AP-42 Section	
Reference	4
Report Sect.	
Reference	11

AP-42 Section	10.8
Reference	11
Report Sect.	2
Reference	11

United States
Environmental Protection
Agency

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

EMB Report 94-WDT-01
September 1994

Air

Wood Treatment Plant Emission Test Report

Kerr-McGee Chemical Corporation
Avoca, Pennsylvania

EPA

Office of Air Quality Planning and Standards
OAQPS
Clean Air

Final Emissions Test Report

Kerr-McGee Chemical Corporation
Forest Products Division
Wood Treatment Plant
Avoca, Pennsylvania

U.S. EPA Contract No. 68-D2-0161
EMB Work Assignment No. 1-2

Prepared by:

Science Applications International Corporation
100 Capitola Drive, Suite 100
Durham, North Carolina 27713

Prepared for:

Dennis P. Holzschuh
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

April 1996

Table of Contents

List of Tables

List of Figures

1. INTRODUCTION

1.1 Summary

The U.S. Environmental Protection Agency (EPA), Office of Air Quality Planning and Standards (OAQPS), Industrial Studies Branch (ISB), is studying baseline hazardous air pollutant (HAP) emissions and maximum achievable control technology (MACT) for the creosote wood-treating industry.

The Kerr-McGee Chemical Corporation (KMCC) facility located in Avoca, Pennsylvania was selected for study for this project. The KMCC facility has an incinerator that controls emissions from the vacuum system exhaust and the creosote work and storage tanks. The reported efficiency for the incinerator is 99 percent. No other facility uses an incinerator or reports a control efficiency close to the 99 percent reported at KMCC.

The testing program consisted of: (1) monitoring total organic hydrocarbons by CFR 40 Part 60 Appendix A, Method 25A; (2) measuring velocity, moisture, and gas composition measurements with Methods 1 through 4; and, (3) collecting creosote samples for analysis. Analysis for HAPs in the creosote sample was accomplished with TO-13 analysis. Testing with Methods 1 through 4 and Method 25A was conducted on the inlet and outlet of the incinerator. Due to the small dimensions of the inlet port and pipe, and the high temperature of the incinerator outlet, some modifications in the standard Methods 1 through 4 protocols were required. Samples from two incomplete tests were compiled to reflect the emission patterns from the process units and emission control unit (incinerator) over the course of one entire process cycle.

1.2. Key Personnel Test Program Organization

The key personnel who coordinated the test program and their phone numbers are:

- Eugene Crumpler, EPA Technical Coordinator (919) 541-0881
- Betty Gatano, RT1, Field Test Coordinator (919) 940-8603
- Jeff Snyder, Kerr-McGee, Plant Contact (717) 457-7446
- James Houck, SAIC, Work Assigment Manager (503) 643-3755
- Roger Bighouse, SAIC, Test Director (503) 643-3755

2. Plant and Sampling Location Descriptions

2.1. Process Description and Operation

The Kerr-McGee Chemical Corporation (KMCC) facility, located in Avoca, Pennsylvania, uses creosote to treat railroad ties, and switch ties made from other hardwoods. In 1991, the facility treated roughly 1.3 million cubic feet of wood products and consumed 900,000 gallons of creosote. The type of creosote used in the facility is P2 creosote, a 60/40 creosote coal tar mixture. The facility operates two treatment cylinders for conditioning and treating wood. Each cylinder has an associated condenser, work tank, storage tank, and vacuum pump. Both Cylinders measure 7 feet in diameter by 150 feet in length. The creosote facility operates 24 hours per day, 5 days per week. Figure 2-1 shows the layout of the creosote treatment process and the air pollution control device.

The facility either uses 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 12 to 17 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. As a result, the facility is now boultonizing a larger percentage of wood. For example, in the past, the facility treated about 50 percent air-seasoned wood, but because of of the wood shortage, only about 20 percent of the wood treated is now air-seasoned.

The Boulton process is used to condition green wood prior to treatment at the KMCC facility. Initially, the creosote treating cylinder is full. Approximately 3,000 to 6,000 gallons of creosote are then returned to the work tank to ensure that the void space in the cylinder is maintained. The total filling time lasts thirty minutes. Steam coils in the bottom of the cylinder are used for heating, and the cylinder is heated to approximately 180 °F. A 20"-24" Hg vacuum is then pulled on the cylinder to lower the boiling point of water in the wood, causing part of the water to evaporate. The temperature in the cylinder drops approximately 25°F during the initial hours

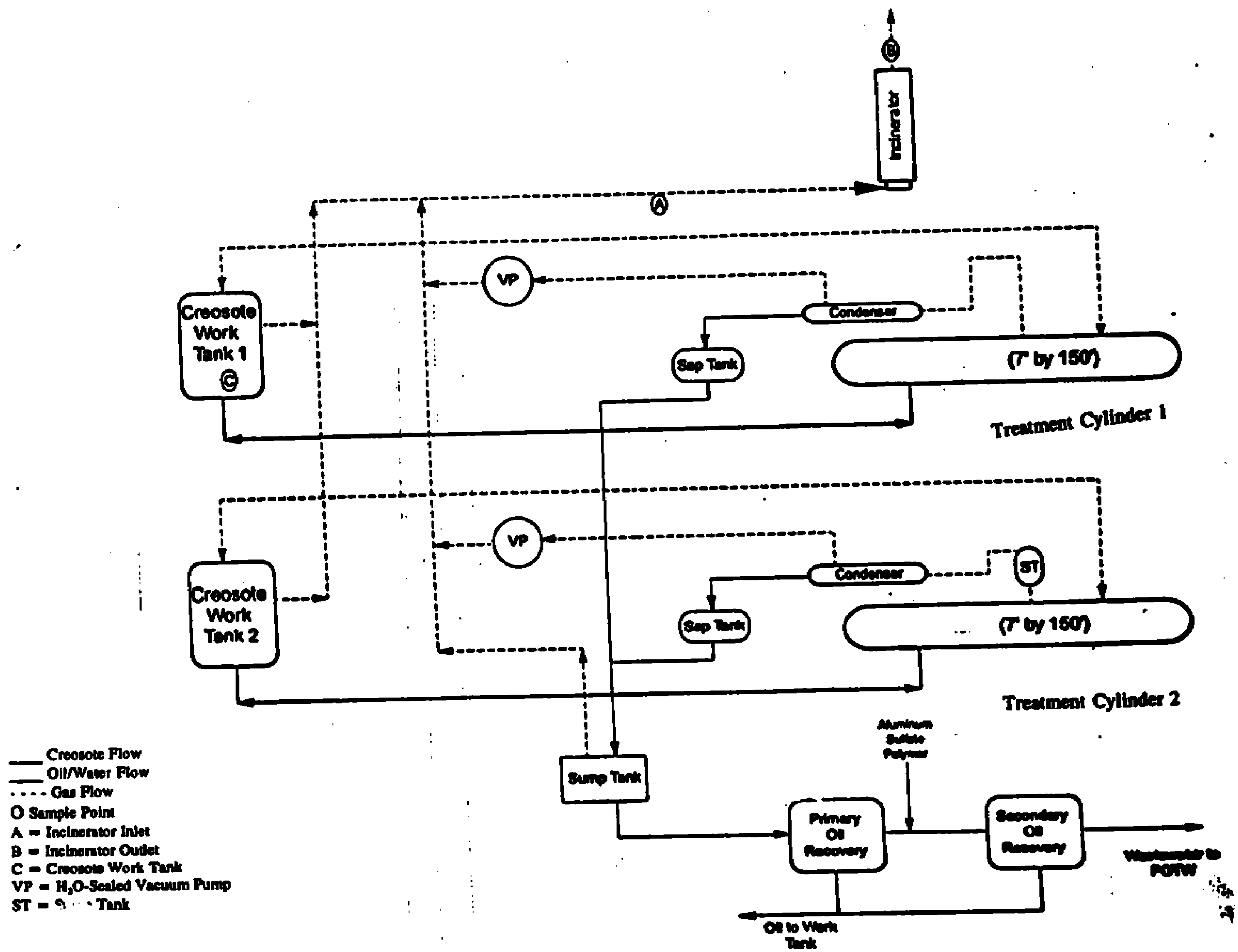


Figure 2-1. Layout and sampling locations for the KMCC facility in Avoca, Pennsylvania

of the vacuum and increased to 180°F in about 3 hours. The operator maintains the cylinder temperature at 180°F for the remainder of Boultonization. Vapors from the cylinder are condensed in a shell-and-tube condenser, and the condensate collects in one of two, 85-gallon sap tanks. During the Boultonization, the operator empties the sap tanks into a sump tank at thirty-minute intervals. The Boulton cycle lasts from 12 to 17 hours, depending on the type of wood being conditioned and the customer requirements.

After the wood has been conditioned, the treatment process begins. The KMCC 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 work 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 200 psig. Pressure is maintained for approximately 1 to 4 hours, depending on the type of wood being treated and the specification of the final product. After pressurization, the preservative is drained from the cylinder and returned to the creosote work tank. The total draining time lasts approximately thirty minutes. A final 20" to 24" Hg vacuum is then pulled on the cylinder for two hours

At this point the treating process is completed, and the charge can be removed from the cylinder without affecting the quality of the product. However, on some charges, the facility quenches the ties before the cylinder door is opened, in order to reduce the emissions from the treated wood. After the final 2-hour vacuum, the cylinder is filled with wastewater. Total filling time lasts approximately 30 minutes. The water remains in the cylinder for one hour, and the water is then drained and returned to the wastewater treatment system. A post-quenching vacuum of 22" Hg is pulled on the cylinder for another hour. After vacuuming, the cylinder is opened and the charge removed. The charge remains on the drip pad until all dripping has stopped, and it is then either stored onsite or loaded in rail cars and shipped to the customer.

2.2 Control Equipment Description

The KMCC facility uses a thermal oxidizer (incinerator) to control emissions from the process work tanks, the creosote storage tanks, vacuum system exhaust, and the sump tank. The lines from all of these sources combined to one inlet that enters the bottom of the incinerator. The incinerator was designed and manufactured by the John Zink Company, and the manufacturer's reported efficiency for the incinerator is 99 percent. The thermal incinerator is neither recuperative nor regenerative. Figure 2-2 is a schematic of the incinerator. The following are the design specifications for the incinerator:

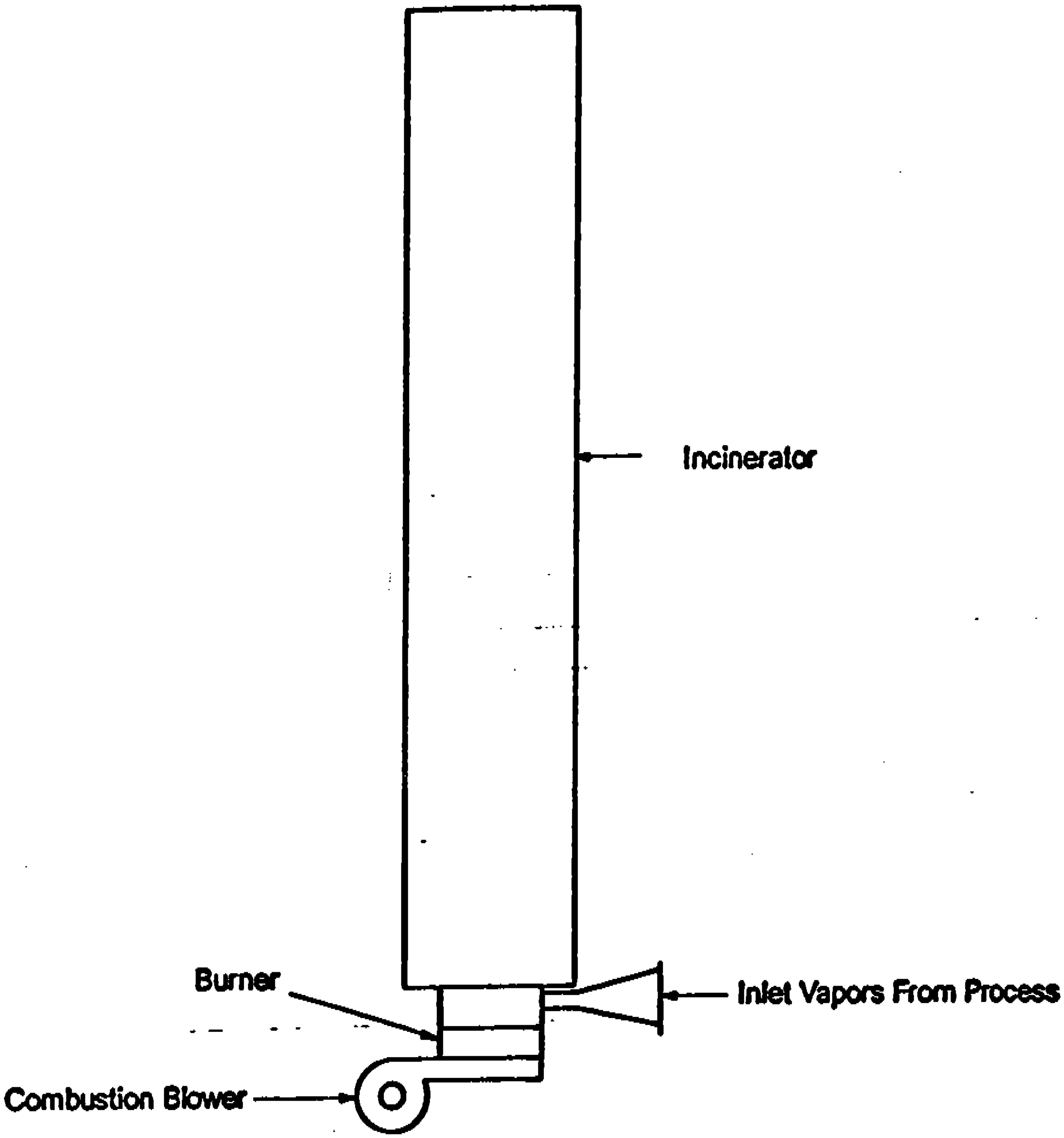
Waste Stream	Incinerator Operating Conditions
Flow rate: 4000 cfm	Excess Air: 25%
Temperature: 100°F	Chamber Temperature: 1800°F
Pressure: Atmospheric	Residence Time: 1.0 sec

