392	62.1	62.6	57.9
12-Apr-94	10:41 am	2191	2596	1252	10:40 am	130	54.4	870	475	396	54.7	60.0	42.9
12-Apr-94	10:42 am	2766	2847	2640									
12-Apr-94	10:47 am	2244	2554	1418	10:45 am	132	55.6	830	453	376	51.3	54.9	41.9
12-Apr-94	10:49 am	2646	2681	2578									
12-Apr-94	10:54 am	1763	2101	1434	10:50 am	131	55.0	860	469	390	38.4	45.7	31.2
12-Apr-94	10:55 am	2142	2163	2101	10:55 am	134	56.7	870	475	393	46.9	47.4	46.0
12-Apr-94	11:10 am	1670	2466	843	11:10 am	105	40.6	820	447	389	42.6	52.4	32.9
12-Apr-94	11:11 am	2259	2363	2192									
12-Apr-94	11:21 am	1603	1702	1065	11:20 am	103	39.4	800	436	381	36.1	37.8	29.6
12-Apr-94	11:22 am	1791	1851	1723									
12-Apr-94	11:27 am	1443	1617	691	11:25 am	100	37.8	840	458	402	35.3	36.6	29.5
12-Apr-94	11:28 am	1633	1638	1617									
12-Apr-94	11:29 am	1638	1638	1638									
12-Apr-94	11:37 am	1449	1638	677	11:35 am	97	36.1	870	475	419	36.3	38.8	27.0
12-Apr-94	11:39 am	1662	1681	1638									
12-Apr-94	11:40 am	1681	1681	1681	11:40 am	96	35.6	880	480	425	39.8	39.8	39.8
12-Apr-94	11:47 am	1314	1511	536	11:45 am	96	35.6	870	475	420	30.8	35.4	12.5
12-Apr-94	11:55 am	1262	1702	297	11:55 am	95	35.0	870	475	421	41.2	46.9	31.5
12-Apr-94	11:56 am	1840	1979	1723									
12-Apr-94	11:58 am	2173	2320	2008									
12-Apr-94	12:04 pm	1701	2318	1307	12:00 pm	92	33.3	1660	905	807	76.5	104.3	58.8
12-Apr-94	12:05 pm	2549	2628	2379	12:05 pm	92	33.3	1650	900	802	114.0	117.5	106.4
12-Apr-94	12:32 pm	1240	1480	721	12:30 pm	94	34.4	1560	851	756	52.2	62.3	30.4
12-Apr-94	12:35 pm	1325	1564	591	12:35 pm	92	33.3	1570	856	763	56.4	66.5	25.1
12-Apr-94	12:47 pm	1126	1382	742	12:45 pm	95	35.0	1520	829	735	52.4	58.2	43.8
12-Apr-94	12:48 pm	1432	1458	1395									
12-Apr-94	1:43 pm	564	667	393	Average	113	45.0	1019	556	477	15.0	17.7	10.5
12-Apr-94	1:50 pm	619	689	524	Average	113	45.0	1019	556	477	16.5	18.3	13.9
12-Apr-94	1:51 pm	700	776	698	Average	113	45.0	1019	556	477	18.6	20.6	18.6
12-Apr-94	2:18 pm	706	776	590	Average	113	45.0	1019	556	477	18.8	20.6	15.7
12-Apr-94	2:19 pm	824	869	783	Average	113	45.0	1019	556	477	21.9	23.1	20.8
	Average	2288	2562	1705		113.0	45.0	1019	556	479	54.1	60.7	40.5
	Maximum	5567	5795	5272		134.0	56.7	1660	905	807	114.6	127.4	106.4
	Minimum	564	667	297		92.0	33.3	800	436	376	15.0	17.7	10.5
	Std. Dev.	1212	1349	1147		14.9	8.3	260	142	132	28.2	32.5	21.5

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Inlet No. 2 Cylinder Filling

		Concentration of THC				Temperature		Velocity	Flow		Average	OMR-P High	OMR-P Low
		Average	High	Low					actual	std cond.	Mass	Mass	Mass
Date	Time	ppm	ppm	ppm	Time	deg. F	deg. C	ft/min.	cfm	cfm	g/min.	g/min.	g/min.
12-Apr-94	2:30 pm	899	1041	723	2:30 pm	93	33.9	620	338	301	19.0	20.5	17.0
12-Apr-94	2:31 pm	1171	1255	1063									
12-Apr-94	2:32 pm	1323	1374	1251									
12-Apr-94	2:54 pm	1272	1361	1158	2:50 pm	94	34.4	560	305	271	19.2	20.6	17.5
12-Apr-94	2:55 pm	1373	1391	1315	2:55 pm	94	34.4	540	295	262	20.0	20.3	19.2
12-Apr-94	3:24 pm	1121	1237	932	3:20 pm	95	35.0	540	295	261	16.3	18.0	13.6
12-Apr-94	3:25 pm	1325	1407	1248	3:25 pm	95	35.0	480	262	232	17.1	18.2	16.1
12-Apr-94	3:43 pm	1261	1331	1192	3:40 pm	96	35.6	530	289	256	17.7	18.3	17.1
12-Apr-94	3:44 pm	1219	1239	1203									
12-Apr-94	4:00 pm	1132	1181	1089	4:00 pm	97	36.1	480	262	231	14.6	15.2	14.0
12-Apr-94	4:27 pm	1799	1876	1681	4:25 pm	97	36.1	5970	3256	2876	299.6	309.5	286.9
12-Apr-94	4:28 pm	1938	1985	1898									
	Average	1319	1390	1229		95	35	1215	663	586	53	55	50
	Maximum	1938	1985	1898		97	36	5970	3256	2876	300	310	287
	Minimum	899	1041	723		93	34	480	262	231	15	15	14
	Std. Dev.	275	262	297		1	1	1798	980	866	93	96	89

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Inlet

No. 2 Cylinder Heating to 200F

		Concentration of THC				Temperature		Velocity	Flow		Average	OMR-P High	OMR-P Low
Date	Time	Average ppm	High ppm	Low ppm	Time	deg. F	deg. C	ft/min.	actual cfm	std cond. cfm	Mass g/min.	Mass g/min.	Mass g/min.
12-Apr-94	4:46 pm	1263	1343	1146	4:45 pm	95	35.0	5920	3229	2862	209.88	218.28	198.28
12-Apr-94	4:47 pm	1339	1361	1296									
12-Apr-94	4:48 pm	1344	1400	1286									
12-Apr-94	5:16 pm	1183	1225	1152	5:20 pm	96	35.6	320	175	154	10.32	10.73	9.91
12-Apr-94	5:17 pm	1214	1267	1151									
12-Apr-94	5:33 pm	1029	1147	887	5:30 pm	94	34.4	340	185	165	10.48	11.25	9.45
12-Apr-94	5:34 pm	1254	1303	1172									
12-Apr-94	5:35 pm	1356	1394	1303	5:35 pm	94	34.4	330	180	160	12.08	12.42	11.61
12-Apr-94	5:53 pm	1118	1200	1012	5:50 pm	92	33.3	350	191	170	11.26	11.82	10.54
12-Apr-94	5:54 pm	1257	1292	1210									
12-Apr-94	6:18 pm	981	1051	891	6:15 pm	92	33.3	330	180	160	9.29	9.76	8.72
12-Apr-94	6:19 pm	1097	1132	1059									
12-Apr-94	6:39 pm	762	845	682	6:25 pm	91	32.8	320	175	156	6.62	7.34	5.93
12-Apr-94	6:40 pm	911	960	861	6:30 pm	91	32.8	320	175	156	8.52	8.78	8.23
12-Apr-94	6:41 pm	995	1014	968									
12-Apr-94	6:42 pm	1036	1059	1013									
	Average	1134	1187	1068		93	34	1029	561	498	34.81	36.30	32.83
	Maximum	1356	1400	1303		96	36	5920	3229	2862	209.88	218.28	198.28
	Minimum	762	845	682		91	33	320	175	154	6.62	7.34	5.93
	Std. Dev.	166	161	173		2	1	1849	1008	894	66.19	68.80	62.55

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Inlet

Cylinder #1 BV/ Cylinder #2 Heating

		Concentration of THC				Temperature		Velocity	Flow		Average	OMR-P High	OMR-P Low
Date	Time	Average ppm	High ppm	Low ppm	Time	deg. F	deg. C	ft/min.	actual cfm	std cond. cfm	Mass g/min.	Mass g/min.	Mass g/min.
12-Apr-94	7:11 pm	5115	5330	4674	7:10 pm	144	62.2	200	109	89	22.3	23.1	21.2
12-Apr-94	7:12 pm	4294	4535	4150									
12-Apr-94	7:13 pm	4091	4150	4040									
12-Apr-94	7:36 pm	7679	8282	6609	7:35 pm	114	45.6	210	115	98	44.5	45.9	42.2
12-Apr-94	7:37 pm	8364	8457	8304									
12-Apr-94	7:38 pm	8331	8435	8194									
12-Apr-94	8:12 pm	12387	12955	11782	8:10 pm	137	58.3	590	322	265	192.9	197.0	188.0
12-Apr-94	8:13 pm	13173	13372	12957									
12-Apr-94	8:14 pm	13576	13645	13410									
12-Apr-94	8:27 pm	8115	11584	3222	8:25 pm	124	51.1	550	300	253	153.1	170.7	128.4
12-Apr-94	8:28 pm	12052	12267	11755									
12-Apr-94	8:29 pm	12428	12510	12360									
12-Apr-94	8:30 pm	12279	12360	12253	8:30 pm	127	52.8	460	251	210	143.9	144.9	143.6
12-Apr-94	8:51 pm	7390	7872	7034	8:50 pm	123	50.6	490	267	226	99.8	102.6	97.3
12-Apr-94	8:52 pm	8119	8297	7906									
12-Apr-94	8:53 pm	8300	8313	8271									
12-Apr-94	9:20 pm	6035	6462	5481	9:20 pm	119	48.3	730	398	338	129.2	133.0	124.4
12-Apr-94	9:22 pm	7155	7280	7000									
12-Apr-94	9:23 pm	7363	7409	7301									
12-Apr-94	9:25 pm	7469	7516	7409	9:25 pm	119	48.3	780	425	361	151.0	151.7	150.2
12-Apr-94	9:26 pm	7521	7538	7495									
12-Apr-94	9:57 pm	4960	5214	4588	9:55 pm	120	48.9	740	404	342	97.5	102.8	93.5
12-Apr-94	9:58 pm	4981	5214	4806									
12-Apr-94	9:59 pm	5180	5365	5064									
12-Apr-94	10:00 pm	5322	5744	5128									
	Average	8067	8404	7648		125	52	528	288	243	114.9	119.1	109.8
	Maximum	13576	13645	13410		144	62	780	425	361	192.9	197.0	188.0
	Minimum	4091	4150	3222		114	46	200	109	89	22.3	23.1	21.2
	Std. Dev.	2888	2949	3039		9	5	202	110	94	51.6	53.5	49.8

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Inlet

Cylinder #1 Press/ Cylinder #2 BV

		Concentration of THC				Temperature		Velocity	Flow		OMR-P		
		Average	High	Low					actual	std cond.	Average	High	Low
Date	Time	ppm	ppm	ppm	Time	deg. F	deg. C	ft/min.	cfm	cfm	Mass g/min.	Mass g/min.	Mass g/min.
12-Apr-94	10:34 pm	8548	8871	7985	10:30 pm	139	59.4	770	420	345	164.4	170.6	153.5
12-Apr-94	10:35 pm	9137	9243	9002	10:35 pm	141	60.6	800	436	357	183.6	184.8	182.3
12-Apr-94	10:37 pm	9280	9309	9265									
12-Apr-94	10:38 pm	9241	9287	9199									
12-Apr-94	11:19 pm	14270	14442	13904	11:15 pm	148	64.4	760	415	335	266.8	270.0	260.0
12-Apr-94	11:20 pm	14530	14576	14450	11:20 pm	150	65.6	800	436	352	285.9	286.4	284.2
12-Apr-94	11:21 pm	14576	14576	14576									
12-Apr-94	11:22 pm	14572	14576	14554									
12-Apr-94	11:23 pm	14591	14598	14576									
12-Apr-94	11:24 pm	14590	14666	14288									
12-Apr-94	11:59 pm	11992	12335	11335	11:55 pm	142	61.1	750	409	334	223.5	229.9	211.2
13-Apr-94	12:00 am	12791	13156	12363	12:00 am	143	61.7	700	382	311	222.1	228.4	214.7
13-Apr-94	12:34 am	12732	13382	11784	12:30 am	148	64.4	730	398	322	228.7	240.3	211.6
13-Apr-94	12:35 am	13835	13997	13535	12:35 am	151	66.1	670	365	294	231.3	233.8	228.0
13-Apr-94	12:36 am	14145	14197	14064									
13-Apr-94	12:37 am	14321	14576	14108									
13-Apr-94	1:37 am	6766	7841	5862	1:35 am	107	41.7	445	243	211	95.9	108.8	84.1
13-Apr-94	1:38 am	7290	9084	6158									
13-Apr-94	1:39 am	10453	10887	9478									
13-Apr-94	1:40 am	11301	11790	10887	1:40 am	151	66.1	470	256	206	131.1	136.1	125.6
13-Apr-94	1:41 am	11489	11863	10952									
	Average	11926	12250	11539		142	61	690	376	307	203.3	208.9	195.5
	Maximum	14591	14666	14576		151	66	800	436	357	285.9	286.4	284.2
	Minimum	6766	7841	5862		107	42	445	243	206	95.9	108.8	84.1
	Std. Dev.	2586	2354	2784		12	7	122	67	52	56.3	54.4	57.6