The incinerator is fueled by natural gas. However, the fuel usage for the incinerator cannot be measured directly because the natural gas meter services both the incinerator and the facility's boiler. During weekends when the treatment process is not operating, the incinerator operates at reduced temperatures in order to control emissions from the creosote work tanks and the sump tank.

2.3. Flue Gas Sampling Locations

Total hydrocarbon compound sampling (Method 25A) was conducted and associated flow, gas composition, and moisture measurements were taken at the incinerator inlet and the incinerator outlet.

Figure 2-2. Incinerator at Kerr-McGee Chemical Corporation in Avoca, Pennsylvania (not drawn to scale).



2.3.1. Incinerator Inlet

The existing 1/2" port located in the 3" incinerator inlet was used intermittently for Method 25A and Methods 1 through 4. (Due to the small dimensions, a thermal anemometer probe was used in place of a pitot tube for velocity measurements.) The port is approximately 9" (three diameters) downstream and approximately 5" (1 2/3 diameters) upstream of disturbances.

2.3.2. Incinerator Outlet

A single 2" port was installed in the 30"-diameter stack at a location 72" upstream of where the gas discharges to the atmosphere. This port was used simultaneously for Method 25A and Methods 1 through 4.

2.4. Creosote Sampling Locations

The sample was taken from a tap connected to creosote work tank #1. A single sample was taken during test run #2 with a volume of 273 ml.

3. Summary and Discussion Test Results

3.1. Objectives

The purpose of this test program is to provide a characterization of overall emissions from creosote wood treatment plants and information on the performance of the control unit. Specific objectives in order of priority are:

- Measure simultaneously total hydrocarbon (THC) emissions (Method 25A) at the incinerator inlet and outlet.

- Determine the efficiency of the incinerator by comparing the THC emissions at the scrubber's inlet and outlet.

- Sample the creosote solution during the total hydrocarbon test run and analyze it for concentrations of HAPs.

Two test runs were conducted. Test #1 was conducted on cylinder #1. The Boulton cycle lasted 14 hours; the final vacuum lasted 4 hours. Test #2 was conducted on cylinder #2. The Boulton cycle lasted 12 hours. Test #2 was terminated before the pressurization phase was completed, due to a gasket failure on the treatment cylinder.

Table 3-1 presents a sampling and analysis matrix.

Table 3-1. Sampling Matrix.

Run	Date	Sample Type	Test Method	Location/Clock Time (hours)		
				Inlet -	Outlet -	Work Tank -
1	9/8-9/93	THC	M25A	0800-1545	1545-0620	
1-1	9/8/93	O_2/CO_2/Moist.	M3/M4		1132-1202	
1-2	9/8/93	O_2/CO_2/Moist.	M3/M4		1255-1325	
1-3	9/8/93	O_2/CO_2/Moist.	M3/M4		1413-1443	
1-4	9/8/93	O_2/CO_2/Moist.	M3/M4		1738-1808	
1-5	9/8/93	O_2/CO_2/Moist.	M3/M4		1836-1906	
1-6	9/8/93	O_2/CO_2/Moist.	M3/M4		1947-2018	
1-7	9/8/93	O_2/CO_2/Moist.	M3/M4		2053-2123	
1-8	9/8/93	O_2/CO_2/Moist.	M3/M4		2329-2359	
1-9	9/9/93	O_2/CO_2/Moist.	M3/M4		0042-0112	
1-10	9/9/93	O_2/CO_2/Moist.	M3/M4		0144-0214	
1-11	9/9/93	O_2/CO_2/Moist.	M3/M4		0241-0311	
1-12	9/9/93	O_2/CO_2/Moist.	M3/M4		0340-0413	
1-13	9/9/93	O_2/CO_2/Moist.	M3/M4		0451-0521	
2	9/10/93	THC Preservative	M25A Tap Sample	1215-2230	0800-2230	 1738
2-1	9/10/93	O_2/CO_2/Moist.	M3/M4		0836-0908	
2-2	9/10/93	O_2/CO_2/Moist.	M3/M4		0937-1010	
2-3	9/10/93	O_2/CO_2/Moist.	M3/M4		1048-1127	
2-4	9/10/93	O_2/CO_2/Moist.	M3/M4		1210-1244	
2-5	9/10/93	O_2/CO_2/Moist.	M3/M4		1311-1341	
2-6	9/10/93	O_2/CO_2/Moist.	M3/M4		1539-1609	
2-7	9/10/93	O_2/CO_2/Moist.	M3/M4		1651-1721	
2-8	9/10/93	O_2/CO_2/Moist.	M3/M4		1748-1818	
2-9	9/10/93	O_2/CO_2/Moist.	M3/M4		1850-1929	
2-10	9/10/93	O_2/CO_2/Moist.	M3/M4		2007-2037	
2-11	9/10/93	O_2/CO_2/Moist.	M3/M4		2118-2148	

3.2. Field Test Changes and Problems

3.2.1. Damaged Analyzer

One of two THC analyzers was damaged during shipping. Therefore, only the inlet or the outlet could be monitored until a replacement analyzer was acquired. During run 1, the inlet THC concentrations were monitored for the first 7 3/4 hours. At the direction of the Technical Coordinator, the outlet THC concentrations were monitored for the remaining 15 hours of run 1.

A replacement analyzer was acquired and was on-line (at the inlet sampling location) approximately 4 hours into run 2. At that time, both the inlet and outlet THC concentrations were monitored simultaneously until the termination of run 2.

3.2.2. Premature Termination of Run 2

Run 2 was terminated on 9/10/93 at 2230 hours due to plant shutdown. The cylinder gasket failed during the pressurization cycle and could not be repaired until maintenance crews arrived on 9/13/93.

3.3. Presentation of Results

3.3.1. THC Emissions

3.3.1.1. *Inlet THC Emissions*

Inlet THC Concentrations The inlet THC concentrations varied cyclically. The inlet concentration dropped when the sump was activated to pump the water from the sump tank into the waste water storage tank (Figure 3-1). This variation is seen only during the vacuum cycles (Boulton cycle and final vacuum). Hourly averages of the inlet THC concentrations during Boultonization were made and are presented in Table 3-2.

Inlet THC concentrations were monitored during the first creosote blowback (after Boulton cycle) of run 2. The entire blowback lasted 30 minutes, with the THC concentration peaking at 4950 ppm THC as propane 4 minutes into the blowback. The THC concentration slowly decreased during the blowback and was at 2910 ppm THC as propane at the end of the blowback. The average concentration during the blowback was 3690 ppm THC as propane. Inlet THC concentrations were also monitored during the pressurization cycle for run 2. In the 30 minutes prior to cylinder gasket failure, the inlet averaged 2620 ppm THC as propane.

Flow Rate Numerous intermittent measurements of flue velocity, temperature, moisture, CO_2 %, and O_2 % were made at the inlet. These results as well as the flow rate are presented in Tables 3-3 and 3-4.

Inlet duct flow rates were intensely monitored on 9/10/93 (Run 2) from 0830 to 1023 (Figure 3-2). The increases and decreases in flow rate correspond to the sump tank pump episodes. Since these episodes of varying flow rate are brief, they will be ignored and the general decreasing trend in flow rate will be used to calculate emission rates. The use of this

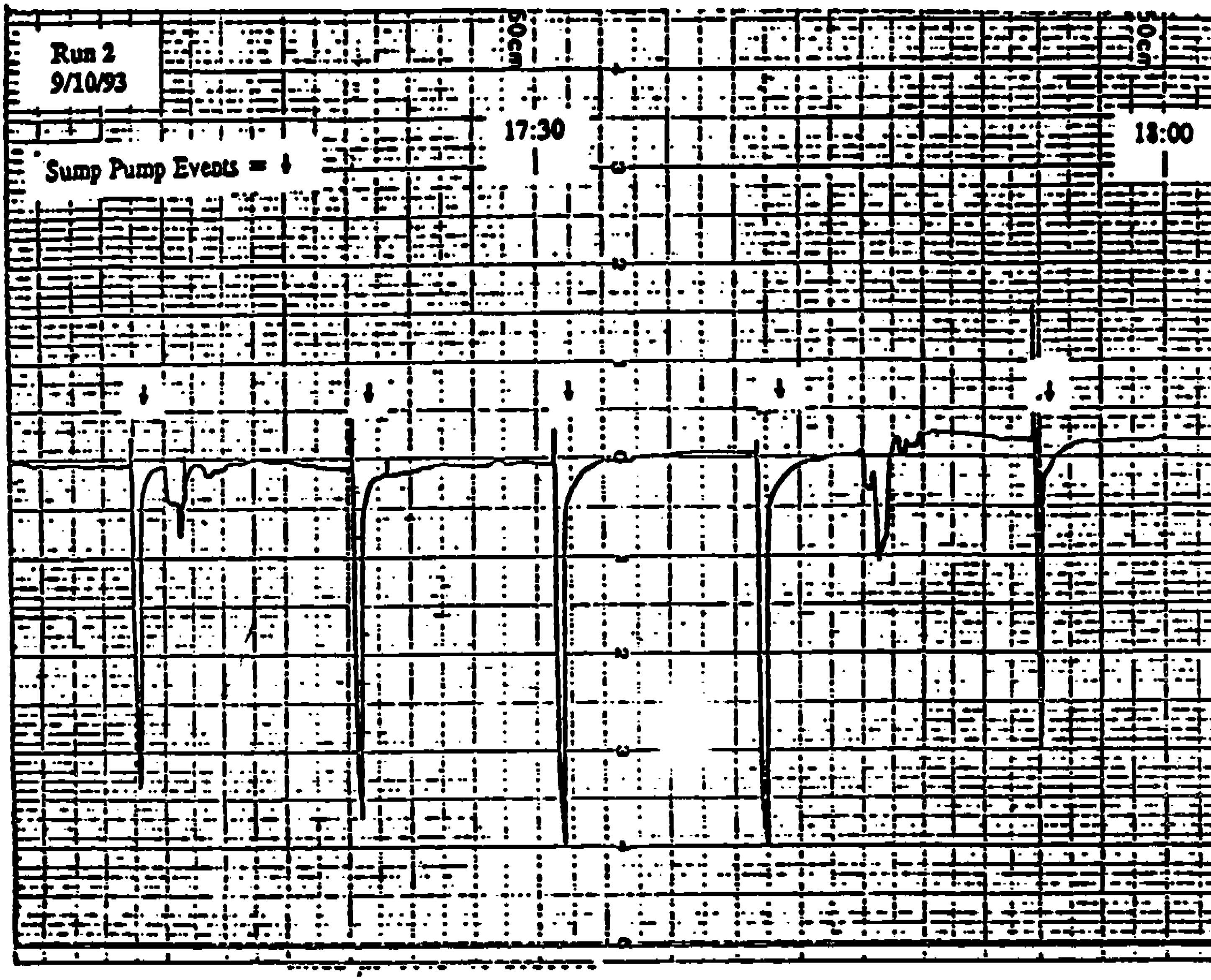


Figure 3-1. Variation of the inlet THC concentration corresponding to sump pump events.

Table 3-2. Hourly Averages of Inlet THC Concentrations During Boulton Cycle.

Hour of Boulton Cycle	Average THC Concentration (ppm as propane)		
	Run 1	Run 2	Composite[a]
1	18,260	[b]	18,260
2	18,260	[b]	18,260
3	11,490	[b]	11,490
4	7,910	[b]	7,910
5	11,490	12,100	11,800
6	19,320	11,760	15,540
7	[c]	11,100	11,100
8		10,310	10,310
9		9,480	9,480
10		9,700	9,700
11		9,440	9,440
12		9,440	9,440
Average	–	–	11,890

a. Average of runs 1 and 2.
b. Inlet analyzer not operational.
c. Measurement of inlet concentrations terminated.

Table 3-3. Run 1 Inlet Measurements of Temperature, Oxygen Content, Carbon Dioxide Content, Moisture Content, and Flow Rate During Boulton Cycle.

Time (Hours)	Temperature (°F)	O_2 (%)	CO_2 (%)	Moisture (%)	Flow Rate (DSCFM)
0848	123	21	0	9.6	29.0
0910	107	18	2	7.8	116.0
0936	107	20	2	7.8	9.7
1007	119	20	2	11.5	19.0
1037	106	20	2	7.1	14.5
1105	106	20	2	6.1	14.5
1134	113	20	1	9.3	9.7
1209	130	20	1	15.1	9.7
1310	118	20	2	10.8	12.1
1545[a]	–	–	–	–	–

a. Inlet measurements terminated.

Table 3-4. Run 2 Inlet Measurements of Temperature, Oxygen Content, Carbon Dioxide Content, Moisture Content, and Flow Rate.

Cycle of Treatment Process	Time (Hours)	Temperature (°F)	O_2 (%)	CO_2 (%)	Moisture (%)	Flow Rate (DSCFM)
Boulton	1025	140	–	–	19.7	–
	1238	137	–	–	19.8	14.5
	1410	132	20	4	15.9	14.5
	1538	116	20	3	10.2	6.8
	1650	120	21	2	11.4	7.3
	1815	114	21	2	8.7	3.9
	1940	111	21	1	8.8	8.7
	2022	109	21	2	7.5	6.8
First Blowback	2046	–	–	–	–	23.2
	2107	–	–	–	–	33.8
Pressurization	2140	–	–	–	–	6.3
	2145[a]	–	–	–	–	–

a. Gasket failure, run 2 terminated.

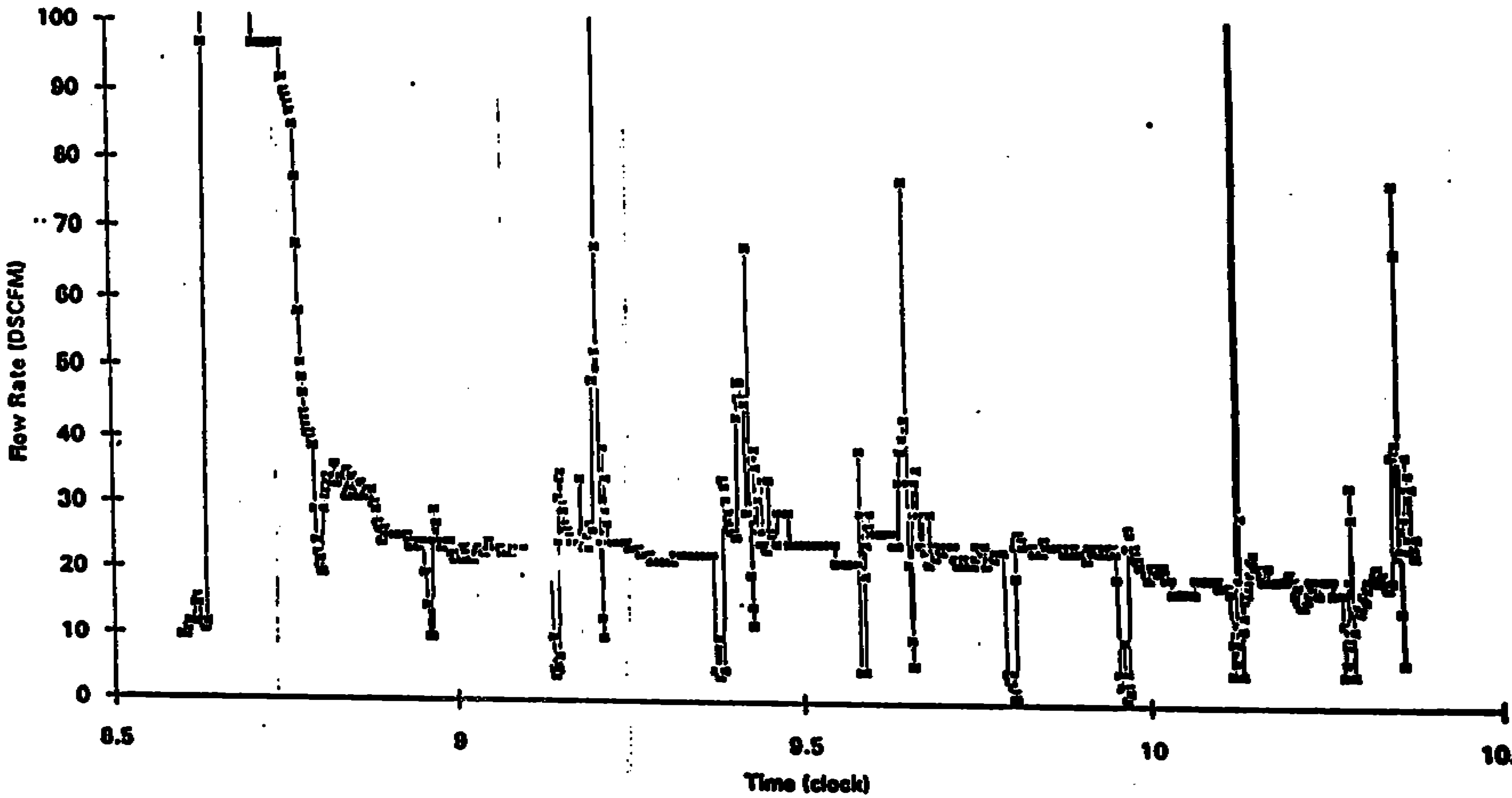


Figure 3-2. Inlet duct flow rates during a portion of the Boulton cycle for run 2.

decreasing trend in flow rates during the Boulton process is supported by the intermittent measurements taken during the Boulton cycle after the intensive flow measurements (Figure 3-3). Flow rates were measured twice during the 30-minute blowback cycle of run 2 and avered 28.5 DSCFM.

Emission Rate By combining the average flow rate and average THC concentrations measured at the inlet of the incinerator, we can estimate the average emission rates for each cycle of the process for which we have data. Table 3-5 presents the average flow rates, THC concentrations, and emission rates for various cycles of the wood treatment process.

3.3.1.2. Outlet THC Emissions

Outlet THC Emissions THC concentrations of the outlet were monitored during run 1 from midway through the Boulton cycle to completion of final vacuum. THC concentrations of the outlet were monitored during run 2 from the beginning of the Boulton cycle until gasket failure occurred at the beginning of the pressurization cycle. In all cases, the outlet THC concentration was measured to be <2 ppm as propane except under one circumstance.

Compressed air is used to blow the water from the SAP tank into the sump tank. If the air is left on after all water has been forced out of the SAP tank, THC outlet concentrations go up (Figure 3-4). The duration and magnitude of this "spike" are dependent on the duration and pressure of the "excess" air that is forced through the system. Such spikes ranged from approximately 20 ppm to over 1000 ppm. Each episode lasted less than 30 seconds.
Due to the extremely short nature of these spikes, they can be neglected. The THC concentration at the outlet of the incinerator is measured to be <2 ppm as propane.

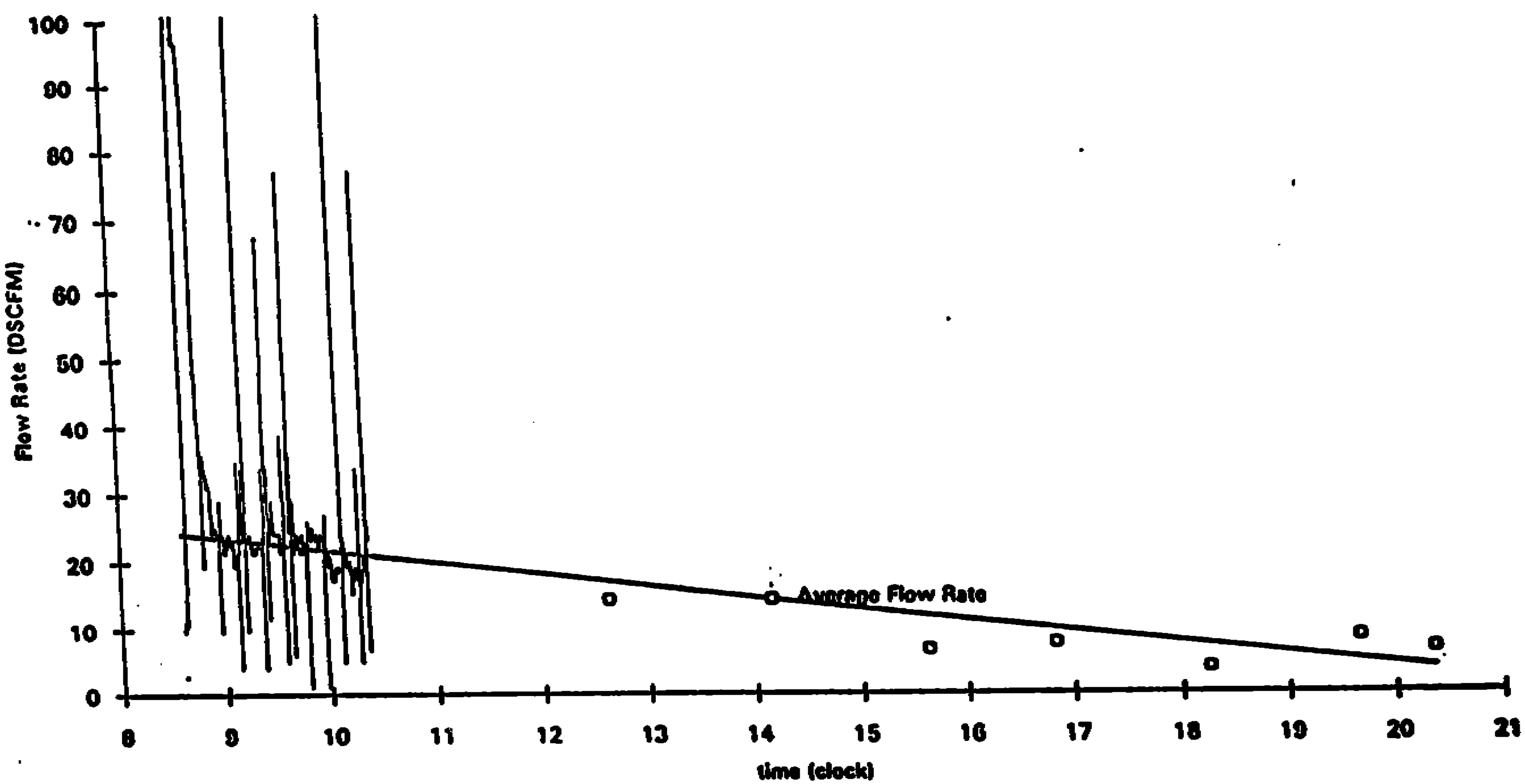


Figure 3-3. Flow rate measurements of inlet duct during entire Boulton cycle for run 2.

Table 3-5. Average Inlet THC Concentrations, Flow Rates, and Emission Rates by Process Cycle.