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Inlet

Cylinder #1 FV/ Cylinder #2 Pressure

		Concentration of THC				Temperature		Velocity	Flow		OMR-P Average	OMR-P High	OMR-P Low
Date	Time	Average ppm	High ppm	Low ppm	Time	deg. F	deg. C	ft/min.	actual cfm	std cond. cfm	Mass g/min.	Mass g/min.	Mass g/min.
13-Apr-94	2:18 am	3853	4101	3472	2:15 am	134	56.7	750	409	339	72.8	77.5	65.6
13-Apr-94	2:20 am	4288	4470	4123	2:20 am	133	56.1	780	425	353	131.0	148.6	115.6
13-Apr-94	2:21 am	4568	4622	4492									
13-Apr-94	2:22 am	7205	10195	4601									
13-Apr-94	2:23 am	10564	10931	10293									
13-Apr-94	2:54 am	8664	9373	7718	2:50 am	147	63.9	770	420	340	164.4	177.9	146.5
13-Apr-94	2:55 am	9868	10239	9490	2:55 am	148	64.4	830	453	366	211.2	215.5	206.9
13-Apr-94	2:56 am	10406	10564	10288									
13-Apr-94	2:58 am	10759	10852	10613									
13-Apr-94	3:38 am	5832	6283	5194	3:35 am	142	61.1	710	387	316	550.1	113.8	101.8
13-Apr-94	3:39 am	56532	6613	6343									
13-Apr-94	3:40 am	6389	6591	6239	3:40 am	141	60.6	750	409	335	119.5	124.3	115.4
13-Apr-94	3:41 am	6412	6723	6129									
	Average	11180	7812	6846		141	60	765	417	342	208.2	142.9	125.3
	Maximum	56532	10931	10613		148	64	830	453	366	550.1	215.5	206.9
	Minimum	3853	4101	3472		133	56	710	387	316	72.8	77.5	65.6
	Std. Dev.	13304	2513	2464		6	3	36	20	15	158.6	44.7	43.6

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Inlet

Cylinder #1 Final Drain/ Cylinder #2 FV

		Concentration of THC				Temperature		Velocity	Flow		Average	OMR-P High	OMR-P Low
Date	Time	Average ppm	High ppm	Low ppm	Time	deg. F	deg. C	ft/min.	actual cfm	std cond. cfm	Mass g/min.	Mass g/min.	Mass g/min.
13-Apr-94	6:13 am	1859	1978	1584	6:10 am	104	40.0	710	387	338	37.0	38.8	33.8
13-Apr-94	6:14 am	2070	2141	2002									
13-Apr-94	6:15 am	2191	2235	2141	6:15 am	105	40.6	700	382	332	41.8	44.0	39.2
13-Apr-94	6:16 am	2128	2444	1772									
13-Apr-94	6:18 am	2271	2351	2191									
13-Apr-94	6:19 am	2421	2468	2351									
13-Apr-94	6:20 am	2524	2561	2491	6:20 am	105	40.6	660	360	313	45.7	46.4	45.3
13-Apr-94	6:21 am	2595	2631	2561									
13-Apr-94	6:22 am	2645	2677	2631									
13-Apr-94	6:23 am	2689	2762	2677									
13-Apr-94	6:41 am	4397	4774	3830	6:40 am	150	65.6	610	333	268	74.3	78.2	69.6
13-Apr-94	6:43 am	5083	5321	4820									
13-Apr-94	6:44 am	5429	5586	5310									
13-Apr-94	6:45 am	5731	5845	5612	6:45 am	152	66.7	620	338	272	86.8	88.6	85.0
13-Apr-94	7:12 am	3551	3632	3378	7:10 am	154	67.8	910	496	398	70.1	73.5	66.7
13-Apr-94	7:13 am	2974	3309	2780									
13-Apr-94	7:14 am	2957	3010	2863									
13-Apr-94	7:16 am	3659	4170	3042	7:15 am	156	68.9	750	409	327	83.1	87.2	77.9
13-Apr-94	7:17 am	4525	4760	4233									
13-Apr-94	7:18 am	4945	5082	4783									
13-Apr-94	7:19 am	5125	5151	5050									
	Average	3418	3566	3243		132	56	709	386	321	62.7	65.3	59.6
	Maximum	5731	5845	5612		156	69	910	496	398	86.8	88.6	85.0
	Minimum	1859	1978	1584		104	40	610	333	268	37.0	38.8	33.8
	Std. Dev.	1242	1280	1216		24	13	94	51	41	19.2	19.9	18.6

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Outlet

No Charging/Background

OMR-P

Date	Time	Concentration of THC Average ppm	High ppm	Low ppm	Time	Temperature deg. F	deg. C	Velocity ft/min.	Flow actual cfm	std cond. cfm	Average Mass g/min.	High Mass g/min.	Low Mass g/min.
12-Apr-94	9:38 am	4003	10518	325	9:40 am	76.4	24.7	1000	545	500	66.1	117.1	35.2
12-Apr-94	9:40 am	767	818	697									
12-Apr-94	9:43 am	2252	4637	1414									
12-Apr-94	9:44 am	1294	1386	1224									
12-Apr-94	9:48 am	4056	5633	2302									
12-Apr-94	9:49 am	1845	2200	1606									
12-Apr-94	9:52 am	3335	5645	2292	9:50 am	77.9	25.5	920	502	459	67.3	100.6	51.2
12-Apr-94	9:53 am	1925	2218	1710									
12-Apr-94	9:57 am	3515	5688	2523	9:55 am	77.9	25.5	900	491	449	61.6	83.4	50.4
12-Apr-94	9:58 am	2132	2442	1893									
12-Apr-94	9:59 am	1731	1865	1629									
12-Apr-94	10:12 am	2028	4625	1136	10:10 am	78.9	26.1	950	518	473	46.1	80.6	34.1
12-Apr-94	10:13 am	1468	1487	1449									
12-Apr-94	10:16 am	2133	2826	1749	10:15 am	78.4	25.8	930	507	463	47.7	58.6	41.6
12-Apr-94	10:19 am	1557	1708	1469									
12-Apr-94	10:23 am	1831	2143	1625	10:20 am	78.7	25.9	880	480	438	44.7	52.4	39.7
12-Apr-94	10:26 am	1472	1604	1441	10:25 am	78.9	26.1	880	480	438	46.5	60.4	40.2
12-Apr-94	10:29 am	2337	3344	1853									
12-Apr-94	10:32 am	1669	1832	1492	10:30 am	79.8	26.6	930	507	462	43.0	47.2	38.5
12-Apr-94	10:37 am	2063	2614	1811	10:35 am	80.3	26.8	860	469	427	49.1	62.2	43.1
12-Apr-94	10:40 am	1669	1791	1498	10:40 am	80.5	26.9	870	475	432	40.2	43.1	36.1
12-Apr-94	10:43 am	2111	2647	1770	10:45 am	80.5	26.9	830	453	412	42.7	52.8	37.4
12-Apr-94	10:46 am	1608	1749	1483									
12-Apr-94	10:50 am	1998	2681	1749	10:50 am	80.9	27.2	860	469	427	47.5	63.8	41.6
12-Apr-94	10:53 am	1608	1718	1490	10:55 am	80.9	27.2	870	475	432	41.1	47.0	37.2
12-Apr-94	10:56 am	1807	2192	1604									
12-Apr-94	11:00 am	1603	1930	1227	11:00 am	80.8	27.1	810	442	402	35.9	43.2	27.5
12-Apr-94	11:18 am	697	818	606	11:15 am	81.0	27.2	820	447	407	15.8	18.5	13.7
12-Apr-94	11:19 am	872	898	830	11:20 am	81.0	27.2	800	436	397	27.1	30.0	24.0
12-Apr-94	11:23 am	1606	1894	1298									
12-Apr-94	11:24 am	1195	1277	1133									
12-Apr-94	11:30 am	1362	1659	1274	11:30 am	81.2	27.3	780	425	387	27.8	31.5	26.3
12-Apr-94	11:31 am	1213	1263	1170									
12-Apr-94	11:41 am	1353	1697	1242	11:40 am	80.1	26.7	880	480	437	29.6	34.2	27.9
12-Apr-94	11:43 am	1074	1109	1044									
12-Apr-94	12:06 pm	2637	2649	2607	12:00 pm	81.8	27.7	1660	905	822	120.9	121.4	119.5
12-Apr-94	12:08 pm	1782	2586	1410	12:05 pm	81.8	27.7	1650	900	817	70.1	90.5	60.0
12-Apr-94	12:09 pm	1295	1387	1226									
12-Apr-94	12:10 pm	1159	1215	1107	12:10 pm	82.0	27.8	1680	916	832	53.7	56.3	51.3
12-Apr-94	12:17 pm	333	498	181	12:15 pm	82.0	27.8	1680	916	832	21.2	26.0	16.2
12-Apr-94	12:19 pm	581	625	517									
12-Apr-94	12:40 pm	202	342	51	12:40 pm	81.1	27.3	1570	856	779	8.8	14.8	2.2
12-Apr-94	12:41 pm	407	440	357	12:45 pm	80.8	27.1	1520	829	754	17.1	18.5	15.0
12-Apr-94	12:55 pm	316	347	266	12:55 pm	80.2	26.8	590	322	293	5.2	5.7	4.3
12-Apr-94	12:57 pm	363	372	351	Average	80.2	26.8	1045	570	519	10.5	10.8	10.2
12-Apr-94	2:07 pm	398	435	347	Average	80.2	26.8	1045	570	519	11.5	12.6	10.0
	Average	1623	2210	1293		80.2	26.8	1045	570	519	40.7	51.2	34.6
	Maximum	4056	10518	2607		82.0	27.8	1680	916	832	120.9	121.4	119.5
	Minimum	202	342	51		76.4	24.7	590	322	293	5.2	5.7	2.2
	Std. Dev.	885	1835	607		1.4	0.8	324	176	160	24.0	31.1	22.4

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Outlet

No. 2 Cylinder Filling

		Concentration of THC				Temperature		Velocity	Flow		Average	OMR-P High	OMR-P Low
Date	Time	Average ppm	High ppm	Low ppm	Time	deg. F	deg. C	ft/min.	actual cfm	std cond. cfm	Mass g/min.	Mass g/min.	Mass g/min.
12-Apr-94	2:26 pm	219	245	187	2:30 pm	79.5	26.4	620	338	308	3.76	4.21	3.21
12-Apr-94	2:45 pm	219	254	169	2:45 pm	79.5	26.4	570	311	283	3.92	4.31	3.37
12-Apr-94	2:47 pm	277	291	258									
12-Apr-94	3:14 pm	242	266	210	3:10 pm	79.4	26.3	560	305	279	3.76	4.13	3.26
12-Apr-94	3:15 pm	283	295	269	3:15 pm	79.5	26.4	520	284	259	4.08	4.25	3.88
12-Apr-94	3:34 pm	229	250	199	3:30 pm	80.0	26.7	500	273	248	3.17	3.46	2.76
12-Apr-94	3:35 pm	268	278	253	3:35 pm	79.7	26.5	530	289	264	3.94	4.08	3.72
12-Apr-94	3:52 pm	218	239	192	3:50 pm	79.9	26.6	520	284	258	3.41	3.64	3.13
12-Apr-94	3:53 pm	256	266	243									
12-Apr-94	4:17 pm	276	317	220	4:15 pm	78.2	25.7	480	262	239	4.16	4.56	3.63
12-Apr-94	4:18 pm	347	367	324									
	Average	258	279	229		79	26	538	293	267	3.78	4.08	3.37
	Maximum	347	367	324		80	27	620	338	308	4.16	4.56	3.88
	Minimum	218	239	169		78	26	480	262	239	3.17	3.46	2.76
	Std. Dev.	37	36	43		1	0	41	23	21	0.31	0.34	0.34

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Outlet

No. 2 Cylinder Heating to 200F

		Concentration of THC									OMR-P		
		Average	High	Low		Temperature		Velocity	Flow actual	Flow std cond.	Average Mass	High Mass	Low Mass
Date	Time	ppm	ppm	ppm	Time	deg. F	deg. C	ft/min.	cfm	cfm	g/min.	g/min.	g/min.
12-Apr-94	4:37 pm	243	262	216	4:35 pm	166.6	74.8	9460	5160	4051	54.88	59.17	48.78
12-Apr-94	4:57 pm	215	232	191	4:55 pm	121.0	49.4	2280	1244	1053	13.56	14.29	12.50
12-Apr-94	4:58 pm	247	255	235									
12-Apr-94	5:24 pm	200	218	177	5:20 pm	78.0	25.6	320	175	160	1.78	1.94	1.57
12-Apr-94	5:25 pm	231	239	220	5:25 pm	78.5	25.8	350	191	174	2.25	2.32	2.14
12-Apr-94	5:44 pm	166	187	138	5:40 pm	78.2	25.7	400	218	199	1.85	2.08	1.53
12-Apr-94	5:45 pm	204	214	190	5:45 pm	78.4	25.8	330	180	164	1.87	1.96	1.74
12-Apr-94	6:07 pm	170	192	143	6:05 pm	78.3	25.7	320	175	160	1.81	1.93	1.66
12-Apr-94	6:08 pm	210	221	195									
12-Apr-94	6:09 pm	231	238	223									
12-Apr-94	6:29 pm	151	170	128	6:25 pm	78.3	25.7	320	175	160	1.34	1.51	1.14
12-Apr-94	6:30 pm	184	194	173	6:30 pm	192.8	89.3	320	175	132	1.26	1.36	1.14
12-Apr-94	6:53 pm	148	167	124									
12-Apr-94	6:54 pm	183	194	170									
	Average	199	213	180		106	41	1567	854	695	8.95	9.62	8.02
	Maximum	247	262	235		193	89	9460	5160	4051	54.88	59.17	48.78
	Minimum	148	167	124		78	26	320	175	132	1.26	1.36	1.14
	Std. Dev.	32	29	35		42	23	2856	1558	1219	16.65	17.94	14.81

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Outlet

Cylinder #1 BV/ Cylinder #2 Heating

		Concentration of THC				Temperature		Velocity	Flow		Average	OMR-P High	OMR-P Low
Date	Time	Average ppm	High ppm	Low ppm	Time	deg. F	deg. C	ft/min.	actual cfm	std cond. cfm	Mass g/min.	Mass g/min.	Mass g/min.
12-Apr-94	7:24 pm	539	585	486	7:20 pm	79.2	26.2	200	109	100	2.99	3.25	2.70
12-Apr-94	7:25 pm	622	647	593	7:25 pm	79.2	26.2	180	98	90	3.24	3.35	3.11
12-Apr-94	7:27 pm	675	695	651									
12-Apr-94	7:49 pm	982	1032	913	7:45 pm	80.1	26.7	470	256	234	12.78	13.43	11.89
12-Apr-94	7:50 pm	1074	1101	1039	7:50 pm	80.0	26.7	400	218	199	12.61	13.60	12.08
12-Apr-94	7:51 pm	1117	1126	1103									
12-Apr-94	7:53 pm	1223	1456	1129									
12-Apr-94	8:19 pm	1802	1911	740	8:00 pm	80.5	26.9	630	344	313	31.42	33.32	12.90
12-Apr-94	8:20 pm	1951	1975	1924	8:20 pm	81.4	27.4	550	300	273	29.95	30.12	29.76
12-Apr-94	8:21 pm	1965	1975	1954									
12-Apr-94	8:22 pm	1996	1996	1996									
12-Apr-94	8:37 pm	1098	1418	132	8:35 pm	81.9	27.7	480	262	238	17.14	19.57	10.39
12-Apr-94	8:38 pm	1489	1536	1436									
12-Apr-94	8:44 pm	1402	1554	340	8:40 pm	81.9	27.7	480	262	238	18.58	20.59	4.51
12-Apr-94	9:00 pm	1487	1504	1472	9:00 pm	82.0	27.8	630	344	312	25.86	26.15	25.60
12-Apr-94	9:10 pm	1239	1266	1205	9:10 pm	82.1	27.8	610	333	302	21.31	21.67	20.83
12-Apr-94	9:11 pm	1293	1309	1270									
12-Apr-94	9:40 pm	1320	1349	1281	9:40 pm	81.6	27.6	750	409	372	28.09	28.28	27.83
12-Apr-94	9:41 pm	1362	1368	1351									
12-Apr-94	9:42 pm	1369	1372	1366									
12-Apr-94	9:43 pm	1368	1370	1365									
12-Apr-94	9:44 pm	1360	1366	1355									
	Average	1306	1360	1141		81	27	489	267	242	18.54	19.39	14.69
	Maximum	1996	1996	1996		82	28	750	409	372	31.42	33.32	29.76
	Minimum	539	585	132		79	26	180	98	90	2.99	3.25	2.70
	Std. Dev.	391	391	490		1	1	169	92	84	9.51	9.66	9.41

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Outlet

Cylinder #1 Press/ Cylinder #2 BV

		Concentration of THC				Temperature		Velocity	Flow		Average	OMR-P High	OMR-P Low
		Average	High	Low					actual	std cond.	Mass	Mass	Mass
Date	Time	ppm	ppm	ppm	Time	deg. F	deg. C	ft/min.	cfm	cfm	g/min.	g/min.	g/min.
12-Apr-94	10:22 pm	1277	1365	1181	10:20 pm	82.5	28.1	750	409	371	28.6	31.6	26.5
12-Apr-94	10:24 pm	1488	1694	1378									
12-Apr-94	10:25 pm	1749	1781	1697	10:25 pm	82.5	28.1	740	404	366	36.3	36.8	35.5
12-Apr-94	10:26 pm	1807	1825	1781									
12-Apr-94	10:49 pm	2185	2197	2131	10:45 pm	83.3	28.5	750	409	370	45.1	45.4	44.0
12-Apr-94	10:50 pm	2217	2219	2197	10:50 pm	83.3	28.5	750	409	370	45.8	45.9	45.6
12-Apr-94	10:51 pm	2220	2241	2219									
12-Apr-94	10:53 pm	2219	2219	2219									
12-Apr-94	10:54 pm	2215	2219	2197									
12-Apr-94	11:44 pm	2699	2767	2610	11:40 pm	85.5	29.7	740	404	364	54.8	56.2	53.0
12-Apr-94	11:45 pm	2786	2790	2767	11:45 pm	85.6	29.8	780	425	384	60.0	60.1	59.8
13-Apr-94	11:46 pm	2812	2812	2812									
13-Apr-94	11:47 pm	2818	2834	2812									
13-Apr-94	12:18 am	2400	2654	1870	12:15 am	86.2	30.1	740	404	364	52.5	55.8	46.1
13-Apr-94	12:19 am	2776	2853	2676									
13-Apr-94	12:20 am	2947	3008	2875	12:20 am	86.1	30.1	720	393	354	60.2	60.8	59.4
13-Apr-94	12:21 am	3060	3075	3008									
13-Apr-94	12:22 am	3089	3119	3075									
13-Apr-94	12:23 am	3105	3119	3097									
13-Apr-94	12:52 am	3015	3075	2897	12:45 am	87.4	30.8	570	311	279	48.6	49.0	48.0
13-Apr-94	12:53 am	3119	3141	3097									
13-Apr-94	12:54 am	3158	3185	3141									
13-Apr-94	12:55 am	3185	3185	3185									
13-Apr-94	1:59 am	1797	1837	1728	1:55 am	87.3	30.7	710	387	348	34.9	35.6	33.5
	Average	2506	2551	2444		85.0	29.4	725.0	395	357	46.7	47.7	45.1
	Maximum	3185	3185	3185		87.4	30.8	780.0	425	384	60.2	60.8	59.8
	Minimum	1277	1365	1181		82.5	28.1	570.0	311	279	28.6	31.6	26.5
	Std. Dev.	565	549	590		1.8	1.0	54.6	30	27	10.2	10.0	10.3

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Outlet

Cylinder #1 FV/ Cylinder #2 Pressure

		Concentration of THC				Temperature		Velocity	Flow		Average	OMR-P High	OMR-P Low
Date	Time	Average ppm	High ppm	Low ppm	Time	deg. F	deg. C	ft/min.	actual cfm	std cond. cfm	Mass g/min.	Mass g/min.	Mass g/min.
13-Apr-94	2:38 am	2201	2235	2137	2:35 am	87.5	30.8	760	415	372	46.2	46.6	45.4
13-Apr-94	2:39 am	2248	2256	2235									
13-Apr-94	2:40 am	2256	2278	2235	2:40 am	87.5	30.8	760	415	372	47.2	47.7	46.9
13-Apr-94	2:41 am	2294	2321	2278									
13-Apr-94	4:02 am	1417	1561	853	3:55 am	86.5	30.3	730	398	358	28.3	31.2	17.0
13-Apr-94	6:05 am	350	497	142	5:55 am	106	41.1	1850	1009	877	22.1	26.5	15.9
13-Apr-94	6:06 am	554	589	509									
	Average	1617	1677	1484		92	33	1025	559	495	36.0	38.0	31.3
	Maximum	2294	2321	2278		106	41	1850	1009	877	47.2	47.7	46.9
	Minimum	350	497	142		87	30	730	398	358	22.1	26.5	15.9
	Std. Dev.	791	757	873		8	5	476	260	221	11.0	9.3	14.8

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Outlet

Cylinder #1 FV/ Cylinder #2 Pressure

		Concentration of THC				Temperature		Velocity	Flow		Average	OMR-P High	OMR-P Low
		Average	High	Low					actual	std cond.	Mass	Mass	Mass
Date	Time	ppm	ppm	ppm	Time	deg. F	deg. C	ft/min.	cfm	cfm	g/min.	g/min.	g/min.
13-Apr-94	2:38 am	2201	2235	2137	2:35 am	87.5	30.8	760	415	372	46.2	46.6	45.4
13-Apr-94	2:39 am	2248	2256	2235									
13-Apr-94	2:40 am	2256	2278	2235	2:40 am	87.5	30.8	760	415	372	47.2	47.7	46.9
13-Apr-94	2:41 am	2294	2321	2278									
13-Apr-94	4:02 am	1417	1561	853	3:55 am	86.5	30.3	730	398	358	28.3	31.2	17.0
13-Apr-94	6:05 am	350	497	142	5:55 am	106	41.1	1850	1009	877	22.1	26.5	15.9
13-Apr-94	6:06 am	554	589	509									
Average		1617	1677	1484		92	33	1025	559	495	36.0	38.0	31.3
Maximum		2294	2321	2278		106	41	1850	1009	877	47.2	47.7	46.9
Minimum		350	497	142		87	30	730	398	358	22.1	26.5	15.9
Std. Dev.		791	757	873		8	5	476	260	221	11.0	9.3	14.8

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Outlet

Cylinder #1 Final Drain/ Cylinder #2 FV

		Concentration of THC										OMR-P	
		Average	High	Low		Temperature		Velocity	Flow		Average	High	Low
Date	Time	ppm	ppm	ppm	Time	deg. F	deg. C	ft/min.	actual cfm	std cond. cfm	Mass g/min.	Mass g/min.	Mass g/min.
13-Apr-94	6:33 am	1087	1149	1013	6:30 am	77.4	25.2	600	327	300	19.13	19.93	18.13
13-Apr-94	6:34 am	1204	1237	1158									
13-Apr-94	6:35 am	1276	1319	1242	6:35 am	77.9	25.5	600	327	299	23.12	23.80	22.43
13-Apr-94	6:36 am	1396	1451	1331									
13-Apr-94	6:37 am	1485	1509	1459									
13-Apr-94	6:49 am	2416	2561	514	6:45 am	78.4	25.8	620	338	309	41.62	44.12	8.85
13-Apr-94	6:50 am	2152	2281	2048	6:50 am	107.7	42.1	700	382	331	36.47	38.06	35.20
13-Apr-94	6:52 am	1949	2025	1885									
13-Apr-94	6:53 am	1831	1885	1792									
	Average	1644	1713	1382		85	30	630	344	310	30.09	31.48	21.15
	Maximum	2416	2561	2048		108	42	700	382	331	41.62	44.12	35.20
	Minimum	1087	1149	514		77	25	600	327	299	19.13	19.93	8.85
	Std. Dev.	436	469	451		13	7	41	22	13	9.25	9.94	9.48

UNCOMPILED DATA

Summary of Test Results

	No Charging/ Background			No. 2 Cylinder Filling			No. 2 Cylinder Heating to 200F			Cylinder #1 BV/ Cylinder #2 Heating		
Date	Inlet 12-Apr-94	Outlet 12-Apr-94	Difference	Inlet 12-Apr-94	Outlet 12-Apr-94	Difference	Inlet 12-Apr-94	Outlet 12-Apr-94	Difference	Inlet 12-Apr-94	Outlet 12-Apr-94	Difference
Ts, deg. F	113.0	80.2	32.9	95.1	85.5	9.7	93.1	105.6	-12.4	125.2	80.9	44.3
Pb, in. Hg	30.00	30.00		30.00	30.00		30.00	30.00		30.00	30.00	
Ps, mm Hg	762.0	762.0		762.0	762.0		762.0	762.0		762.0	762.0	
As, sq.ft.	0.545	0.545		0.545	0.545		0.545	0.545		0.545	0.545	
vs, ft/min.	1019	1019		1215	1215		1029	1029		528	528	
Qa, ft/min.	556	556		663	663		561	561		288	288	
Qs, ft.min.	479	479		586	586		498	498		243	243	
Cmeas	2288	1623	665	1319	258	1062	1134	199	935	8067	1306	6761
K	3	3		3	3		3	3		3	3	
Cc	6865	4869	1996	3958	258	3701	3401	596	2805	24201	3918	20283
OMR-p	54.1	40.7	13.4	52.942	3.73	49.2	34.81	8.95	25.9	114.9	18.5	96.4
OMR-C	43.6	32.8	10.8	42.7	3.01	39.7	28.08	7.22	20.9	92.7	15.0	77.7