Cycle is Treatment Process	Length of Cycle	Average THC Concentration (ppm as propane)	Average Flow Rate (DSCFM)	Average Emission Rate[a] (lb/hr propane)
Boulton	12 hours	11,890[b]	14[c]	1.22
First Blowback	15 minutes	3,690[c]	28.5[b]	0.77
Pressurization	30 minutes[c,d]	2,620[c]	6.3[c]	0.12
Second Blowback	--	--	--	--
Final Vacuum	--	--	--	--
Removal of Charge	--	--	--	--

a. Multiply lb/hr propane by 3 to get lb/hr carbon emissions.
b. From composite of runs 1 and 2.
c. From run 2 data.
d. Prior to gasket failure.

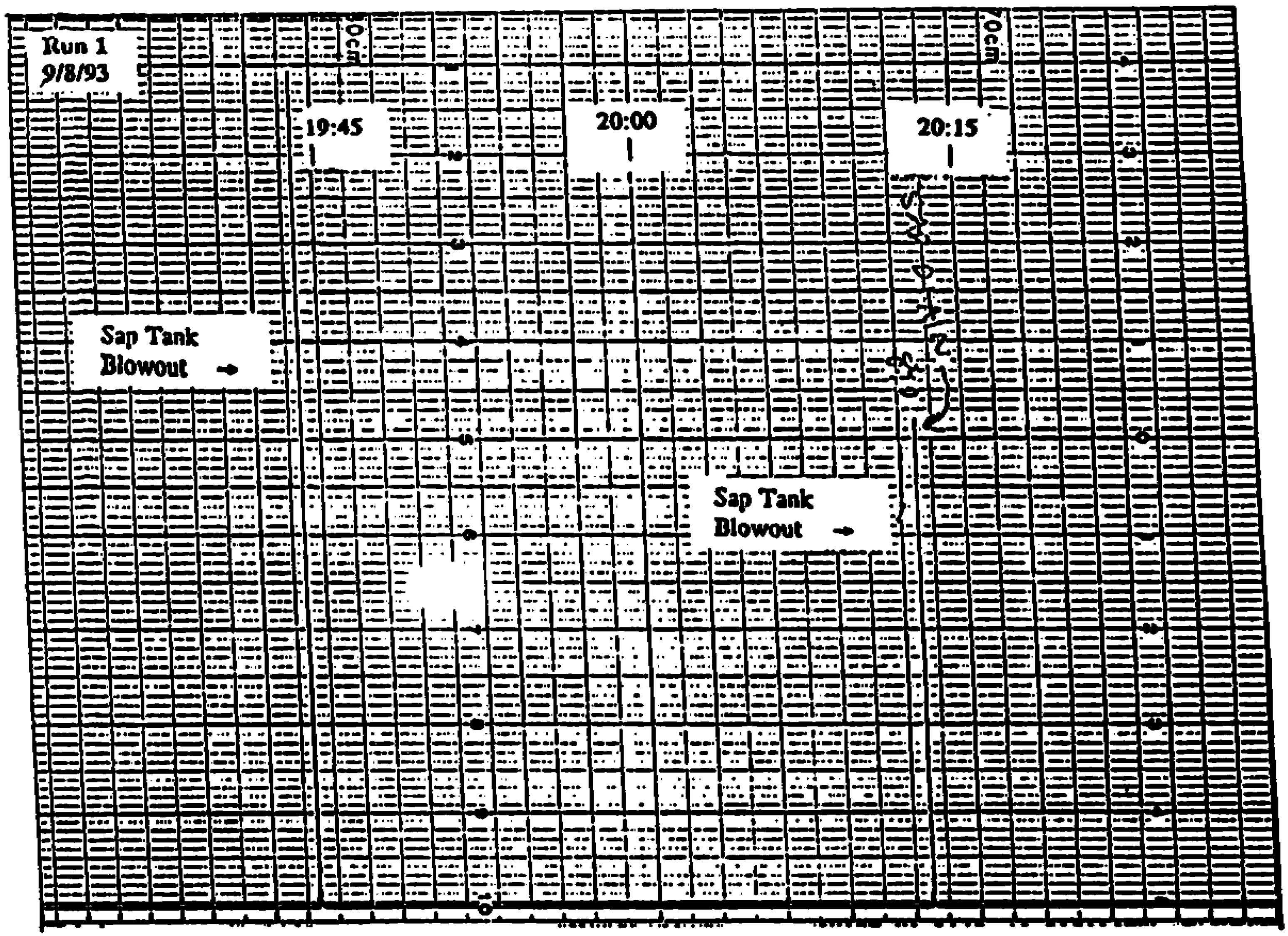


Figure 3-4. Outlet THC concentrations during SAP tank blowouts.

Flow Rate Flow rate, oxygen and carbon dioxide contents, moisture, and temperature measured at the outlet were all veryn uniform throughout all cycles of the test. Table 3-6 presents the results of each EPA Method 4 test done at the outlet for both runs 1 and 2.

Emission Rates The average emission rates THC (as propane) are presented in Table 3-7.

Table 3-6. Runs 1 and 2 Outlet Measurements of Temperature, Oxygen Content, Carbon Dioxide Content, Moisture Content, and Flow Rate.

Run	Average Temp. (°F)	Moisture (%)	O_2 (%)	CO_2 (%)	Flow Rate (DSCFM)
1-1	1598	12.9	11.5	4.5	454
1-2	1605	13.0	10.5	4.0	453
1-3	1583	13.4	11.0	5.0	454
1-4	1580	13.8	11	5.0	452
1-5	1580	13.8	12	5.0	451
1-6	1580	13.6	11.0	4.0	453
1-7	1580	13.2	14.0	4.0	454
1-8	1580	12.3	11.0	4.0	459
1-9	1580	13.7	10.5	4.5	453
1-10	1580	15.2	11.5	4.0	446
1-11	1580	13.6	12.5	6.0	451
1-12	1580	13.4	10.0	5.0	507
1-13	1580	13.4	11.0	4.0	454
Average Run 1	1584	13.5	11.3	4.5	464
2-1	1580	14.3	10.5	6.0	448
2-2	1580	13.6	10.0	5.5	452
2-3	1580	13.5	11.0	5.0	453
2-4	1580	12.9	5	5.5	458
2-5	1550	14.3	11.0	5.5	452
2-6	1550	13.1	11.0	5.5	457
2-7	1550	12.9	110	5.0	459
2-8	1550	12.7	11.0	6.0	458
2-9	1550	12.8	10.5	6.0	458
2-10	1550	12.3	11.0	6.0	460
2-11	1550	12.8	10.5	5.5	459
Average Run 2	1561	13.2	10.7	5.6	456
Average, Runs 1 & 2	1573	13.4	11.0	5.0	460

Table 3-7. Average Outlet Emission Rates

Run	Average THC (ppm as propane)	Average Flow Rate (DSCFM)	THC Emission Rate[a] (lb/hr propane)
1	< 2 ppm	464	<0.0068
2[b]	< 2 ppm	460	<0.0068
Average	–	462	<0.0068

a. Multiply THC ppm as propane by 3 to get ppm of carbon.
b. Run 2 terminated at the beginning of pressurization due to gasket failure.

3.3.2. Incinerator Efficiency

Because inlet emission data is limited to the Boulton cycle, first blowback, and beginning of the pressurization cycle, incinerator efficiency can be calculated only for these cycles. Table 3-8 presents the incinerator efficiency results.

Table 3-8. Incinerator Efficiency Results

Cycle	Average Inlet Emissions (lb/hr propane)	Average Outlet Emissions (lb/hr propane)	THC Destruction Efficiency (%)
Boulton Cycle	1.22	<0.0068	>99.4
First Blowback	0.77	<0.0068	>99.1
Pressurization[a]	0.12	<0.0068	>94.3

a. Data limited to first 30 minutes of pressurization due to gasket failure.

The lower detection limit of the THC analyzer measuring the outlet concentration was the limiting factor in measuring the incinerator's THC destruction efficiency.

3.3.3. HAPs Concentration in Preservation

Table 3-9 summarizes the analytical data for HAPs in the creosote preservative and a sample blank. The laboratory report for the sample blank (H_2O blank) are located in Appendix A.

Table 3-9. Creosote Analytical Results (µg/ml)
Samples Collected 9-16-93

Compound	Sample ID	
	AV-C-1	H_2O Blank
Lower Detection Limit	2.0	0.0015
Phenol	ND	ND
bis(2-Chloroethyl) Ether	ND	ND
2-Chlorophenol	ND	ND
1,3-Dichlorobenzene	ND	ND
1,4-Dichlorobenzene	ND	ND
1,2-Dichlorobenzene	ND	ND
bis(2-Chloroisopropyl) Ether	ND	ND
N-Nitroso-di-n-Propylamine	ND	ND
Hexachloroethane	ND	ND
Nitrobenzene	NT	ND
Isophorone	N	ND
2-Nitrophenol	ND	ND
2,4-Dimethylphenol	ND	ND
Benzoic Acid	ND	ND
bis(2-Chloroethoxy) Methane	ND	ND
2,4-Dichlorophenol	ND	ND
1,2,4-Trichlorobenzene	ND	ND
Naphthalene	223.44	ND

Table 3-9. Creosote Analytical Results (μg/ml) (continued)

Compound	Sample ID	
	AV-C-1	H_2O Blank
Lower Detection Limit	2.0	0.0015
4-Chloroaniline	ND	ND
Hexachlorobutadiene	ND	ND
4-Chloro-3-Methylphenol	ND	ND
2-Methylnaphthalene	150.18	ND
Hexachlorocyclopentadiene	ND	ND
2,4,6-Trichlorophenol	ND	ND
2,4,5-Trichlorophenol	ND	ND
2-Chloronaphthalene	ND	ND
2-Nitroaniline	ND	ND
Dimethylphthalate	ND	ND
Acenaphthylene	216.12	ND
2,6-Dinitrotoluene	ND	ND
3-Nitroaniline	ND	ND
Acenaphthene	ND	ND
2,4-Dinitrophenol	ND	ND
4-Nitrophenol	ND	ND
2,4-2,4-Dinitrotoluene	ND	ND
Dibenzofuran	131.87	ND
Diethylphthalate	ND	ND
Fluorene	128.21	ND

Table 3-9. Creosote Analytical Results (µg/ml) (continued)

Compound	Sample ID	
	AV-C-1	H_2O Blank
Lower Detection Limit	2.0	0.0015
4-Chlorophenyl-Phenyl Ether	ND	ND
4-Nitroaniline	ND	ND
4,6-Dinitro-2-Methylphenol	ND	ND
N-Nitrosodiphenylamine	ND	ND
4-Bromophenyl-Phenyl Ether	ND	ND
Hexachlorobenzene	ND	ND
Pentachlorophenol	ND	ND
Phenanthrene	300.37	ND
Anthracene	40.29	ND
di-n-Butylphthalate	ND	ND
Fluoranthene	227.11	ND
Pyrene	16[illegible]50	ND
Butylbenzylphthalate	N[illegible]	ND
3,3'-Dichlorobenzidine	ND	ND
Chrysene	51.28	ND
Benzo(a)anthracene	40.29	ND
bis(2-Ethylhexyl)phthalate	ND	ND
Di-n-Octylphthalate	ND	ND
Benzo(b)fluoranthene	21.98	ND
Benzo(k)fluoranthene	13.55	ND

Table 3-9. Creosote Analytical Results (μg/ml) (continued)

Compound	Sample ID	
	AV-C-1	H_2O Blank
Lower Detection Limit	2.0	0.0015
Benzo(a)pyrene	ND	ND
Indeno(1,2,3-cd)pyrene	16.12	ND
Dibenz(a,h)anthracene	ND	ND
Benzo(g,h,i)perylene	ND	ND
Biphenyl	36.63	ND
Quinoline	36.63	ND
Xylenes	ND	ND
Cresols	ND	ND

ND = not detected.

Sample AV-C-2 was furnished to the lab as a duplicate but was not analyzed by the client's request.

4. Sampling and Analytical Procedures

4.1. Test Methods

4.1.1. EPA Test Method 25A

This method was used in the measurement of total hydrocarbons on the inlet and outlet of the incinerator, to determine the incinerator removal efficiency for organics.
The system consisted of an in-stack filter, heated sample line, a Ratfisch Model RS55 total hydrocarbon analyzer, and a strip chart recorder. The analyzer was calibrated approximately once every hour during testing. Calibration gases were NIST calibrated cylinders of propane with a nitrogen balance. The data were recorded as propane.

In conjunction with the EPA Method 25A test, EPA Methods 1 through 4 were used for the determination of sampling locations, sampling traverse points, stack gas molecular weight, stack moisture, stack flow rate, and emissions rate. Determination of the stack moisture on the outlet of the incinerator was conducted with a Method 4 sampling train with the impinger water and silica gel analyzed gravimetrically. Moisture determination on the inlet was conducted using the wet bulb/dry bulb method (Method 4).