	Cylinder #1 Press/ Cylinder #2 BV			Cylinder #1 FV/ Cylinder #2 Pressure			Cylinder #1 Final Drain/ Cylinder #2 FV		
Date	Inlet 12-Apr-94	Outlet 12-Apr-94	Difference	Inlet 13-Apr-94	Outlet 13-Apr-94	Difference	Inlet 13-Apr-94	Outlet 13-Apr-94	Difference
Ts, deg. F	142.0	85.0	57.0	140.8	91.9	49.0	132.3	85.4	46.9
Pb, in. Hg	30.00	30.00		30.00	30.00		30.00	30.00	
Ps, mm Hg	762.0	762.0		762.0	762.0		762.0	762.0	
As, sq.ft.	0.545	0.545		0.545	0.545		0.545	0.545	
vs, ft/min.	690	690		765	765		709	709	
Qa, ft/min.	376	376		417	417		386	386	
Qs, ft.min.	307	307		342	342		321	321	
Cmeas	11926	2506	9420	11180	1617	9563	3418	1644	1774
K	3	3		3	3		3	3	
Cc	35779	7518	28261	33540	4851	28689	10253	4932	5321
OMR-p	203.3	46.7	156.7	208.16	35.96	172.2	62.7	30.1	32.6
OMR-C	164.0	37.6	126.4	167.90	29.01	138.9	50.6	24.3	26.3

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood

		Inlet			No Charging/Background Outlet				Temperature				
		Average	High	Low		Average	High	Low		Inlet		Outlet		Velocity
Date	Time	ppm	ppm	ppm	Time	ppm	ppm	ppm	Time	deg. F	deg. C	deg. F	deg. C	ft/min.
12-Apr-94	9:41 am	2541	3928	576	9:38 am	4003	10518	325	9:40 am	110	43.3	76.4	24.7	1000
12-Apr-94	9:42 am	4348	4599	4019	9:40 am	767	818	697	9:50 am	121	49.4	77.9	25.5	920
12-Apr-94	9:46 am	3417	4515	978	9:43 am	2252	4637	1414	9:55 am	121	49.4	77.9	25.5	900
12-Apr-94	9:47 am	5145	5500	4591	9:44 am	1294	1386	1224	10:00 am	124	51.1	78.5	25.8	900
12-Apr-94	9:50 am	4139	5145	1547	9:48 am	4056	5633	2302	10:05 am	125	51.7	78.5	25.8	970
12-Apr-94	9:51 am	5439	5612	5193	9:49 am	1845	2200	1606	10:10 am	127	52.8	78.9	26.1	950
12-Apr-94	9:55 am	4328	5193	1662	9:52 am	3335	5645	2292	10:15 am	128	53.3	78.4	25.8	930
12-Apr-94	9:56 am	5567	5795	5272	9:53 am	1925	2218	1710	10:20 am	133	56.1	78.7	25.9	880
12-Apr-94	10:00 am	4266	4987	1359	9:57 am	3515	5688	2523	10:25 am	131	55.0	78.9	26.1	880
12-Apr-94	10:14 am	2309	2888	1416	9:58 am	2132	2442	1893	10:30 am	131	55.0	79.8	26.6	930
12-Apr-94	10:15 am	2707	2888	2557	9:59 am	1731	1865	1629	10:35 am	129	53.9	80.3	26.8	860
12-Apr-94	10:20 am	2145	2308	1397	10:12 am	2028	4625	1136	10:40 am	130	54.4	80.5	26.9	870
12-Apr-94	10:22 am	2183	2246	2122	10:13 am	1468	1487	1449	10:45 am	132	55.6	80.5	26.9	830
12-Apr-94	10:27 am	2351	2875	1394	10:16 am	2133	2826	1749	10:50 am	131	55.0	80.9	27.2	860
12-Apr-94	10:28 am	3157	3308	2930	10:19 am	1557	1708	1469	10:55 am	134	56.7	80.9	27.2	870
12-Apr-94	10:33 am	2503	2723	1268	10:23 am	1631	2143	1625	11:00 am	129	53.9	80.8	27.1	810
12-Apr-94	10:34 am	2792	2826	2723	10:26 am	1472	1604	1441	11:05 am	105	40.6	81.0	27.2	820
12-Apr-94	10:35 am	2843	2868	2653	10:29 am	2337	3344	1853	11:10 am	105	40.6	81.0	27.2	820
12-Apr-94	10:41 am	2191	2596	1252	10:32 am	1669	1832	1492	11:15 am	103	39.4	81.0	27.2	820
12-Apr-94	10:42 am	2766	2847	2640	10:37 am	2063	2614	1811	11:20 am	103	39.4	81.0	27.2	800
12-Apr-94	10:47 am	2244	2554	1418	10:40 am	1669	1791	1498	11:25 am	100	37.8	81.2	27.3	840
12-Apr-94	10:49 am	2646	2681	2578	10:43 am	2111	2847	1770	11:30 am	98	36.7	81.2	27.3	780
12-Apr-94	10:54 am	1763	2101	1434	10:46 am	1608	1749	1483	11:35 am	97	36.1	81.1	27.3	870
12-Apr-94	10:55 am	2142	2163	2101	10:50 am	1998	2681	1749	11:40 am	96	35.6	80.1	26.7	880
12-Apr-94	11:10 am	1670	2466	843	10:53 am	1608	1718	1490	11:45 am	96	35.6	80.7	27.1	870
12-Apr-94	11:11 am	2259	2363	2192	10:56 am	1807	2192	1604	11:50 am	95	35.0	80.7	27.1	880
12-Apr-94	11:21 am	1603	1702	1065	11:00 am	1603	1930	1227	11:55 am	95	35.0	80.7	27.1	870
12-Apr-94	11:22 am	1791	1851	1723	11:18 am	697	818	606	12:00 pm	92	33.3	81.8	27.7	1660
12-Apr-94	11:27 am	1443	1617	691	11:19 am	872	898	830	12:05 pm	92	33.3	81.8	27.7	1650
12-Apr-94	11:28 am	1633	1638	1617	11:23 am	1606	1894	1298	12:10 pm	92	33.3	82.0	27.8	1680
12-Apr-94	11:29 am	1638	1638	1638	11:24 am	1195	1277	1133	12:15 pm	94	34.4	82.0	27.8	1680
12-Apr-94	11:37 am	1449	1638	677	11:30 am	1362	1659	1274	12:20 pm	94	34.4	82.0	27.8	1540
12-Apr-94	11:39 am	1662	1681	1638	11:31 am	1213	1263	1170	12:25 pm	94	34.4	82.0	27.8	1570
12-Apr-94	11:40 am	1681	1681	1681	11:41 am	1353	1697	1242	12:30 pm	94	34.4	82.1	27.8	1560
12-Apr-94	11:47 am	1314	1511	536	11:43 am	1074	1109	1044	12:35 pm	92	33.3	82.1	27.8	1570
12-Apr-94	11:55 am	1262	1702	297	12:06 pm	2637	2649	2607	12:40 pm	89	31.7	81.1	27.3	1570
12-Apr-94	11:56 am	1840	1979	1723	12:08 pm	1782	2586	1410	12:45 pm	95	35.0	80.8	27.1	1520
12-Apr-94	11:58 am	2173	2320	2008	12:09 pm	1295	1387	1226	12:50 pm	95	35.0	80.2	26.8	1670
12-Apr-94	12:04 pm	1701	2318	1307	12:10 pm	1159	1215	1107	12:55 pm	93	33.9	80.2	26.8	590
12-Apr-94	12:05 pm	2549	2628	2379	12:17 pm	333	498	181	1:00 pm	93	33.9	79.5	26.4	650
12-Apr-94	12:32 pm	1240	1480	721	12:19 pm	581	625	517	1:05 pm	93	33.9	79.4	26.3	590
12-Apr-94	12:35 pm	1325	1564	591	12:40 pm	202	342	51						
12-Apr-94	12:47 pm	1126	1382	742	12:41 pm	407	440	357						
12-Apr-94	12:48 pm	1432	1458	1395	12:55 pm	316	347	266						
12-Apr-94	1:43 pm	564	667	393	12:57 pm	363	372	351						
12-Apr-94	1:50 pm	619	689	524	2:07 pm	398	435	347						
12-Apr-94	1:51 pm	700	776	698										
12-Apr-94	2:18 pm	706	776	590										
12-Apr-94	2:19 pm	824	869	783										
	Average	2288	2562	1705		1623	2210	1293		108	42.3	80.4	26.9	1051
	Maximum	5567	5795	5272		4056	10518	2607		134	56.7	82.1	27.8	1680
	Minimum	564	667	297		202	342	51		89	31.7	76.4	24.7	590
	Std. Dev.	1212	1349	1147		885	1835	607		16	8.9	1.3	0.7	347

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 26A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood

		Inlet			(2) Cylinder Filling Outlet				Temperature				
		Average	High	Low		Average	High	Low		Inlet		Outlet		Velocity
Date	Time	ppm	ppm	ppm	Time	ppm	ppm	ppm	Time	deg. F	deg. C	deg. F	deg. C	ft/min.
12-Apr-94	2:30 pm	899	1041	723	2:26 pm	219	245	187	2:30 pm	93	33.9	79.5	26.4	620
12-Apr-94	2:31 pm	1171	1255	1063	2:45 pm	219	254	169	2:35 pm	94	34.4	79.6	26.4	550
12-Apr-94	2:32 pm	1323	1374	1251	2:47 pm	277	291	258	2:40 pm	94	34.4	79.5	26.4	580
12-Apr-94	2:54 pm	1272	1361	1158	3:14 pm	242	266	210	2:45 pm	94	34.4	79.5	26.4	570
12-Apr-94	2:55 pm	1373	1391	1315	3:15 pm	283	295	269	2:50 pm	94	34.4	79.5	26.4	560
12-Apr-94	3:24 pm	1121	1237	932	3:34 pm	229	250	199	2:55 pm	94	34.4	79.4	26.3	540
12-Apr-94	3:25 pm	1325	1407	1248	3:35 pm	268	278	253	3:00 pm	95	35.0	79.4	26.3	670
12-Apr-94	3:43 pm	1261	1331	1192	3:52 pm	218	239	192	3:05 pm	95	35.0	79.4	26.3	680
12-Apr-94	3:44 pm	1219	1239	1203	3:53 pm	256	266	243	3:10 pm	95	35.0	79.4	26.3	560
12-Apr-94	4:00 pm	1132	1181	1089	4:17 pm	276	317	220	3:15 pm	95	35.0	79.5	26.4	520
12-Apr-94	4:27 pm	1799	1876	1681	4:18 pm	347	367	324	3:20 pm	95	35.0	79.5	26.4	540
12-Apr-94	4:28 pm	1938	1985	1898					3:25 pm	95	35.0	79.4	26.3	480
									3:30 pm	94	34.4	80.0	26.7	500
									3:35 pm	96	35.6	79.7	26.5	530
									3:40 pm	96	35.6	79.9	26.6	530
									3:45 pm	96	35.6	79.7	26.5	550
									3:50 pm	96	35.6	79.9	26.6	520
									3:55 pm	96	35.6	79.6	26.4	510
									4:00 pm	97	36.1	79.6	26.4	480
									4:05 pm	98	36.7	79.6	26.4	520
									4:10 pm	96	35.6	126.1	52.3	480
									4:15 pm	96	35.6	126.1	52.3	480
									4:20 pm	97	36.1	157.4	69.7	5970
									4:25 pm	97	36.1	157.4	69.7	5970
									4:30 pm	97	36.1	160.0	71.1	6240
	Average	1319	1390	1229		258	279	229		95	35.2	92.7	33.7	1206
	Maximum	1938	1985	1898		347	367	324		98	36.7	160.0	71.1	6240
	Minimum	899	1041	723		218	239	169		93	33.9	79.4	26.3	480
	Std. Dev.	275	262	297		37	36	43		1	0.7	27.3	15.1	1794