A fyrite analyzer was 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 was 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 measurements on the inlet pipe were measured with a hot wire anemometer; (2) One port location was used during the velocity traverse; and, (3) The outlet O_2 and CO_2 measurements were made on the exhaust of the Method 4 sampling system. Figure 4-1 is the sample train schematic.

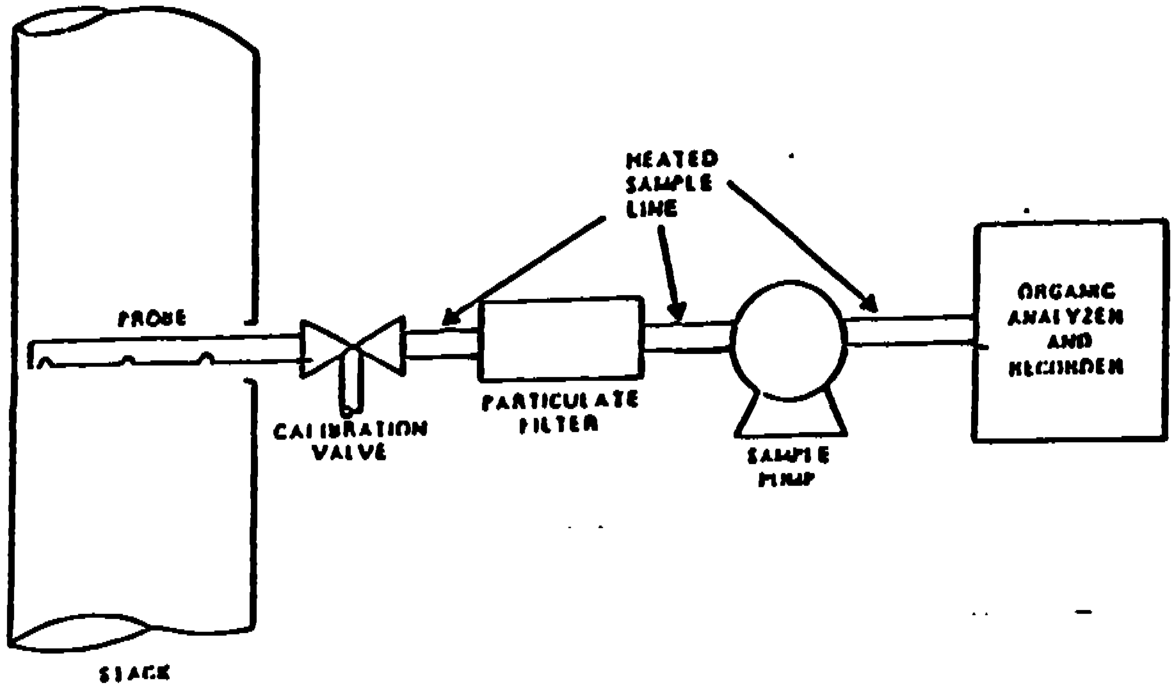


Figure 4-1. Organic concentration measurement system.

4.1.2. EPA Test Method TO-13

This method was used to analyze the creosote in the creosote storage tank. A sample was taken from the creosote tank during the testing period. The sample was placed in a glass container and then sent to the laboratory where it was analyzed for speciated organic compounds.

4.2. Process Data

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

4.2.1. Operating Conditions

KMCC test # 1 was conducted on cylinder number 1. During this test, the Boulton cycle lasted for 14 hours, and the final vacuum lasted for 4 hours. Figure 4-2 shows the temperature and pressure in cylinder number 1 throughout the entire wood treatment process.

KMCC test #2 was conducted on cylinder number 2. During this test, the Boulton cycle lasted 12 hours. Figure 4-3 shows the temperature and pressure in cylinder number 2 throughout the entire wood treatment process.

4.2.2. Occurrences During Normal Operating Conditions

Under normal conditions, both treatment cylinders are in operation, but only one cylinder was operating during each of the test runs. The sump tank is a closed tank located underneath cylinder number one. The condensate in the sap tanks, the condensate from the condenser, and the water from the water-sealed vacuum pumps collect in the sump tank. The level in the sump tank is maintained by an automatic level controller. When the level in the sump is too high, the controller activates two pumps that periodically transfer the water in the sump tank to the creosote recovery and wastwater treatment system. When the sump pumps were activated during the two tests, variations were seen in the total hydrocarbon monitoring. The periodic dumping of the sap tank into the sump tank also caused momentary variations in the total hydrocarbon monitoring at the inlet of the incinerator.

4.2.3. Problems and/or Variations During Testing

During Test #1 (8:45 a.m. to 6:00 a.m., 9/08/93 and 9/09/93), cylinder number 1 ran normally. During Test #2, (8:02 a.m. to 10:42 p.m., 09/10/93), cylinder number 2 ran normally until the start of pressurization. When the cylinder reached approximately 65 psi, the gasket on the cylinder door failed. Normal operations could not continue until the gasket was replaced on the following Monday morning. As a result, testing of the remainder of the process could not be completed because of the gasket failure. Based on creosote work tank levels, approximately 300 gallons of cresote were expelled from the cylinder due to the gasket failure. This cresote was held in secondary containment and was then recycled to the creosote recovery system for reuse.

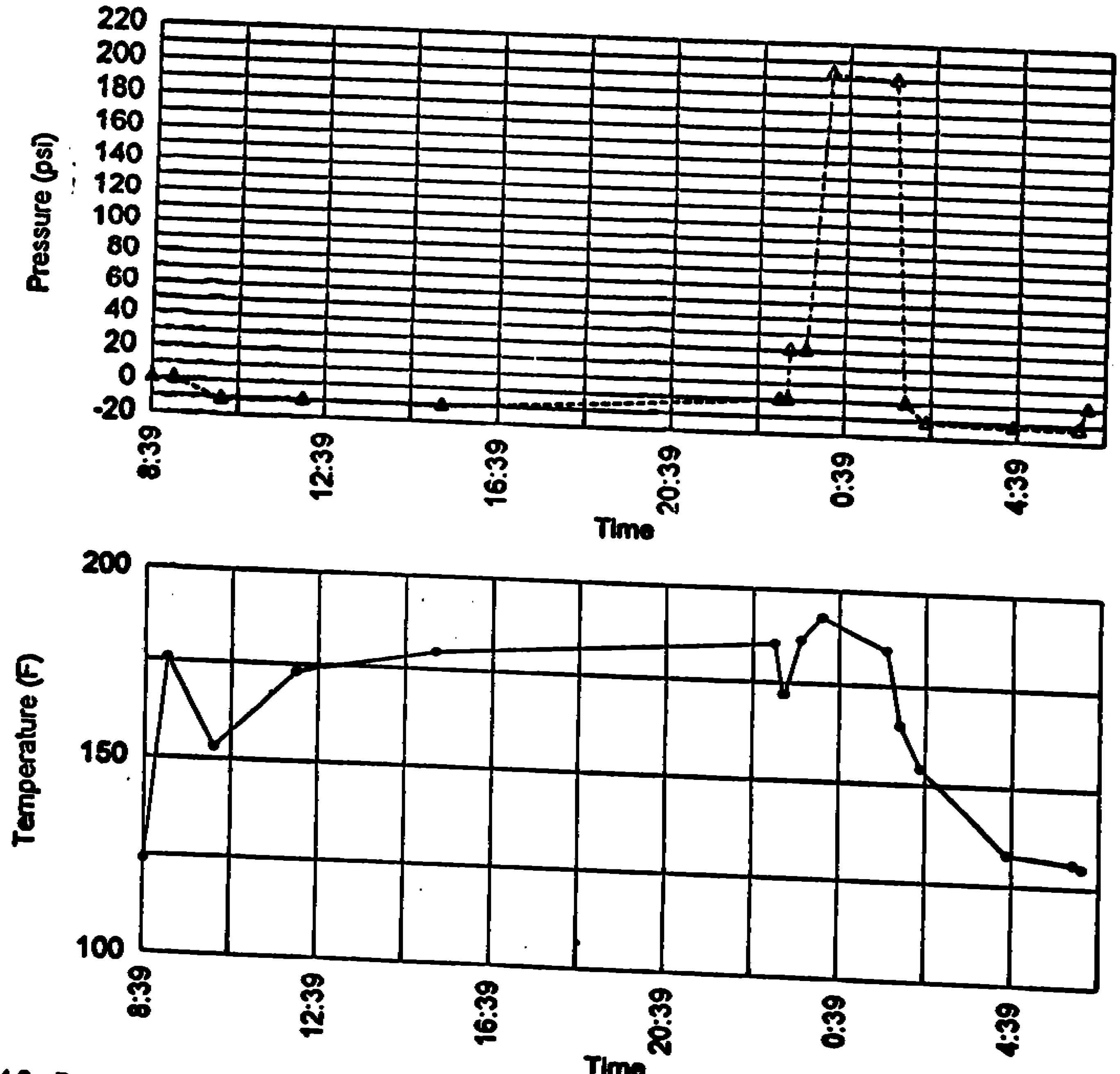


Figure 4-2. Process profile during Test #1 at Kerr-McGee Chemical Corporation in Avoca, Pennsylvania (09/08/93-09/09/93)

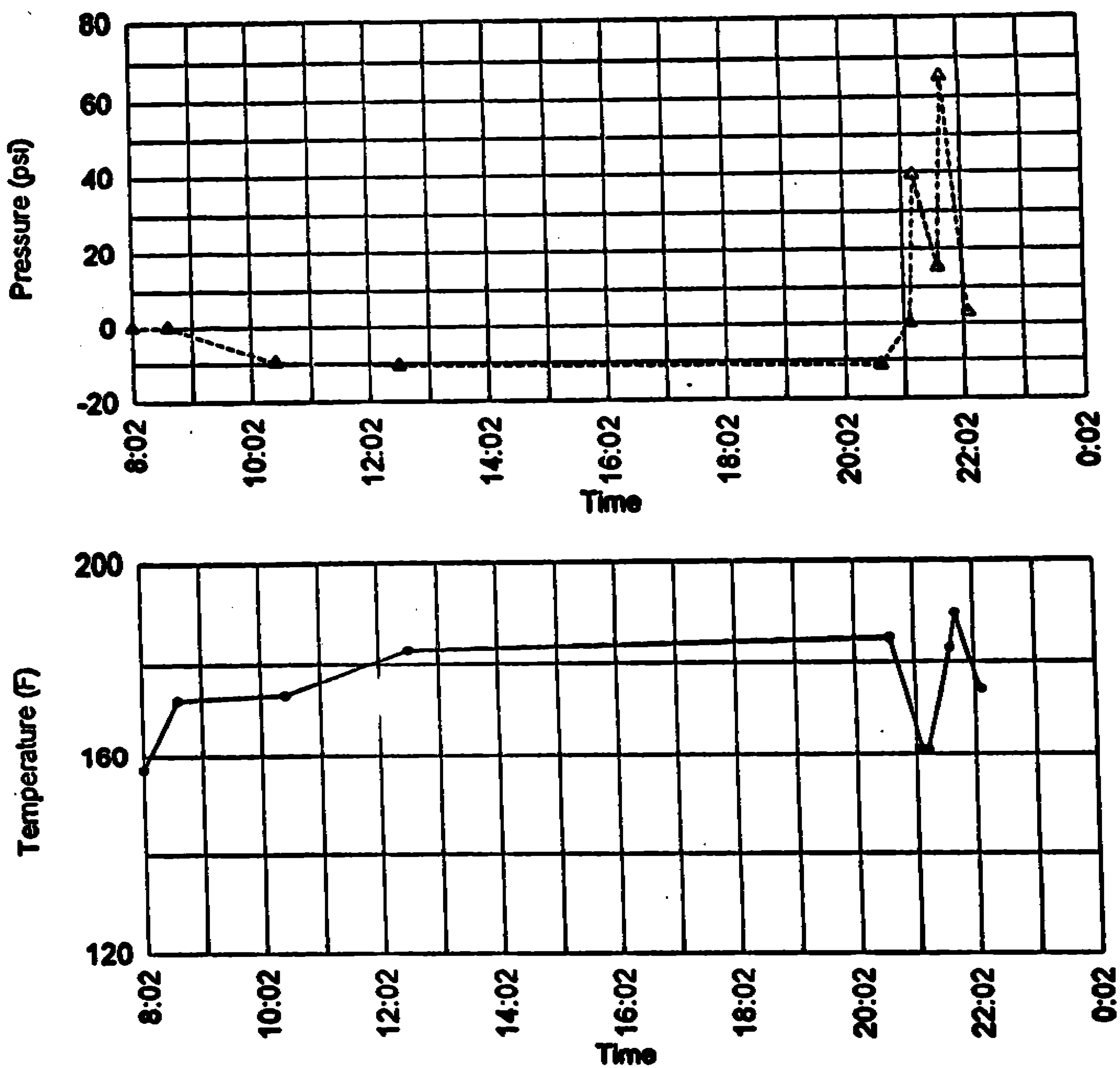


Figure 4-3. Process profile during Test #2 at Kerr-McGee Chemical Corporation in Avoca, Pennsylvania (09/10/93)

5. Internal QA/QC Activities

5.1. QA/QC Problems

One THC analyzer was damaged during shipment, leaving only one operational THC analyzer available for run 1. An additional THC analyzer was shipped and was on site 48 hours later (approximately 4 hours into run 2). At the direction of the Technical Coordinator, the inlet THC concentrations were monitored for 7 3/4 hours into run 1, at which time the analyzer was switched to monitor the outlet THC concentrations for the remaining 15 hours of run 1.