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood

		Inlet			Cylinder #1 Press/ Cylinder #2 BV Outlet				Temperature				
		Average	High	Low		Average	High	Low		Inlet		Outlet		Velocity
Date	Time	ppm	ppm	ppm	Time	ppm	ppm	ppm	Time	deg. F	deg. C	deg. F	deg. C	ft/min.
12-Apr-94	10:34 pm	8548	8871	7985	10:22 pm	1277	1365	1181	10:20 pm	119	48.3	82.5	28.1	750
12-Apr-94	10:35 pm	9137	9243	9002	10:24 pm	1488	1694	1378	10:25 pm	129	53.9	82.5	28.1	740
12-Apr-94	10:37 pm	9280	9309	9265	10:25 pm	1749	1781	1697	10:30 pm	139	59.4	82.5	28.1	770
12-Apr-94	10:38 pm	9241	9287	9199	10:26 pm	1807	1825	1781	10:35 pm	141	60.6	82.5	28.1	800
12-Apr-94	11:19 pm	14270	14442	13904	10:49 pm	2185	2197	2131	10:40 pm	151	66.1	83.2	28.4	750
12-Apr-94	11:20 pm	14530	14576	14450	10:50 pm	2217	2219	2197	10:45 pm	151	66.1	83.3	28.5	750
12-Apr-94	11:21 pm	14576	14576	14576	10:51 pm	2220	2241	2219	10:50 pm	150	65.6	83.3	28.5	750
12-Apr-94	11:22 pm	14572	14576	14554	10:53 pm	2219	2219	2219	10:55 pm	150	65.6	83.6	28.7	740
12-Apr-94	11:23 pm	14591	14598	14576	10:54 pm	2215	2219	2197	11:00 pm	149	65.0	84.0	28.9	760
12-Apr-94	11:24 pm	14590	14666	14288	11:44 pm	2699	2767	2610	11:05 pm	152	66.7	84.3	29.1	780
12-Apr-94	11:59 pm	11992	12335	11335	11:45 pm	2786	2790	2767	11:10 pm	150	65.6	84.4	29.1	740
13-Apr-94	12:00 am	12791	13156	12363	11:46 pm	2812	2812	2812	11:15 pm	148	64.4	85.1	29.5	760
13-Apr-94	12:34 am	12732	13382	11784	11:47 pm	2818	2834	2812	11:20 pm	150	65.6	85.1	29.5	800
13-Apr-94	12:35 am	13835	13997	13535	12:18 am	2400	2654	1870	11:25 pm	151	66.1	85.2	29.6	790
13-Apr-94	12:36 am	14145	14197	14064	12:19 am	2776	2853	2676	11:30 pm	150	65.6	85.1	29.5	760
13-Apr-94	12:37 am	14321	14576	14108	12:20 am	2947	3008	2875	11:35 pm	151	66.1	85.6	29.8	750
13-Apr-94	1:37 am	6766	7841	5862	12:21 am	3060	3075	3008	11:40 pm	143	61.7	85.5	29.7	740
13-Apr-94	1:38 am	7290	9084	6158	12:22 am	3089	3119	3075	11:45 pm	139	59.4	85.6	29.8	780
13-Apr-94	1:39 am	10453	10887	9478	12:23 am	3105	3119	3097	11:50 pm	139	59.4	85.3	29.6	730
13-Apr-94	1:40 am	11301	11790	10887	12:52 am	3015	3075	2897	11:55 pm	142	61.1	85.3	29.6	750
13-Apr-94	1:41 am	11489	11863	10952	12:53 am	3119	3141	3097	12:00 am	143	61.7	85.7	29.8	700
					12:54 am	3158	3185	3141	12:05 am	148	64.4	86.0	30.0	730
					12:55 am	3185	3185	3185	12:10 am	145	62.8	85.9	29.9	740
					1:59 am	1797	1837	1728	12:15 am	153	67.2	86.2	30.1	740
									12:20 am	153	67.2	86.1	30.1	720
									12:25 am	150	65.6	86.3	30.2	740
									12:30 am	148	64.4	86.5	30.3	730
									12:35 am	151	66.1	86.5	30.3	670
									12:40 am	155	68.3	86.8	30.4	660
									12:45 am	154	67.8	87.4	30.8	570
									1:35 am	107	41.7	87.8	31.0	445
									1:40 am	151	66.1	87.8	31.0	470
									1:45 am	145	62.8	87.1	30.6	460
									1:50 am	143	61.7	87.3	30.7	740
									1:55 am	103	39.4	87.3	30.7	710
	Average	11926	12250	11539		2506	2551	2444		144	62.3	85.3	29.6	715
	Maximum	14591	14666	14576		3185	3185	3185		155	68.3	87.8	31.0	800
	Minimum	6766	7841	5862		1277	1365	1181		103	39.4	82.5	28.1	445
	Std. Dev.	2586	2354	2784		565	549	590		12	6.7	1.6	0.9	89

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood

		Inlet			Cylinder #1 FV/ Cylinder #2 Pressure Outlet				Temperature				
		Average	High	Low		Average	High	Low	Inlet		Outlet		Velocity
Date	Time	ppm	ppm	ppm	Time	ppm	ppm	ppm	Time	deg. F	deg. C	deg. F	deg. C	ft/min.
13-Apr-94	2:18 am	3853	4101	3472	2:38 am	2201	2235	2137	2:00 am	143	61.7	87.3	30.7	720
13-Apr-94	2:20 am	4288	4470	4123	2:39 am	2248	2256	2235	2:05 am	138	58.9	86.9	30.5	730
13-Apr-94	2:21 am	4568	4622	4492	2:40 am	2256	2278	2235	2:10 am	135	57.2	86.9	30.5	750
13-Apr-94	2:22 am	7205	10195	4601	2:41 am	2294	2321	2278	2:15 am	134	56.7	86.9	30.5	750
13-Apr-94	2:23 am	10564	10931	10293	4:02 am	1417	1561	853	2:20 am	133	56.1	86.9	30.5	780
13-Apr-94	2:54 am	8664	9373	7718	6:05 am	350	497	142	2:25 am	140	60.0	87.5	30.8	780
13-Apr-94	2:55 am	9868	10239	9490	6:06 am	554	589	509	2:30 am	152	66.7	87.5	30.8	780
13-Apr-94	2:56 am	10406	10564	10288					2:35 am	152	66.7	87.5	30.8	760
13-Apr-94	2:58 am	10759	10852	10613					2:40 am	146	63.3	87.5	30.8	760
13-Apr-94	3:38 am	5832	6283	5194					2:45 am	146	63.3	87.5	30.8	770
13-Apr-94	3:39 am	56532	6613	6343					2:50 am	147	63.9	87.8	31.0	770
13-Apr-94	3:40 am	6389	6591	6239					2:55 am	148	64.4	87.7	30.9	830
13-Apr-94	3:41 am	6412	6723	6129					3:00 am	147	63.9	87.7	30.9	770
									3:05 am	148	64.4	87.6	30.9	770
									3:10 am	147	63.9	87.6	30.9	800
									3:15 am	147	63.9	87.2	30.7	750
									3:20 am	147	63.9	87.4	30.8	750
									3:25 am	147	63.9	87.0	30.6	760
									3:30 am	146	63.3	87.1	30.6	730
									3:35 am	142	61.1	87.0	30.6	710
									3:40 am	141	60.6	86.8	30.4	750
									3:45 am	141	60.6	86.5	30.3	730
									3:50 am	140	60.0	86.5	30.3	700
									3:55 am	140	60.0	86.5	30.3	730
									5:15 am			98.0	36.7	1600
									5:20 am			99.0	37.2	970
									5:25 am			99.0	37.2	910
									5:30 am			101	38.3	1020
									5:35 am			105	40.6	1750
									5:40 am			105	40.6	1760
									5:45 am			106	41.1	1840
									5:50 am			106	41.1	1860
									5:55 am			106	41.1	1850
Average		11180	7812	6846		1617	1677	1484		144	62.0	91.4	33.0	960
Maximum		56532	10931	10613		2294	2321	2278		152	66.7	106.0	41.1	1860
Minimum		3853	4101	3472		350	497	142		133	56.1	86.5	30.3	700
Std. Dev.		13304	2513	2464		791	757	873		5	2.9	7.2	4.0	392

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood

		Inlet			Cylinder #1 Press/ Cylinder #2 BV Outlet				Temperature				
		Average	High	Low		Average	High	Low	Inlet		Outlet		Velocity
Date	Time	ppm	ppm	ppm	Time	ppm	ppm	ppm	Time	deg. F	deg. C	deg. F	deg. C	ft/min.
12-Apr-94	10:34 pm	8548	8871	7985	10:22 pm	1277	1365	1181	10:20 pm	119	48.3	82.5	28.1	750
12-Apr-94	10:35 pm	9137	9243	9002	10:24 pm	1488	1694	1378	10:25 pm	129	53.9	82.5	28.1	740
12-Apr-94	10:37 pm	9280	9309	9265	10:25 pm	1749	1781	1697	10:30 pm	139	59.4	82.5	28.1	770
12-Apr-94	10:38 pm	9241	9287	9199	10:26 pm	1807	1825	1781	10:35 pm	141	60.6	82.5	28.1	800
12-Apr-94	11:19 pm	14270	14442	13904	10:49 pm	2185	2197	2131	10:40 pm	151	66.1	83.2	28.4	750
12-Apr-94	11:20 pm	14530	14576	14450	10:50 pm	2217	2219	2197	10:45 pm	151	66.1	83.3	28.5	750
12-Apr-94	11:21 pm	14576	14576	14576	10:51 pm	2220	2241	2219	10:50 pm	150	65.6	83.3	28.5	750
12-Apr-94	11:22 pm	14572	14576	14554	10:53 pm	2219	2219	2219	10:55 pm	150	65.6	83.6	28.7	740
12-Apr-94	11:23 pm	14591	14598	14576	10:54 pm	2215	2219	2197	11:00 pm	149	65.0	84.0	28.9	760
12-Apr-94	11:24 pm	14590	14666	14288	11:44 pm	2699	2767	2610	11:05 pm	152	66.7	84.3	29.1	780
12-Apr-94	11:59 pm	11992	12335	11335	11:45 pm	2786	2790	2767	11:10 pm	150	65.6	84.4	29.1	740
13-Apr-94	12:00 am	12791	13156	12363	11:46 pm	2812	2812	2812	11:15 pm	148	64.4	85.1	29.5	760
13-Apr-94	12:34 am	12732	13382	11784	11:47 pm	2818	2834	2812	11:20 pm	150	65.6	85.1	29.5	800
13-Apr-94	12:35 am	13835	13997	13535	12:18 am	2400	2654	1870	11:25 pm	151	66.1	85.2	29.6	790
13-Apr-94	12:36 am	14145	14197	14064	12:19 am	2776	2853	2676	11:30 pm	150	65.6	85.1	29.5	780
13-Apr-94	12:37 am	14321	14576	14108	12:20 am	2947	3008	2875	11:35 pm	151	66.1	85.6	29.8	750
13-Apr-94	1:37 am	6766	7841	5862	12:21 am	3060	3075	3008	11:40 pm	143	61.7	85.5	29.7	740
13-Apr-94	1:38 am	7290	9084	6158	12:22 am	3089	3119	3075	11:45 pm	139	59.4	85.6	29.8	780
13-Apr-94	1:39 am	10453	10887	9478	12:23 am	3105	3119	3097	11:50 pm	139	59.4	85.3	29.6	730
13-Apr-94	1:40 am	11301	11790	10887	12:52 am	3015	3075	2897	11:55 pm	142	61.1	85.3	29.6	750
13-Apr-94	1:41 am	11489	11863	10952	12:53 am	3119	3141	3097	12:00 am	143	61.7	85.7	29.8	700
					12:54 am	3158	3185	3141	12:05 am	148	64.4	86.0	30.0	730
					12:55 am	3185	3185	3185	12:10 am	145	62.8	85.9	29.9	740
					1:59 am	1797	1837	1728	12:15 am	153	67.2	86.2	30.1	740
									12:20 am	153	67.2	86.1	30.1	720
									12:25 am	150	65.6	86.3	30.2	740
									12:30 am	148	64.4	86.5	30.3	730
									12:35 am	151	66.1	86.5	30.3	670
									12:40 am	155	68.3	86.8	30.4	660
									12:45 am	154	67.8	87.4	30.8	570
									1:35 am	107	41.7	87.8	31.0	445
									1:40 am	151	66.1	87.8	31.0	470
									1:45 am	145	62.8	87.1	30.6	460
									1:50 am	143	61.7	87.3	30.7	470
									1:55 am	103	39.4	87.3	30.7	710
	Average	11926	12250	11539		2506	2551	2444		144	62.3	85.3	29.6	707
	Maximum	14591	14666	14576		3185	3185	3185		155	68.3	87.8	31.0	800
	Minimum	6766	7841	5862		1277	1365	1181		103	39.4	82.5	28.1	445
	Std. Dev.	2586	2354	2784		565	549	590		12	6.7	1.6	0.9	97