5.2. QA Audits

Calibrations of the THC analyzers were done at approximately two-hour intervals using certified gases of known concentrations of THC (propane). The certifications are contained in Appendix B.

Calibration of the Method 4 control box was done both prior to and following the test program. Table 5-1 presents the pre-test and post-test calibration data. Pre-test and post-test calibration worksheets are contained in Appendix C.

A sample blank was prepared and shipped to the lab for analysis in an identical manner as the preservative sample. De-ionized, distilled water was used as the blank solution.

Table 5-1. Method 4 Calibrations Data.

Control Box ID	Gas Meter Coefficient (Yd)		Deviation
	Pre-Test	Post-Test	
OMST20	0.967	0.967	0%

Appendix A

Preservative Analysis Laboratory Results

AIR TOXICS LTD.

SAMPLE NAME: AV-C-1

ID#: 9309158-01A

Semi-Volatiles By EPA METHOD TO-13 GC/MS Full Scan

File Name:	9092408	Date of Collection: 9/16/93
Dil. Factor:	1100	Date of Extraction: NA
		Date of Analysis: 9/24/93

Compound	Det. Limit (uG)	Amount (uG)
Phenol	550	Not Detected
bis(2-Chloroethyl) Ether	550	Not Detected
2-Chlorophenol	550	Not Detected
1,3-Dichlorobenzene	550	Not Detected
1,4-Dichlorobenzene	550	Not Detected
1,2-Dichlorobenzene	550	Not Detected
bis(2-Chloroisopropyl) Ether	550	Not Detected
N-Nitroso-di-n-Propylamine	550	Not Detected
Hexachloroethane	550	Not Detected
Nitrobenzene	550	Not Detected
Isophorone	550	Not Detected
2-Nitrophenol	550	Not Detected
2,4-Dimethylphenol	550	Not Detected
Benzoic Acid	550	Not Detected
bis(2-Chloroethoxy) Methane	550	Not Detected
2,4-Dichlorophenol	550	Not Detected
1,2,4-Trichlorobenzene	550	Not Detected
Naphthalene	550	61000
4-Chloroaniline	550	Not Detected
Hexachlorobutadiene	550	Not Detected
4-Chloro-3-Methylphenol	550	Not Detected
2-Methylnaphthalene	550	41000
Hexachlorocyclopentadiene	550	Not Detected
2,4,6-Trichlorophenol	550	Not Detected
2,4,5-Trichlorophenol	550	Not Detected
2-Chloronaphthalene	550	Not Detected
2-Nitroaniline	550	Not Detected
Dimethylphthalate	550	Not Detected
Acenaphthylene	550	59000
2,6-Dinitrotoluene	550	Not Detected
3-Nitroaniline	550	Not Detected
Acenaphthene	550	Not Detected
2,4-Dinitrophenol	550	Not Detected
4-Nitrophenol	550	Not Detected
2,4-Dinitrotoluene	550	Not Detected
Dibenzofuran	550	36000
Diethylphthalate	550	Not Detected
Fluorene	550	35000
4-Chlorophenyl-Phenyl Ether	550	Not Detected
4-Nitroaniline	550	Not Detected
4,6-Dinitro-2-Methylphenol	550	Not Detected
N-Nitrosodiphenylamine	550	Not Detected

(cont.)

AIR TOXICS LTD.

SAMPLE NAME: AV-C-1

ID#: 9309158-01A

Semi-Volatiles By EPA METHOD TO-13 GC/MS Full Scan

File Name: 9092408		Date of Collection: 9/16/93
Dil. Factor: 1100		Date of Extraction: NA
		Date of Analysis: 9/24/93

Compound	Det. Limit (uG)	Amount (uG)
4-Bromophenyl-Phenyl Ether	550	Not Detected
Hexachlorobenzene	550	Not Detected
Pentachlorophenol	550	Not Detected
Phenanthrene	550	82000
Anthracene	550	11000
di-n-Butylphthalate	550	Not Detected
Fluoranthene	550	62000
Pyrene	550	46000
Butylbenzylphthalate	550	Not Detected
3,3'-Dichlorobenzidine	550	Not Detected
Chrysene	550	14000
Benzo(a)anthracene	550	11000
bis(2-Ethylhexyl)phthalate	550	Not Detected
Di-n-Octylphthalate	550	Not Detected
Benzo(b)fluoranthene	550	6000
Benzo(k)fluoranthene	550	3700
Benzo(a)pyrene	550	Not Detected
Indeno(1,2,3-cd)pyrene	550	4400
Dibenz(a,h)anthracene	550	Not Detected
Benzo(g,h,i)perylene	550	Not Detected
Biphenyl	550	10000
Quinoline	550	10000
Xylenes	550	Not Detected
Cresols	550	Not Detected

*Surrogates added after dilution.

Surrogates	% Recovery	Method Limits
2-Fluorophenol	118	25-121
Phenol-d5	81	24-113
Nitrobenzene-d5	117	23-120
2-Fluorobiphenyl	107	30-115
2,4,6-Tribromophenol	100	19-122
Terphenyl-d14	108	18-137

AIR TOXICS LTD.

SAMPLE NAME: AV-C-2*

ID#: 9309158-01B

Semi-Volatiles By EPA METHOD TO-13 GC/MS Full Scan

File Name: NA		Date of Collection: 9/16/93
Dil. Factor: 1.0		Date of Extraction: NA
		Date of Analysis: NA

Compound	Det. Limit (uG)	Amount (uG)
Phenol	0.50	Not Analyzed
bis(2-Chloroethyl) Ether	0.50	Not Analyzed
2-Chlorophenol	0.50	Not Analyzed
1,3-Dichlorobenzene	0.50	Not Analyzed
1,4-Dichlorobenzene	0.50	Not Analyzed
1,2-Dichlorobenzene	0.50	Not Analyzed
bis(2-Chloroisopropyl) Ether	0.50	Not Analyzed
N-Nitroso-di-n-Propylamine	0.50	Not Analyzed
Hexachloroethane	0.50	Not Analyzed
Nitrobenzene	0.50	Not Analyzed
Isophorone	0.50	Not Analyzed
2-Nitrophenol	0.50	Not Analyzed
2,4-Dimethylphenol	0.50	Not Analyzed
Benzoic Acid	0.50	Not Analyzed
bis(2-Chloroethoxy) Methane	0.50	Not Analyzed
2,4-Dichlorophenol	0.50	Not Analyzed
1,2,4-Trichlorobenzene	0.50	Not Analyzed
Naphthalene	0.50	Not Analyzed
4-Chloroaniline	0.50	Not Analyzed
Hexachlorobutadiene	0.50	Not Analyzed
4-Chloro-3-Methylphenol	0.50	Not Analyzed
2-Methylnaphthalene	0.50	Not Analyzed
Hexachlorocyclopentadiene	0.50	Not Analyzed
2,4,6-Trichlorophenol	0.50	Not Analyzed
2,4,5-Trichlorophenol	0.50	Not Analyzed
2-Chloronaphthalene	0.50	Not Analyzed
2-Nitroaniline	0.50	Not Analyzed
Dimethylphthalate	0.50	Not Analyzed
Acenaphthylene	0.50	Not Analyzed
2,6-Dinitrotoluene	0.50	Not Analyzed
3-Nitroaniline	0.50	Not Analyzed
Acenaphthene	0.50	Not Analyzed
2,4-Dinitrophenol	0.50	Not Analyzed
4-Nitrophenol	0.50	Not Analyzed
2,4-Dinitrotoluene	0.50	Not Analyzed
Dibenzofuran	0.50	Not Analyzed
Diethylphthalate	0.50	Not Analyzed
Fluorene	0.50	Not Analyzed
4-Chlorophenyl-Phenyl Ether	0.50	Not Analyzed
4-Nitroaniline	0.50	Not Analyzed
4,6-Dinitro-2-Methylphenol	0.50	Not Analyzed
N-Nitrosodiphenylamine	0.50	Not Analyzed

(cont.)

AIR TOXICS LTD.

SAMPLE NAME: AV-C-2*

ID#: 9309158-01B

Semi-Volatiles By EPA METHOD TO-13 GC/MS Full Scan

File Name:	NA	Date of Collection:	9/16/93
Dil. Factor:	1.0	Date of Extraction:	NA
		Date of Analysis:	NA

Compound	Det. Limit (uG)	Amount (uG)
4-Bromophenyl-Phenyl Ether	0.50	Not Analyzed
Hexachlorobenzene	0.50	Not Analyzed
Pentachlorophenol	0.50	Not Analyzed
Phenanthrene	0.50	Not Analyzed
Anthracene	0.50	Not Analyzed
di-n-Butylphthalate	0.50	Not Analyzed
Fluoranthene	0.50	Not Analyzed
Pyrene	0.50	Not Analyzed
Butylbenzylphthalate	0.50	Not Analyzed
3,3'-Dichlorobenzidine	0.50	Not Analyzed
Chrysene	0.50	Not Analyzed
Benzo(a)anthracene	0.50	Not Analyzed
bis(2-Ethylhexyl)phthalate	0.50	Not Analyzed
Di-n-Octylphthalate	0.50	Not Analyzed
Benzo(b)fluoranthene	0.50	Not Analyzed
Benzo(k)fluoranthene	0.50	Not Analyzed
Benzo(a)pyrene	0.50	Not Analyzed
Indeno(1,2,3-cd)pyrene	0.50	Not Analyzed
Dibenz(a,h)anthracene	0.50	Not Analyzed
Benzo(g,h,i)perylene	0.50	Not Analyzed
Biphenyl	0.50	Not Analyzed
Quinoline	0.50	Not Analyzed
Xylenes	0.50	Not Analyzed
Cresols	0.50	Not Analyzed

*Not analyzed per client's request.

Surrogates	% Recovery	Method Limits
2-Fluorophenol	NA	25-121
Phenol-d5	NA	24-113
Nitrobenzene-d5	NA	23-120
2-Fluorobiphenyl	NA	30-115
2,4,6-Tribromophenol	NA	19-122
Terphenyl-d14	NA	18-137

AIR TOXICS LTD.

SAMPLE NAME: H2O BLANK

ID#: 9309158-03A

Semi-Volatiles By EPA METHOD TO-13 GC/MS Full Scan

File Name: 9092507 Date of Collection: 9/16/93
Dil. Factor: 1.0 Date of Extraction: 9/24/93
Date of Analysis: 9/25/93

Compound	Det. Limit (uG)	Amount (uG)
Phenol	0.50	Not Detected
bis(2-Chloroethyl) Ether	0.50	Not Detected
2-Chlorophenol	0.50	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected
bis(2-Chloroisopropyl) Ether	0.50	Not Detected
N-Nitroso-di-n-Propylamine	0.50	Not Detected
Hexachloroethane	0.50	Not Detected
Nitrobenzene	0.50	Not Detected
Isophorone	0.50	Not Detected
2-Nitrophenol	0.50	Not Detected
2,4-Dimethylphenol	0.50	Not Detected
Benzoic Acid	0.50	Not Detected
bis(2-Chloroethoxy) Methane	0.50	Not Detected
2,4-Dichlorophenol	0.50	Not Detected
1,2,4-Trichlorobenzene	0.50	Not Detected
Naphthalene	0.50	Not Detected
4-Chloroaniline	0.50	Not Detected
Hexachlorobutadiene	0.50	Not Detected
4-Chloro-3-Methylphenol	0.50	Not Detected
2-Methylnaphthalene	0.50	Not Detected
Hexachlorocyclopentadiene	0.50	Not Detected
2,4,6-Trichlorophenol	0.50	Not Detected
2,4,5-Trichlorophenol	0.50	Not Detected
2-Chloronaphthalene	0.50	Not Detected
2-Nitroaniline	0.50	Not Detected
Dimethylphthalate	0.50	Not Detected
Acenaphthylene	0.50	Not Detected
2,6-Dinitrotoluene	0.50	Not Detected
3-Nitroaniline	0.50	Not Detected
Acenaphthene	0.50	Not Detected
2,4-Dinitrophenol	0.50	Not Detected
4-Nitrophenol	0.50	Not Detected
2,4-Dinitrotoluene	0.50	Not Detected
Dibenzofuran	0.50	Not Detected
Diethylphthalate	0.50	Not Detected
Fluorene	0.50	Not Detected
4-Chlorophenyl-Phenyl Ether	0.50	Not Detected
4-Nitroaniline	0.50	Not Detected
4,6-Dinitro-2-Methylphenol	0.50	Not Detected
N-Nitrosodiphenylamine	0.50	Not Detected

(cont.)

AIR TOXICS LTD.

SAMPLE NAME: H2O BLANK

ID#: 9309158-03A

Semi-Volatiles By EPA METHOD TO-13 GC/MS Full Scan

File Name:	9092507	Date of Collection:	9/16/93
Dil. Factor:	1.0	Date of Extraction:	9/24/93
		Date of Analysis:	9/25/93

Compound	Det. Limit (uG)	Amount (uG)
4-Bromophenyl-Phenyl Ether	0.50	Not Detected
Hexachlorobenzene	0.50	Not Detected
Pentachlorophenol	0.50	Not Detected
Phenanthrene	0.50	Not Detected
Anthracene	0.50	Not Detected
di-n-Butylphthalate	0.50	Not Detected
Fluoranthene	0.50	Not Detected
Pyrene	0.50	Not Detected
Butylbenzylphthalate	0.50	Not Detected
3,3'-Dichlorobenzidine	0.50	Not Detected
Chrysene	0.50	Not Detected
Benzo(a)anthracene	0.50	Not Detected
bis(2-Ethylhexyl)phthalate	0.50	Not Detected
Di-n-Octylphthalate	0.50	Not Detected
Benzo(b)fluoranthene	0.50	Not Detected
Benzo(k)fluoranthene	0.50	Not Detected
Benzo(a)pyrene	0.50	Not Detected
Indeno(1,2,3-cd)pyrene	0.50	Not Detected
Dibenz(a,h)anthracene	0.50	Not Detected
Benzo(g,h,i)perylene	0.50	Not Detected
Biphenyl	0.50	Not Detected
Quinoline	0.50	Not Detected
Xylenes	0.50	Not Detected
Cresols	0.50	Not Detected

Surrogates	% Recovery	Method Limits
2-Fluorophenol	74	25-121
Phenol-d5	51	24-113
Nitrobenzene-d5	83	23-120
2-Fluorobiphenyl	58	30-115
2,4,6-Tribromophenol	56	19-122
Terphenyl-d14	94	18-137

6

AIR TOXICS LTD.
AN ENVIRONMENTAL ANALYTICAL LABORATORY

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630
(916) 985-1000 • FAX (916) 985-1020

CHAIN OF CUSTODY RECORD

PROJECT # 01-1179-03-4790 PO # ______ COLLECTED BY (Signature) [signature]
REMARKS ______

	FIELD SAMPLE I.D.#	SAMPLING MEDIA (Tenax, Canister etc.)	DATE/TIME	ANALYSIS	VAC./PRESSURE	LAB I.D. #
01A	AV-C-1	250 ml bottle	9-16-93	sample } GC/MS		
01B	AV-C-2	↓	↓	duplicate sample }		
02A	DB-C-4a	↓	↓	sample } GC/MS		
02B	DB-C-4b	↓	↓	duplicate sample }		
03A	H2O Blank	300 ml bottle	↓	GC/MS		

RELINQUISHED BY: DATE/TIME	RECEIVED BY: DATE/TIME	RELINQUISHED BY: DATE/TIME	RECEIVED BY: DATE/TIME
	L. Robinson ATL 9/20/93 1000		

LAB USE ONLY

SHIPPER NAME	AIR BILL #	OPENED BY: DATE/TIME	TEMP (°C)	CONDITION

REMARKS ______

Appendix B

Calibration Gas Certifications

(included in Final Report)

Scott Specialty Gases, Inc.

Shipped From: 1290 COMBERMERE STREET
TROY MI 48083
Phone: 313-589-2950 Fax: 313-589-2134

C E R T I F I C A T E O F A N A L Y S I S

C A E INSTRUMENT RENTAL
246 WOODWORK LANE
PALATINE IL 60067

PROJECT #: 05-52393-002
PO#: 8673-71500
ITEM #: 05023451 2AL
DATE: 6/18/93

CYLINDER #: AAL9218 ANALYTICAL ACCURACY: +-1%

BLEND TYPE : ACUBLEND MASTER GAS

COMPONENT	REQUESTED GAS CONC MOLES		ANALYSIS (MOLES)	
PROPANE	850.	PPM	851.6	PPM
NITROGEN		BAL		BAL

ACUBLEND MASTER GAS
ALM030711 ALM008587

ANALYTICAL METHOD: AMG

ANALYST: [signature] APPROVED BY: S. C. Shapiro

ANALYST SUPERVISOR

1992

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET TROY, MI 48083 PHONE: (313) 589-2950 FAX NO: (313) 589-2134

C A E INSTRUEMNT RENTAL
246 WOODWORK LANE
PALATINE, IL. 60067

Date: 02/27/92

Our Project No.: 0534012

Your P.O. No.: 4559-71500

Gentlemen:

Thank you for choosing Scott for your Specialty gas needs. The analyses for the gases ordered, as reported by our laboratory, are listed below. Results are in volume percent, unless otherwise indicated.

ANALYTICAL REPORT

Cyl. No. ______ Analytical Accuracy ±1%ACMG

Component	Concentration
PROPANE	54.50PPM
NITROGEN	BALANCE
ACUBLEND MASTER GAS	
ALM-004703,ALM-004944,AAL-9952	

Cyl. No. ______ Analytical Accuracy ±1%ACMG

Component	Concentration
PROPANE	2495PPM
NITROGEN	BALANCE
ACUBLEND MASTER GAS	
ALM-008679,ALM-010619,ALM-010140	

Cyl. No. ______ Analytical Accuracy ±1%ACMG

Component	Concentration
PROPANE	5496PPM
NITROGEN	BALANCE
ACUBLEND MASTER GAS	
ALM-010293,ALM-010029,ALM-011352	

Cyl. No. ______ Analytical Accuracy ±1%ACMG

Component	Concentration
PROPANE	8423PPM
NITROGEN	BALANCE
ACUBLEND MASTER GAS	
ALM-003391,ALM-004786,ALM-004952	

Analyst David B Bao

Approved J Shapiro

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

Scott Specialty Gases, Inc.

Shipped From: 1290 COMBERMERE STREET
TROY MI 48083
Phone: 313-589-2950 Fax: 313-589-2134

CERTIFICATE OF ANALYSIS

C A E INSTRUMENT RENTAL

246 WOODWORK LANE

PALATINE IL 60067

PROJECT #: 05-50366-003
PO#: 8266-71500
ITEM #: 05023451 2K
DATE: 4/27/93

CYLINDER #: K000379 ANALYTICAL ACCURACY: +-1%

BLEND TYPE : ACUBLEND MASTER GAS

COMPONENT	REQUESTED GAS CONC MOLES		ANALYSIS (MOLES)	
PROPANE	500.	PPM	504.9	PPM
NITROGEN		BAL		BAL

ACUBLEND MASTER GAS
K011786 K000735

ANALYTICAL METHOD: AMG

ANALYST: [signature] APPROVED BY: S. C. Shapiro
SUPERVISOR

ANALYTICAL REPORT – cont'd

C A E INSTRUMENT RENTAL

Date: 11/22/91

Our Project No.: 0530468

Your P.O. No.: 3750-71500

COPIES

Cyl. No.		Analytical Accuracy ±1%AMG
Component		**Concentration**
PROPANE		851.3PPM
NITROGEN		BALANCE
ACUBLEND MASTER GAS		
ALM-008898,ALM-004772,ALM-015402		

Cyl. No. K-006450		Analytical Accuracy ±1%AMG
Component		**Concentration**
PROPANE		2479PPM
NITROGEN		BALANCE
ACUBLEND MASTER GAS		

Cyl. No. K-001820		Analytical Accuracy ±1%AMG
Component		**Concentration**
PROPANE		8490PPM
NITROGEN		BALANCE
ACUBLEND MASTER GAS		

Cyl. No.		Analytical Accuracy ±1%AMG
Component		**Concentration**
SULFUR DIOXIDE		25.40PPM
NITROGEN		BALANCE
ACUBLEND MASTER GAS		
AAL-8382,AAL-3001,AAL-989		

Cyl. No.		Analytical Accuracy ±1%AMG
Component		**Concentration**
SULFUR DIOXIDE		224.7PPM
NITROGEN		BALANCE
ACUBLEND MASTER GAS		
AAL-13200,AAL-5250,AAL-2882		

Cyl. No.		Analytical Accuracy ±1%AMG
Component		**Concentration**
CARBON MONOXIDE		10.08PPM
NITROGEN		BALANCE
ACUBLEND MASTER GAS		
ALM-013733,ALM-010002,ALM-016772		

Analyst [signature]

Approved By [signature]

SCOTT ENVIRONMENTAL TECHNOLOGY, INC.

Scott Specialty Gases

CERTIFICATE OF ANALYSIS

SCIENCE APPLICATIONS

PO No. 5953735

CAS Reg. Component No.	Component	Certified Analysis
74-98-6	PROPANE	5.00 PCT/M
7727-37-9	NITROGEN	BAL

Analysis Date 06/31/93

Project No 01-58270

Analytical Accuracy +-2%

Analyst WALTER SABITUS

Cylinder No. A1003

Item No 01023453 4A

Grade CERTIFIED MASTER GAS

Reorder/Service Contact (215)766-8861 PLUMSTEADVILLE PA 18949

Scott Specialty Gases

CERTIFICATE OF ANALYSIS

SCIENCE APPLICATIONS

PO No. 5953735

CAS Reg. Component No.	Component	Certified Analysis
74-98-6	PROPANE	9.00 PCT/M
7727-37-9	NITROGEN	BAL

Analysis Date 08/31/93

Project No 01-58270

Analytical Accuracy +-2%

Analyst WALTER SABITUS

Cylinder No. XR6548

Item No. 01023453 4A

Grade CERTIFIED MASTER GAS

Reorder/Service Contact (215)766-8861 PLUMSTEADVILLE PA 18949

Appendix C

Method 4 Calibration Data

Calibration Data Sheet
Dry Gas Meter Against a Calibration ~~Wet~~ dry Test Gas Meter

Dry Gas Meter Id.: OMST 20 Calibration Meter Id.: OMSE 19 Date: Sept 28 - 93
Barometric Pressure: 30.01 " Hg Cal. meter coefficient (Y_{ds}) 1.001
Orifice leak-check: Yes______ No______ Calibrated by: JT

		Run #1	Run #2	Run #3	Run #4
Cal. Meter Vol., Initial	ft^3	178.398	187.238	196.098	
Cal. Meter Vol. Final	ft^3	187.238	196.098	204.775	
Cal. Meter Vol. Diff. (V_{ds})	ft^3	8.840	8.860	8.677	
Dry Gas Meter Vol. Initial	ft^3	714.169	723.343	732.600	
Dry Gas Meter Vol. Final	ft^3	723.343	732.600	741.734	
Dry Gas Meter Vol. Diff. (V_d)	ft^3	9.174	9.257	9.134	
Cal. Meter Temp. (T_{ds})	°F	69	69	69	
Dry Gas Meter Temp. (T_d)	°F	72 1.006	78 1.017	81 1.023	
Time (t)	min	10	10	10	
~~ΔH Wet~~	~~in. Hg~~	/	/	/	/
ΔH Dry	~~in. Hg~~	2.5" H_2O	2.5" H_2O	2.5" H_2O	
Dry Gas Meter Coeff. (Y_d)	N/A	.965	.969	.966	
Flow rate	SCFM	~~1.130~~ .885	.887	.869	
Y_{ds} from Graph	N/A	/	/	/	/
		Average Dry Gas Meter Coefficient			.967