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood

		Inlet			Cylinder #1 BV/ Cylinder #2 Heating Outlet				Temperature				
		Average	High	Low		Average	High	Low	Inlet		Outlet		Velocity
Date	Time	ppm	ppm	ppm	Time	ppm	ppm	ppm	Time	deg. F	deg. C	deg. F	deg. C	ft/min.
12-Apr-94	7:11 pm	5115	5330	4674	7:24 pm	539	585	486	7:10 pm	144	62.2	79.5	26.4	200
12-Apr-94	7:12 pm	4294	4535	4150	7:25 pm	622	647	593	7:15 pm	119	48.3	79.3	26.3	210
12-Apr-94	7:13 pm	4091	4150	4040	7:27 pm	675	695	651	7:20 pm	103	39.4	79.2	26.2	200
12-Apr-94	7:36 pm	7679	8282	6609	7:49 pm	982	1032	913	7:25 pm	103	39.4	79.2	26.2	180
12-Apr-94	7:37 pm	8364	8457	8304	7:50 pm	1074	1101	1039	7:30 pm	104	40.0	79.6	26.4	200
12-Apr-94	7:38 pm	8331	8435	8194	7:51 pm	1117	1128	1103	7:35 pm	114	45.6	79.8	26.6	210
12-Apr-94	8:12 pm	12387	12955	11782	7:53 pm	1223	1456	1129	7:40 pm	137	58.3	80.0	26.7	430
12-Apr-94	8:13 pm	13173	13372	12957	8:19 pm	1802	1911	740	7:45 pm	137	58.3	80.1	26.7	470
12-Apr-94	8:14 pm	13576	13645	13410	8:20 pm	1951	1975	1924	7:50 pm	139	59.4	80.0	26.7	400
12-Apr-94	8:27 pm	8115	11584	3222	8:21 pm	1965	1975	1954	7:55 pm	137	58.3	80.5	26.9	630
12-Apr-94	8:28 pm	12052	12267	11755	8:22 pm	1996	1996	1996	8:00 pm	135	57.2	80.5	26.9	630
12-Apr-94	8:29 pm	12428	12510	12360	8:37 pm	1098	1418	132	8:05 pm	134	56.7	80.7	27.1	620
12-Apr-94	8:30 pm	12279	12360	12253	8:38 pm	1489	1536	1436	8:10 pm	137	58.3	81.4	27.4	590
12-Apr-94	8:51 pm	7390	7872	7034	8:44 pm	1402	1554	340	8:15 pm	137	58.3	81.4	27.4	550
12-Apr-94	8:52 pm	8119	8297	7906	9:00 pm	1487	1504	1472	8:20 pm	129	53.9	81.4	27.4	550
12-Apr-94	8:53 pm	8300	8313	8271	9:10 pm	1239	1268	1205	8:25 pm	124	51.1	81.7	27.6	550
12-Apr-94	9:20 pm	6035	6462	5481	9:11 pm	1293	1309	1270	8:30 pm	127	52.8	81.7	27.6	460
12-Apr-94	9:22 pm	7155	7280	7000	9:40 pm	1320	1349	1281	8:35 pm	126	52.2	81.9	27.7	480
12-Apr-94	9:23 pm	7363	7409	7301	9:41 pm	1362	1368	1351	8:40 pm	126	52.2	81.9	27.7	480
12-Apr-94	9:25 pm	7469	7516	7409	9:42 pm	1369	1372	1366	8:45 pm	124	51.1	81.9	27.7	500
12-Apr-94	9:26 pm	7521	7538	7495	9:43 pm	1368	1370	1365	8:50 pm	123	50.6	81.9	27.7	490
12-Apr-94	9:57 pm	4960	5214	4588	9:44 pm	1360	1366	1355	8:55 pm	122	50.0	82.0	27.8	460
12-Apr-94	9:58 pm	4981	5214	4806					9:00 pm	123	50.6	82.0	27.8	630
12-Apr-94	9:59 pm	5180	5365	5064					9:05 pm	120	48.9	82.1	27.8	610
12-Apr-94	10:00 pm	5322	5744	5128					9:10 pm	120	48.9	82.1	27.8	610
									9:15 pm	119	48.3	81.9	27.7	750
									9:20 pm	119	48.3	82.0	27.8	730
									9:25 pm	119	48.3	81.5	27.5	780
									9:30 pm	120	48.9	81.5	27.5	730
									9:35 pm	120	48.9	81.5	27.5	760
									9:40 pm	119	48.3	81.6	27.6	750
									9:45 pm	119	48.3	81.5	27.5	730
									9:50 pm	110	43.3	81.4	27.4	790
									9:55 pm	120	48.9	81.4	27.4	740
										124	51.0	81.1	27.3	532
										144	62.2	82.1	27.8	790
										103	39.4	79.2	26.2	180
										10	5.7	1.0	0.5	188
	Average	8067	8404	7648	Average	1306	1360	1141						
	Maximum	13576	13645	13410	Maximum	1996	1996	1996						
	Minimum	4091	4150	3222	Minimum	539	585	132						
	Std. Dev.	2888	2949	3039	Std. Dev.	391	391	490						

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood

		Inlet			Cylinder #1 Final Drain/ Cylinder #2 FV Outlet				Temperature				
		Average	High	Low		Average	High	Low	Inlet		Outlet		Velocity
Date	Time	ppm	ppm	ppm	Time	ppm	ppm	ppm	Time	deg. F	deg. C	deg. F	deg. C	ft/min.
13-Apr-94	6:13 am	1859	1978	1584	6:33 am	1087	1149	1013	6:10 am	104	40.0	78.3	25.7	710
13-Apr-94	6:14 am	2070	2141	2002	6:34 am	1204	1237	1158	6:15 am	105	40.6	78.1	25.6	700
13-Apr-94	6:15 am	2191	2235	2141	6:35 am	1276	1319	1242	6:20 am	105	40.6	77.4	25.2	660
13-Apr-94	6:16 am	2128	2444	1772	6:36 am	1396	1451	1331	6:25 am	105	40.6	77.4	25.2	620
13-Apr-94	6:18 am	2271	2351	2191	6:37 am	1485	1509	1459	6:30 am	105	40.6	77.4	25.2	600
13-Apr-94	6:19 am	2421	2468	2351	6:49 am	2416	2561	514	6:35 am	132	55.6	77.9	25.5	600
13-Apr-94	6:20 am	2524	2561	2491	6:50 am	2152	2281	2048	6:40 am	150	65.6	78.4	25.8	610
13-Apr-94	6:21 am	2595	2631	2561	6:52 am	1949	2025	1885	6:45 am	152	66.7	78.4	25.8	620
13-Apr-94	6:22 am	2645	2677	2631	6:53 am	1831	1885	1792	6:50 am	149	65.0	107.7	42.1	700
13-Apr-94	6:23 am	2689	2762	2677					6:55 am	152	66.7	79.6	26.4	850
13-Apr-94	6:41 am	4397	4774	3830					7:00 am	152	66.7	79.7	26.5	820
13-Apr-94	6:43 am	5083	5321	4820					7:05 am	153	67.2	80.5	26.9	800
13-Apr-94	6:44 am	5429	5586	5310					7:10 am	154	67.8	81.4	27.4	910
13-Apr-94	6:45 am	5731	5845	5612					7:15 am	156	68.9	81.4	27.4	750
13-Apr-94	7:12 am	3551	3632	3378					7:20 am	156	68.9	81.4	27.4	790
13-Apr-94	7:13 am	2974	3309	2780										
13-Apr-94	7:14 am	2957	3010	2863										
13-Apr-94	7:16 am	3659	4170	3042										
13-Apr-94	7:17 am	4525	4760	4233										
13-Apr-94	7:18 am	4945	5082	4783										
13-Apr-94	7:19 am	5125	5151	5050										
	Average	3418	3566	3243		1644	1713	1382		135	57.4	81.0	27.2	718
	Maximum	5731	5845	5612		2416	2561	2048		156	68.9	107.7	42.1	910
	Minimum	1859	1978	1584		1087	1149	514		104	40.0	77.4	25.2	600
	Std. Dev.	1242	1280	1216		436	469	451		22	12.4	7.3	4.0	97

Volatile Organic Compound (VOC) Emission Monitoring - EPA Method 25A
Client: AlliedSignal Inc.
Sample Site: Birmingham Treated Wood
Sample Point: Outlet

Blower Pipe

		Concentration of THC		
		Average	High	Low
Date	Time	ppm	ppm	ppm
13-Apr-94	5:23	140	197	16.3
13-Apr-94	5:24	208	213	200
13-Apr-94	5:25	215	216	214
13-Apr-94	5:26	217	217	216
13-Apr-94	5:27	217	217	216
13-Apr-94	5:28	216	216	215
13-Apr-94	5:29	215	216	214
13-Apr-94	5:30	214	214	213
13-Apr-94	5:31	212	213	211
13-Apr-94	5:33	210	211	209
13-Apr-94	5:34	208	209	207
13-Apr-94	5:35	206	207	206
13-Apr-94	5:36	205	206	204
13-Apr-94	5:37	203	204	203
13-Apr-94	5:38	202	203	201
13-Apr-94	5:39	201	201	200
13-Apr-94	5:40	200	201	199
13-Apr-94	5:41	199	199	199
13-Apr-94	5:42	199	199	198
13-Apr-94	5:43	198	198	197
13-Apr-94	5:45	197	197	196
13-Apr-94	5:46	195	196	195
13-Apr-94	5:47	194	195	193
13-Apr-94	5:48	193	193	192
13-Apr-94	5:49	191	192	190
13-Apr-94	5:50	190	190	189
13-Apr-94	5:51	188	189	188
13-Apr-94	5:53	186	187	186
13-Apr-94	5:54	185	186	184
13-Apr-94	5:56	191	196	183

FAX FROM ALLIED SIGNAL

AlliedSignal RESEARCH AND TECHNOLOGY

TO: Gary Pea n		M:	
COMPANY:		COMPANY:	
FAX NUMBER: 904/648-575		OUR FAX NUMBER: (7 391	
TOTAL NUMBER OF PAGES	12	(including this cover sheet)	
IF YOU DO NOT RECEIVE THE ENTIRE FAX, PLEASE CALL /391-3			

DATE: *March 9, 19'4*

SUBJECT: **Request for Quote for Emission Testing Work Plan at BWI.**

I have enclosed a work plan describing the work I would like done at a customer's facility in Birmingham, AL, in the near future (later this month if possible). Included is a 9-page description of plant operations and the test program.

I have also included a generic description of the application of the various methods in the testing procedure.

Other relevent information:

- one THC analyzer can be used with two transfer lines if quick connects are used, of if a 2-way or 3-way valve is used for quick switching between effluent and influent.
- heated transfer lines are strongly requested; 5 ft lines may be sufficiently long enough; though 10 ft lines would be plenty long.
- the inlet and outlet scrubber ducts are 10 inches in diameter.
- the fume scrubber performance is most important; secondary importance can be put on the performance of the knock-out tank.
- alternatives to EPA test method TO-13 may be available if in-house capabilities do not exist.

Any questions, please leave a message on my voice mail and I will get back to you as soon as possible. Otherwise, please return quotation to myself as indicated below. Thank you.

Bill Sheridan
Field Service Specialist
AlliedSignal Environmental Systems & Services
708/391-3222 Voice Mail 708/391-3291 Fax

REQUEST FOR EMISSION TESTING SUPPORT AT BIRMINGHAM WOOD, INC., WARRIOR, ALABAMA

I. REQUEST

Conduct simultaneous inlet and outlet emission testing for total organic carbon from the naphthalene knock-out tank and the water scrubber at the Birmingham Wood, Inc., (BWI) facility in Warrior, Alabama.

II. BASIS FOR SELECTION

The BWI facility has an aqueous scrubber that controls emissions from the vacuum system exhaust, the creosote work and storage tanks, and the cylinder hoods. This facility was selected because of the scrubber. The aqueous scrubber represents the most common air pollution control device (APCD) used in the wood treatment industry. Eight wood treatment facilities use water scrubbers to control emissions. Of these eight, three facilities use packed-bed scrubbers, and five use spray scrubbers. Thus, aqueous scrubbers may represent maximum achievable control technology (MACT) for existing sources. As a result, testing at this facility may establish the potential for emissions reduction for the industry MACT.

III. FACILITY DESCRIPTION

The BWI facility, located in Warrior, AL, uses creosote to treat railroad ties made from oak and hardwoods. In 1992, the facility treated roughly 460,000 cubic feet of wood products. The treating solution used at the BWI facility is a 80/20 creosote coal tar mixture and is called P2 creosote. The facility operates two treatment cylinders for conditioning and treating wood. Two work tanks and one condenser and vacuum pump serve both the cylinders. One cylinder measures 7 feet in diameter by 61 feet in length, and the other measures 6 feet in diameter by 51 feet in length. The creosote facility operates 16 hours per day, 6 days per week. Figure 1 shows the layout of the creosote treatment process and its associated APCD's.

The facility uses either air seasoned wood or it conditions wood by the Boulton method prior to treatment. Air seasoning takes months before the wood can be treated, while Boultonizing the wood takes from 6 to 18 hours. Because of the current wood shortage facing the wood treatment industry, the facility cannot afford to have a large amount of inventory being air seasoned. Currently, BWI is Boultonizing between 90 and 95 percent of the wood treated at the facility.

The Boulton process is used to condition green wood prior to treatment at the BWI facility. Initially, the creosote treating cylinder is filled with just enough preservative to immerse the green wood. The total filling time lasts approximately 30 minutes. The creosote is heated to approximately 180°F. A 25" Hg vacuum is them pulled on the cylinder to lower the boiling point of water in the wood, causing part of the water to evaporate. Vapors from the cylinder are condensed in a shell-and-tube-condenser, and the condensate collects in the work tank. The vacuum is maintained for approximately 6 to 10 hours.

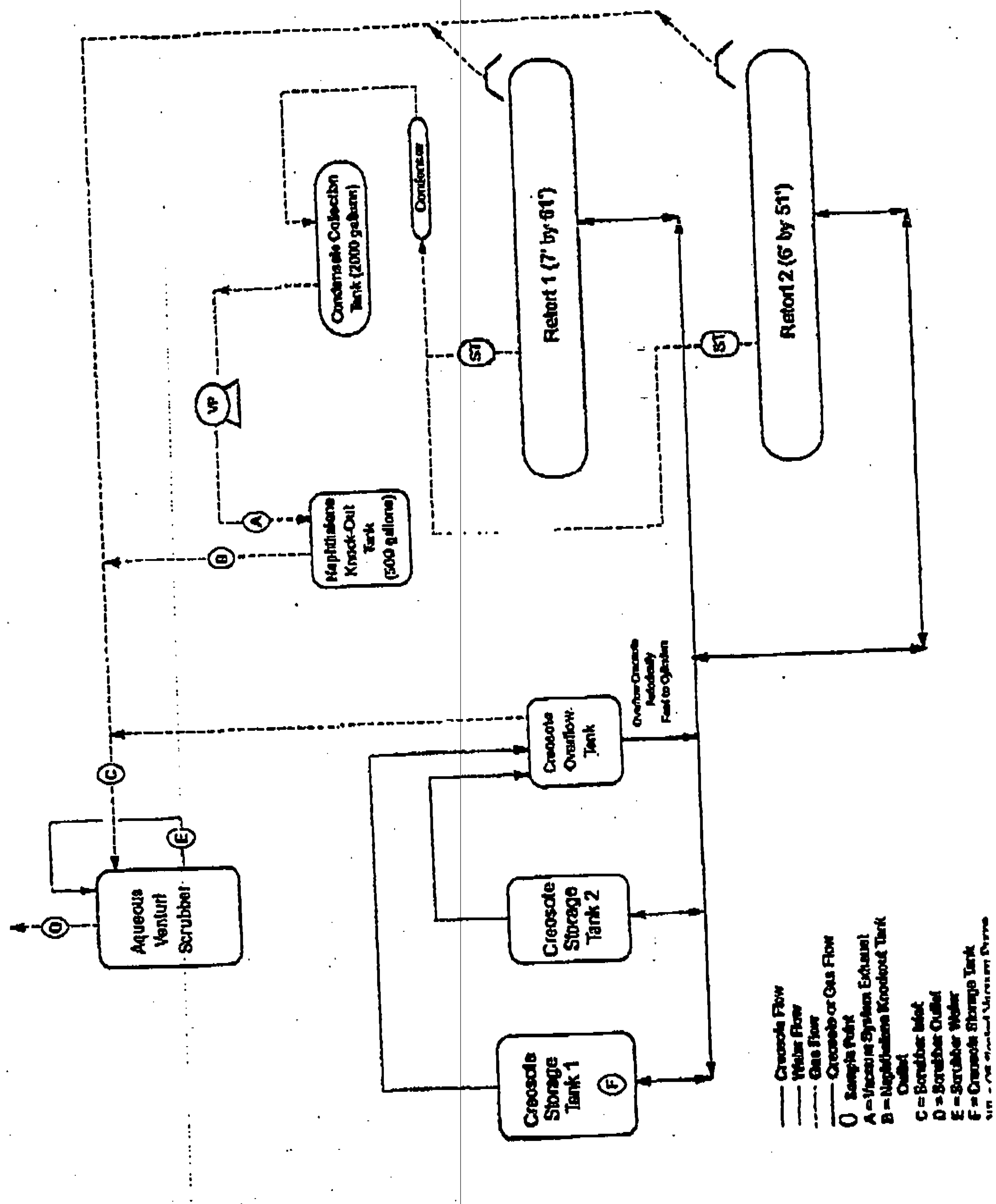
After the wood has been conditioned, the treatment process begins. The BWI facility uses the Rueping method to treat the wood. In this process, the vacuum is broken and the creosote in the cylinder is returned to the storage tank. A brief period of initial air pressure of 30 psig is applied to the cylinder. The cylinder is then filled with creosote while the pressure on the cylinder is maintained. Once filling is complete, pressurization continues until the cylinder pressure reaches 180 psig. Pressure is maintained for 1 to 3 hours depending on the type of wood being treated and the specification of the final product. The pressure on the cylinder is then released to the creosote work tank, and the preservative is drained from the cylinder and returned to the creosote storage tank. The total draining time lasts approximately 30 minutes. A final 25" Hg vacuum is then pulled on the cylinder for at least 1 hour. Any residual creosote that is released from the wood during the final vacuum is returned to the storage tank. Following this step, the cylinder is opened, and the charge is removed.

Noncondensibles from the vacuum system exhaust are initially sent to a 500 gallon naphthalene knock-out tank. Condensed naphthalene and process water collects in this tank, and the liquid in the tank is changed approximately once per day. Vapors from the naphthalene knock-out tank, along with displaced air in equilibrium with the creosote in the storage tank and the fugitives from the cylinder hoods, are sent to a venturi water scrubber. A booster blower is used to pull the vapors from the knock-out tank through the water scrubber. Any vapors not condensed in the scrubber are released to the atmosphere. Figure 2 shows a schematic of the scrubber used at the facility.

Except for the materials of construction, the water scrubb at BWI is identical to the water scrubber at Burke-Parsons-Bowl Corp., in DuBois, PA. Both scrubber systems were designed by Allied-Signal, Inc. The water scrubber at BWI is a Croll-Reynolds venturi jet scrubber, which was installed in 1990. Th scrubber was sized to handle 2,000 ACFM of vapor and a flow ra of 95 gpm of recirculated water. The total capacity of the scrubber is 280 gallons, and treated wastewater is used in the scrubber.

SENT BY:ALLIEDSIGNAL. INC. : 3- 9-94 : 5:20PM :ENGINEERED MATERIALS- 9046485754:# 4/12

NOV 17 '93 10:34AM E P A DURHAM N.Cham TO 95415600 P.4 P.(



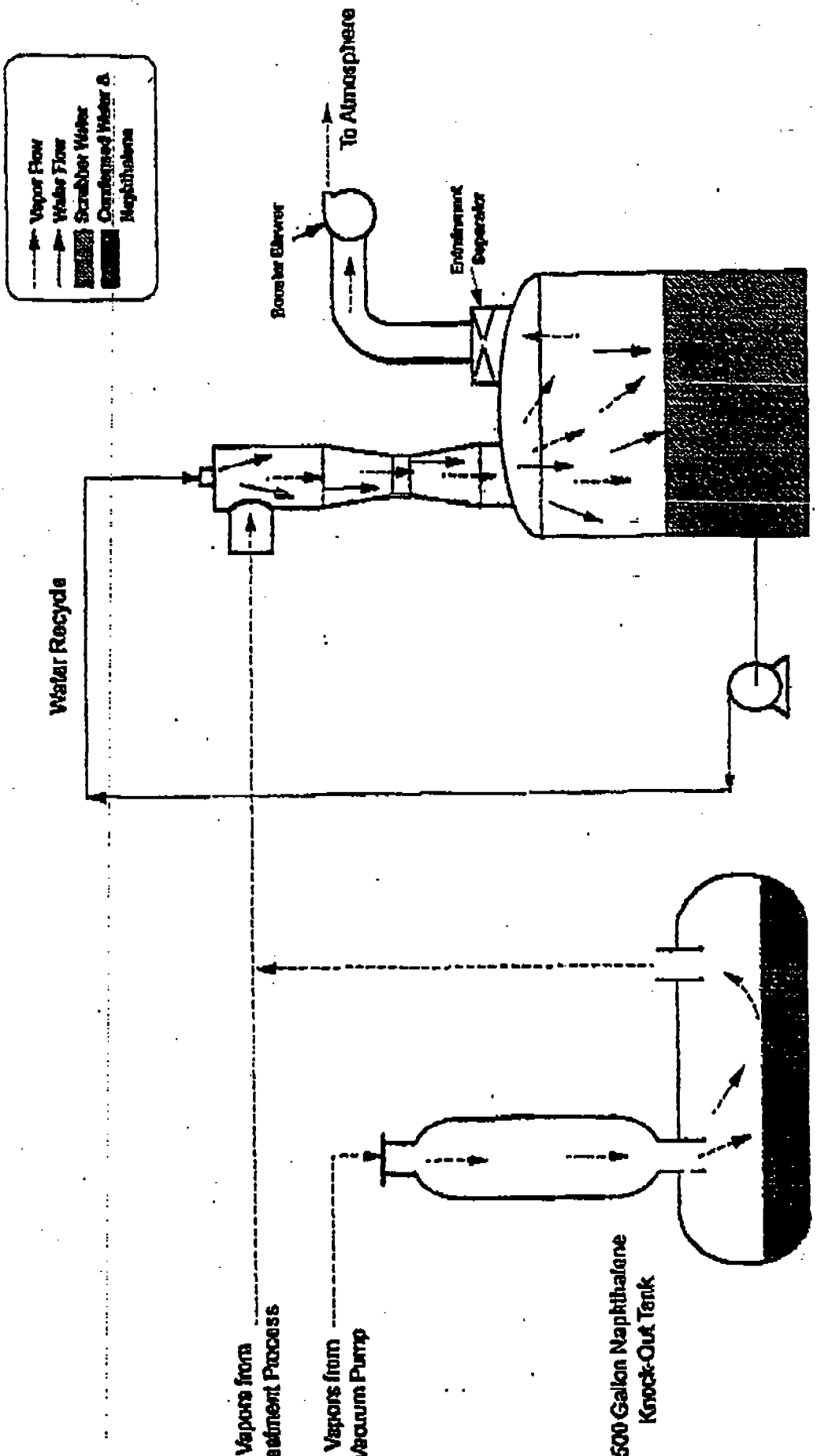


Figure 2. Venturi scrubber at Birmingham Wood, Incorporated in Warrior, Alabama (not drawn to scale).

Hoods are located over both of the cylinder doors at the BWI facility. The hoods are used to capture fugitive emissions from the cylinder door opening, and both hoods measured 2.5 by 6 feet. Canvas canopies are used in conjunction with the hoods to permit a greater capture of emissions from the cylinder door opening. Figure 3 shows a schematic of the hoods.

IV. TEST PROGRAM

Table 1 presents a sampling and analysis schedule for the requested test program that will test emissions at the BWI facility. Figure 1 identifies the inlet and outlet sampling location at the water scrubber and naphthalene knock-out tank. The purpose of testing at this facility is to obtain data on the performance of the scrubber and the knock-out tank. Inlet and outlet testing of these two APCD's using Method 25A for total organic carbons can accomplish this goal. Sampling at the inlet and outlet of the APCD's needs to be conducted simultaneously. Three days of operation will be sampled.

The efficiency of the scrubber will be determined by measuring the total organic carbon (Method 25A) at the scrubber's inlet and outlet. Since high organic content in the scrubber water may influence the scrubber efficiency, the scrubber water will be sampled before and after each test run to avoid misleading values for the scrubber efficiencies.

In addition to the emission testing, the creosote solution should also be sampled. The American Wood Preservers Association defines creosote as a distillate of coal tar with a boiling range of at least 125°C, beginning at about 200°C. As a result, the relative concentration of creosote components can vary. Thus, the creosote solution must be sampled and analyzed during testing to determine the actual concentration of HAPs in the preservative.

The wood treatment process will also be monitored during testing. The time, temperature, and pressure of each stage of the treatment and conditioning process will be monitored and recorded. Additionally, the type of wood to be treated, the product retention, the total volume of the charge, and the amount of preservative consumed will also be recorded for each charge treated during testing.

V. RELATIONSHIP OF TEST DATA TO STANDARDS DEVELOPMENT

The test program will demonstrate the performance capability of water scrubbers used to control process emissions from wood treatment facilities. The results of the tests may represent the control efficiency that can be accomplished for existing source MACT for the industry.

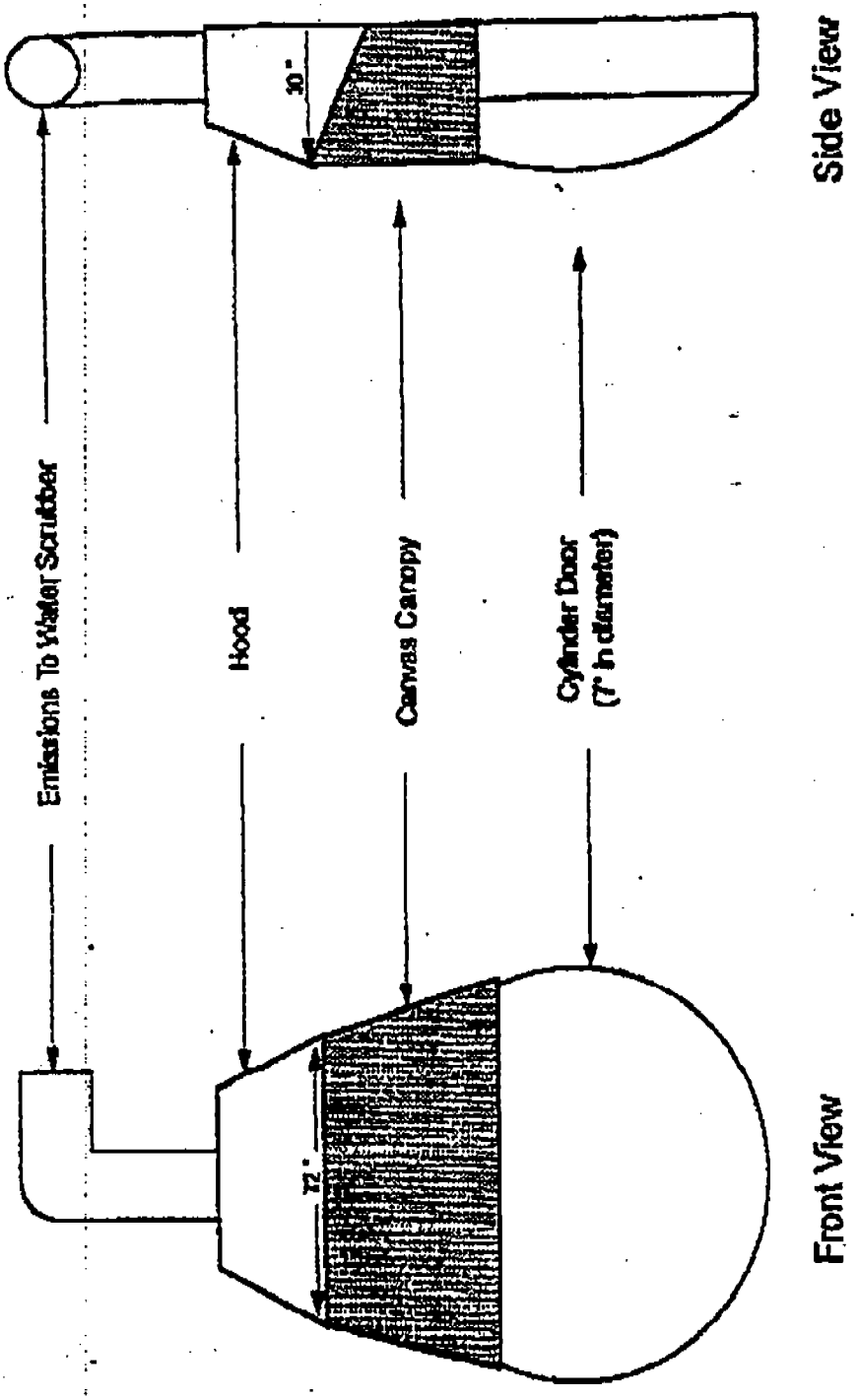


Figure 3. Schematic of the hood and canopy on cylinder door at BWI
(not drawn to scale).