Comments: Post Test Cal - EPA-EMB WA-4 01-1139-03-4790-006
Y = .967 % Deviation = 0.0%

Where: Delta H@ = Orifice pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_2O. Acceptable maximum dry gas meter calibration tolerance ±0.15.

$$Y_d = Y_{ds} \times \frac{V_{ds}}{V_d} \times \frac{T_d + 460}{T_{ds} + 460} \times \frac{P_b + \frac{\Delta H}{13.6} \text{ wet}}{P_b + \frac{\Delta H}{13.6} \text{ dry}}$$

1.001 · · · .994

$$Q = 17.65 \times \frac{P_b}{T_{ds} + 460} \times \frac{V_{ds}}{t}$$

(30.01, 10)

$$\Delta H@ = \frac{0.0317 \Delta H}{P_b (T_d + 460)} \times \frac{(T_{ds} + 460)\theta}{V_{ds}}$$

Calibration Data Sheet
Meter Box Gas Meter Against a Calibration Dry Gas Meter

Box Meter Id.: OMST20 Calibration Meter Id.: OMSE19 Date: 6·4·93

Barometric Pressure: 29.63 (Y_{ds}) Cal. meter coefficient 1.001

Orifice leak-check: Good Calibrated by: JT

	Run #1	Run #2	Run #3	Run #4	*Run #5	+RUN
Cal. Meter Vol. Beg.	979.737	989.926	996.858	1007.440	1017.779	1027.1
Cal. Meter Vol. End	987.767	995.588	1004.784	1017.105	1025.758	1034.9
Cal. Meter Vol. Dif.(V_{ds})	8.030	5.662	7.926	9.665	7.979	7.8
Box Meter Vol. Beg.	485.887	496.740	504.108	515.280	526.171	536.1
Box Meter Vol. End	494.443	502.765	512.490	525.447	534.708	544.4
Box Meter Vol. Dif. (V_d)	8.556	6.025	8.382	10.167	8.537	8.30
Cal. Meter Temp. (F) (T_{ds})	67	67	67	67	67	68
Box Meter Temp. (F) (T_d)	79	81	82	84	81	82
Time (mins.) (t)	20:00	10.00	10:00	10:00	20:00	10:
ΔH	.5	1.0	2.0	3.0	.5	2.0
ΔH@	1.706	1.710	1.742	1.751	1.722	1.78
Box Meter Coeff. (Y_d)	.956	.964	.969	.975	.971	.960
CFM	.398	.562	.787	.959	.396	.77

Comments: 6 MONTH CALIBRATION · OMST20

AVERAGE Y = .967 AVERAGE ΔH@ = 1.736 *2nd RUN @ .5" TO VERIFY 1st

Where: Delta H@ = Orifice pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_2O. Tolerance ±0.15.

+2nd RUN @ 2.0" TO VERIFY AND ALL OTHER RESULT

$$Y_d = Y_{ds} \times \frac{V_{ds}}{V_d} \times \frac{T_d + 460}{T_{ds} + 460} \times \frac{P_b}{P_b + \frac{\Delta H}{13.6}}$$

$$Q = 17.65 \times \frac{P_b}{T_{ds} + 460} \times \frac{V_{ds}}{t}$$

$$\Delta H@ = \frac{0.0317 \Delta H}{P_b (T_d + 460)} \times \frac{(T_{ds} + 460)\theta}{V_{ds}}$$

Temperature Calibration Data Sheet
Method 5 Sample Train

Temperature Monitor Type: Digital Readout
Identification Number: OMST20

Reference Temperature Monitor Type: Mercury-in-glass thermometer
Identification Number: OMSTTNBS
Readout Device: Mercury in glass.

Umbilical Cord ID# 13
Calibration Performed by JF
Date 6-4-93

Control Box ID# OMST20
Ambient Temperature 66
Barometric Pressure 30.00

Reference Point Source	Mercury Temp. of Ref. Point (°F)	Temperature Monitor (°F)						
		Hot Box	Gas Meter		Umbilical (Imp. Exit)	Sample Probe		
			In	Out		Stack	Probe	ID#
Ice Bath	32°	A	30	30	1 31	1 30	1 30	50
					2	2	2	
					3	3	3	
						4	4	
Boiling Water	212°	A	210	210	1 213	1 212	1 210	50
					2	2	2	
					3	3	3	
						4	4	
500 °F NBS traceable thermometer in tube furnace	549°	A	–	–	1 –	1 538°	1 –	50
					2	2	2	
					3	3	3	
						4	4	

Appendix D

Operator Log Sheets and Process Data Sheets

KERR-McGEE CHEMICAL CORPORATION
FOREST PRODUCTS DIVISION

TREATMENT NO 134105

TREATING REPORT

Plant: Avoca Pa.

Charge no: 349 — Date: 9 / 8 / 93

Preservative: 7 LBS.

P2

BOULTON

ACCOUNT	KM ORDER NO
CONRAIL	BL90184

TREATMENT

				Military Time
DOOR CLOSED				0839
BOULTON	FILLING	Started		0909
		Finished	:30 TOT Time	
		Cyl Temp after fill	176 °F	
	VAC	Started		0909
		24 inches attained at		1109
		Finished	14:00 TOT Time	2309
	TEMP	185 Avg on Vac		
	PUMP BACK	Started		2309
		Finished	:11 TOT Time	2320
BUFFING	AIR	Introduced		2320
		30 lbs attained at		2322
		Held until	:15 TOT Time	2335
	FILLING	Started		2335
		Finished	:08 TOT Time	2343
		Cyl Temp after fill	187 °F	
PRE HEAT		Started		
		°F temp attained at		
		Finished	TOT Time	
TREATMENT	PRESS	Started	185 °F	2343
		200 lbs attained at		2408
		Cyl Temp	185 °F	
		Held until	2:00 TOT Time	0143
	PUMP BACK	Started		0143
		Finished	:22 TOT Time	0205
FINAL VACUUM	VAC	Started	165 °F	0205
		22 inches attained at		0230
		Finished	4:00 TOT Time	0605
		Finished	130 °F	
	PUMP BACK	Started		0605
		Finished	:10 TOT Time	0615
Total time this charge				21 / 21
KICK BACK	PAD	Started	67 Amb °F	0700
		Finished	70 Amb °F	1100
			4:00 TOT Time	

Cylinder: 1
Tank: 1

WORK TANK READINGS

	Gal	°F	Gal 100°F	
Before initial fill	35220	187		
After Boulton P B				Absorbed
After heat fill				
After final P B	32980	185		Absorbed

MISC. OPERATIONS

	°F			°F	
Pre Steam start			Bump Vac.		
finish			Quench		
Post Steam start			Fill start		
finish			Fill finish		
Bump Press 1			Held until		
Bump Press 2			TOT Time		

CONCLUSIONS

		PRESERVATIVE TOTAL		
Water Removed	1802 Gal / 5.19 Gal/cu ft	Absorbed	2240	Gal 100
Bored	Y ✓ N	Weight	9.1	Per Gal
		Absorbed	20384	lbs
		Absorbed Per cu ft	7.06	lbs

☑ GREEN ☐ DRY — Initial % Moisture 250 — Handled from Y — Handled to T

SUMMARY OF MATERIALS

GALLON

Product	Species	Class Top Butt	Thick	Width	Length	Factor	Pieces	Ilo	Ter	Untreated PC	Untreated Number	Treated PC	Treated Number	Quantity	Units	Cubic Feet
X Ties	OAK		6"		8'6	2.83	1020		66843				2240			288[illegible]
							1020						2240			[illegible]

Operator Initials: Start — Mid — End

Treating Supervisor: Killian

Plant Manager:

KERR Mc GEE	DATE: 9-8-93
LOCATION: AVOCA, PA.	CHARGE NO.: 349
	CYLINDER NO.: 1

SUMMARY OF TREATING OPERATIONS

No. of Pieces	Material & Species	Size	Seasoning	Bd. Ft.	Cu. Ft.
1020	X-TIES OAK	6" x 8'6"	GREEN		2887
TOTALS 1020					2887

Retention Req.: 7 LBS.	Retention Actual: 7.03	Water Removal: 5.19 Lbs/Cu. Ft.
Total Time: 21 h. 21 min	Treating Time: 2 hr.	Boulton Time: 14 hrs.

Pretreatment Conditioning

Boulton Cycle

Tank Reading Before Filling:	35220	Temp:	187	Time:	0839 AM
Tank Reading After Filling:	18910	Temp:	176	Time:	0909 AM
Amount Creosote For Boulton, Actual:	16310			Required:	
Tank Reading After Pump back:	33450	Temp:	186	Time:	2322 PM
Creosote Used In Boulton:	1170	Retention:	3.69		
Water Removed Last Hour, Gals.:	53	Lbs/Cu. Ft.:	.152		
Total Water Removed, Gals.:	1802	Lbs.:	15011	Lbs/Cu. Ft.	5.19

Boulton Cycle Readings	Maximum	Average	Minimum
Temperature, °F	187	185	154
Vacuum, In. Hg.	24.4	21.0	19.9

Treating Cycle

Tank Reading Before Filling:	33450	Temp:	172	Time:	2320 PM
Initial Air, P.S.I.:	30	Start Time:	2320 PM	Finish Time:	2322 PM
Final Vacuum, In. Hg.:	23	Start Time:	0205 AM	Finish Time:	0605 AM
Final Tank Reading:	32500	Temp:	165	Time:	0205 AM
Creosote Used In Treating:	1070	Retention:	3.37		
Total Creosote Used:	2240	Retention:	7.03		

Attach Treatment Log, Charts, Check Lists & Borings

Treating Cycle Readings	Maximum	Average	Minimum
Temperature, °F	195	190	185
Pressure, P.S.I.	200	200	30
Vacuum, In. Hg.	24.0	21.6	-

Post-Treatment Conditioning

Toluene Extraction Yes ☐ No ☑ Results:

Treating Operator Comments:

Signature M N.G Date: 9-8-93

Plant Q.C. Comments:

Signature Barry Killean Date: 9-8-93

Plant Manager Comments:

Conrail Q.C. Comments

Date:

OC 1 (NEW) 2-77

Diary of wood-preserving gauge readings

CONSOLIDATED RAIL CORPORATION

Forest products treated at the KM Altoona Pa. Plant of the

9/8/93

Charge No. 349 Cyl. No. 1				Charge No. 349 Cyl. No. 1				Charge No. Cyl. No.			
Time-M	Tank Feet (a) or Pounds (b)	Degrees Fahr (c)	Pounds (d) or Inches (e)	Time-M	Tank Feet (a) or Pounds (b)	Degrees Fahr (c)	Pounds (d) or Inches (e)	Time-M	Tank Feet (a) or Pounds (b)	Degrees Fahr (c)	Pounds (d) or Inches (e)
0839	35220	187	0	2009	18910	184°	1392/227				
0900	15785	179	0	2039	18910	184°	1468/227				
0909	18910	176	0	2109	18910	184°	1545/228				
0939	18910	158	20.9	2139	18910	185°	1620/22.8				
1009	18910	154	51 22.3	2209	18910	186°	1693/22.8				
1039	18910	154	98 23.8	2239	18910	187°	1749/22.9				
1109	18910	156	146 24.4	2309	18910	186°	1812/22.7				
1139	18910	163	194 23.6	2320	33450	172°	- -				
1209	18910	173	240 21.7	2322	33450	172	30				
1239	18910	180	289 19.9	2343	18.500	187	30				
1309	18910	178	336 21.8	0143	12400	185	200				
1339	18910	175	394 22.5	0205	32500	165	-				
1409	18910	175	459 22.6	0235	32500	154	23.0				
1439	18910	177	524 22.5	0305	32500	146	24.2				
1509	18910	180°	594/22.4	0335	32500	141	24.3				
1539	18910	183°	673/22.2	0405	32500	136	25.0				
1609	18910	183°	757/22.0	0435	32500	133	25.0				
1639	18910	186°	837/21.8	0505	32500	133	25.0				
1709	18910	185°	917/22.0	0535	32500	132	25.0				
1739	18910	185°	996/22.3	0605	32500	131	25.0				
1809	18910	184°	1079/22.3	0615	32980	130					
1839	18910	183°	1154/22.5								
1909	18910	183°	1237/22.5								
[illegible]	[illegible]	182°	1316/[illegible]								