VI. COORDINATION

Prior to testing, an EPA representative will maintain close coordination with the facility, ISB, EMB, and the testing contractor to ensure that all sampling preparations are completed.

During testing, a representative of EPA will monitor the wood treatment process and the water scrubber to ensure that the control system is operating properly. Testing should occur only while the process and the emissions control device are operating at normal conditions.

Continued coordination will be required among the EMB project officer, the testing contractor, and the ISB representative prior to and during the testing. To ensure that the desired test conditions can be achieved, coordination with the facility is required. The contact at BWI is Mr. Gary McCord, Plant Manager, at (205) 590-0102.

Table 1. Test Matrix for the BWI Facility

SOURCE SAMPLING AND ANALYSIS SCHEDULE				[redacted]								
				Company Name: Birmingham Wood Treatment					Company Location: Wheeler, Alabama			
				Industry: Wood Treatment			Process: Wood Treatment			Control Equipment: Water Scrubber		
							Mini Analysis			Mini Analysis		
Sampling Point Figure 1	Total No. of Samples	Sample Type	Sampling Methods*	Sample Collected By	Minimum Sampling Time	Minimum Volume Sampled	Type	Method	By	Type	Method	By
A	3	TOC	25A	CTR	One	N/A	TOC	25A	CTR			
B	3	TOC	25A	CTR	One	N/A	TOC	25A	CTR			
C	3	TOC	25A	CTR	One	N/A	TOC	25A	CTR			
D	3	TOC	25A	CTR	One	N/A	TOC	25A	CTR			
E	3	Water in Scrubber	Tap Sampling	CTR	One	500 cc	pH	Standard Methods 423	CTR	TOC	GC/MS	CTR
							Temperature		CTR			
F	3	Pneumatic	Tap Sampling	CTR	One	500 cc				Composites	GC/MS	CTR

TOC = Total Organic Carbon
CTR = Contractor
CONT = Capable of Continuous Sampling
GC/MS = Gas Chromatography / Mass Spectroscopy
N/A = not applicable. Methods are sampled continuously. Thus a minimum volume is not applicable
*Methods are EPA values believed otherwise.
^A blow back lasts from thirty minutes to one hour per cycle.
^ The cylinder door opening lasts from thirty minutes to one hour per cycle.

5. Test Methods

40 CFR Part 60, Method 1-4
25A

5.1. EPA Test Method 25A

This method will be used in the measurement of total hydrocarbons on the inlet and outlet of the incinerator to determine removal efficiency of organics.

The system will consist of an in-stack filter, heated sample line, a Ratfisch Model RS55 total hydrocarbon analyzer, and a strip chart recorder. or equivalent (eg J.U.M)

The analyzer will be calibrated once every hour during testing. Calibration gas will be an NIST calibrated cylinder of propane with a nitrogen balance.

The data will be recorded as propane. The final result will be converted and reported as carbon (C1).

In conjunction with the EPA Method 25A test, EPA Methods 1 through 4 will be used for the determination of sampling location, sampling traverse points, stack gases' molecular weight, stack moisture, stack flow rate, and emissions rates.

Determination of the stack moisture on the outlet of the incinerator will be conducted with a Method 4 sampling train with the impinger water and silica gel analyzed gravimetrically. Moisture determination on the inlet will be conducted using the wet bulb/dry bulb method (Method 4).

A fyrite analyzer will be used to measure O_2 and CO_2 concentrations in the stack for the determination of molecular weight of stack gas (Method 3). A standard or calibrated S-type pitot tube will be used to measure the velocity head in the stack for the determination of flow rate (Methods 1 and 2).

Deviation from the Methods: (1) Velocity measurement on the inlet pipe will be measured with a hot wire anemometer. (2) One port location will be used during the velocity traverse. (3) The outlet O_2 and CO_2 measurements will be made on the exhaust of the Method 4 sampling system.

Figure 5-1 is the sample train schematic.

5.2. EPA Test Method TO-13

EPA/600/4-89/017 TO13

This method will be used to analyze the creosote in the creosote storage tank.

A sample will be taken from the creosote tank during the testing period. The sample will be placed in a glass or Teflon container and then sent to the laboratory where it will be analyzed for speciated organic compounds.

5.3. Process Data

Representatives from will monitor the wood treatment process during testing. The time, temperature, and pressure of each stage of the treatment and conditioning process will be monitored and recorded. Additionally, the type of wood to be treated, the product retention, the total volume of the charge, and the amount of preservative consumed will also be recorded for each charge treated during testing.

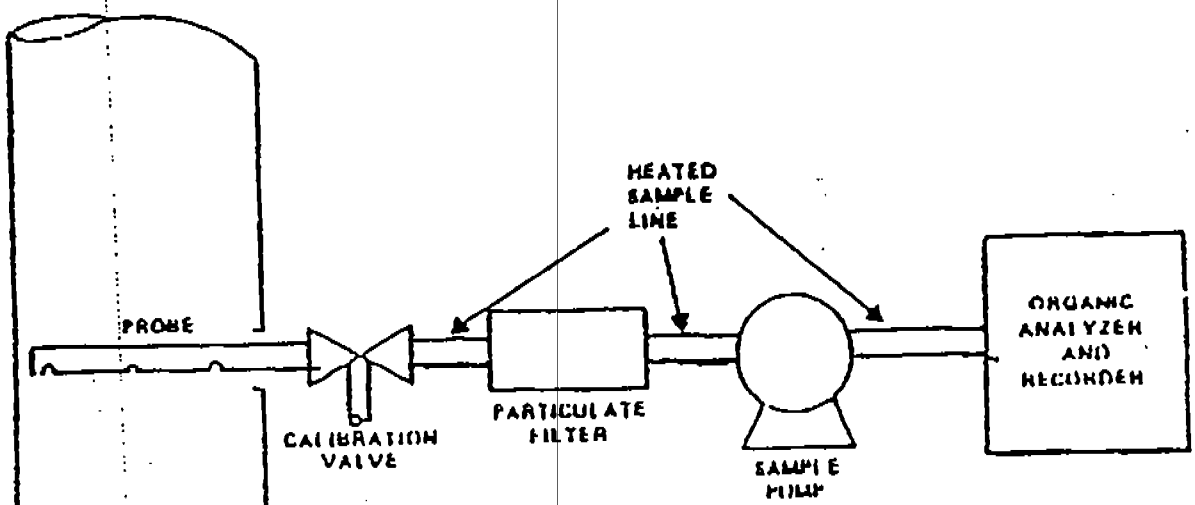


Figure 5-1. Organic concentration measurement system.

AlliedSignal

AlliedSignal Inc.
Research and Technology
50 East Algonquin Road
Box 5016
Des Plaines, IL 60017-5016

847
708 391 3500

July 19, 1994

Mr. Eugene P. Crumpler, Jr.
Environmental Engineer
U.S. EPA Room #1028
411 W. Chapel Hill Street
Durham, NC 27701

Dear Mr. Crumpler:

Per our conversation, enclosed is the *Naphthalene Knock-Out Tank and Water Scrubber* report.

If you have any questions, advise.

Sincerely,

W. S. Sheridan

William S. Sheridan

/hg

Enclosure

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 3

To Rich Mawhinney	From E Crumpler
Dept./Agency RTI	Phone # (919) 541-0981
Fax # (919) 677-0065	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

the emissions factors reported per cubic foot of treated wood were:

Wood conditioning emission factor	7.43E-05 lb/cf
Air Release emissions factor	3.70E-05 lb/cf
Final Vacuum emission factor	2.97E-06 lb/cf
Total =	1.14E-04 lb/cf

The total production of treated wood products for the Sesquehanna plant in 1991 was 1,668,700 cubic feet. Therefore the emissions from the vacuum pump system before the condenser were:

1,668,700 cf x 1.14E-04 lb/cf ÷ 2000 lb/ton = 0.09 ton/yr of naphthalene

Preliminary test report, Naphthalene Knock-out Tank and Water Scrubber, Birmingham Wood, Inc. Warrior, AL, April 12 and 13, 1994, Conducted by TTL, Inc. Tuscaloosa, AL.

Birmingham Wood Inc., is a creosote treating facility with two treating cylinders. The facility has a low pressure venturi scrubbing system that collects emissions from the storage tanks, the cylinders, the vacuum pump, and a hood system for the cylinder doors. The vapors collected are pulled through a knock out tank and then through a venturi fume scrubber that uses recirculated water as the scrubbing medium. The system uses an induced draft fan at the outlet of the scrubber to maintain a negative pressure on the entire collection system.

The testing consisted of sampling for total hydrocarbons using method 25A at both the inlet and outlet of the scrubbing system. In evaluating the testing results, it became apparent that the induced draft fan was causing emissions from the

creosote storage tanks when the rest of the process was down. In order to account for this and allow the data at the inlet to the scrubber to be representative of emissions from an uncontrolled treatment facility, it is necessary to subtract out the "background" emissions induced by the negative pressure on the system.

From pages 3 and 4 of the test report, the following THC mass rates are reported for the inlet of the scrubber system:

Operating Period		Total Hydrocarbons	
Cylinder #1	Cylinder #2	Inlet, lb/hr	Outlet, lb/hr
Background		7.16	5.38
Holding	Filling	7.00	0.49
Holding	Heating	4.60	1.18
Boulton Vac.	Heating	15.2	2.45
Pressure	Boulton Vac.	26.9	8.17
Final Vac.	Pressure	27.5	4.76
Draining	Final Vac.	8.29	3.98

Inlet emissions for the complete operating cycle at Birmingham Wood, Inc. were calculated as follows:

Time, hours	THC, lb/hr	THC x Time, lb-hours
1	7.2	7.2
0.5	7.0	3.5
1	4.6	4.6
8	15.2	121.6
7	26.9	188.3
1	27.5	27.5
1	8.3	8.3
19.5	TOTAL =	360.9

7 × 61 = 2348
6 × 51 = 1442
3790 ft³

3790 ft³ = TOTAL VOLUME
5 × 10⁶ ft³ in 1991
5.5 × 10⁶ ft³ in 1993
6 DAYS INPUT 1 cycle/day

3790 × (365-52) = 1186270

ASSUME CYLINDER IS 50% OF VOLUME
(3790) × 0.5 = 1895 ft³

The background emissions are 7.2 lb/hr THC for 19.5 hours = 140.4 lb-hours

Uncontrolled THC emissions corrected for the background are:

360.9 lb-hr - 140.4 lb-hr = 220.5 lb-hours for a complete operating cycle

Total annual uncontrolled emissions based on one cycle per 24 hours are:

220.5 lb/day x 5 days/week x 50 weeks/year = 55,125 lb THC per year

Calculate annual emissions of naphthalene as shown above;

Converting THC as propane to carbon:

55,125 lb propane/yr x 0.817 lb carbon/lb propane = 45,037 lb/yr carbon

Assuming that all of the carbon is creosote and that creosote (a mixture of several hundred organic compounds) has the same percent of carbon as naphthalene:

$$45{,}037 \text{ lb carbon/yr} \times \frac{128}{120} = 48{,}040 \text{ lb/yr creosote}$$

If the naphthalene content of creosote is 3%, then:

48,040 lb/yr creosote x 0.03 = 1,441 lb/yr naphthalene
= 0.72 ton/yr naphthalene

If naphthalene is 10% of creosote, emissions would be 2.4 ton/yr naphthalene.