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FIXED-BED GASIFICATION RESEARCH USING U.S. COALS, VOLUME 11 GASIFICATION OF MINNESOTA PEAT

Contract H0222001

Black, Sivalls, and Bryson, Incorporated

**BUREAU OF MINES
UNITED STATES DEPARTMENT OF THE INTERIOR**

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FOREWORD

This report was prepared by Black, Sivalis & Bryson, Incorporated, Houston, Texas under USBM Contract Number HO222001. The contract was administered under the technical direction of the Twin Cities Research Center with Mr. Robert Zahl acting as Technical Project Officer. Mr. Frank Pavlich was the contract administrator for the Bureau of Mines. This report is a partial summary of the work recently completed as a part of this contract during the period June 1984 to December 1984. This report was submitted by the authors on May 1, 1985.

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15. Abstract (Limit: 200 words) A single-staged, fixed-bed Wellman-Galusha gasifier coupled with a hot, raw gas combustion system and scrubber has been used to gasify numerous coals from throughout the United States. The gasification test program is organized as a cooperative effort by private industrial participants and governmental agencies. The consortium of participants is organized under the Mining and Industrial Fuel Gas (MIFGa) Group. This report is the eleventh volume in a series of reports describing the atmospheric pressure, fixed-bed gasification of U.S. coals. This specific report describes the gasification of peat pellets and peat sods during 3 different test periods.			
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INTRODUCTION

The United States Department of Interior, Bureau of Mines, Twin Cities Research Center, Minneapolis, Minnesota is the site of a 6.5 foot diameter Wellman-Galusha gasifier, installed in 1977-78. This gasifier, combustor/incinerator, and flue gas scrubber system in the past had been operated jointly by Bureau of Mines personnel, personnel from member companies of the Mining and Industrial Fuel Gas Group (MIFGa), and United States Department of Energy (DOE) personnel/consultants. Numerous tests using a variety of coals have to date been performed.

In May of 1982, Black, Sivalls & Bryson, Incorporated was awarded the contract to plan, execute, and report gasification test performance data from this small industrial fixed-bed gasification test facility. BS&B is responsible for program administration, test planning, test execution, and all documentation of program activities and test reports. The University of Minnesota, Particle Technology Laboratory is subcontractor to BS&B to monitor process parameters, and provide analysis for material inputs and outputs.

This report is the eleventh volume in a series of final contract reports describing the fixed-bed gasification of U.S. coals at the Bureau of Mines, Twin Cities Research Center. This report covers test periods identified as BOM/FGT 010 and BOM/FGT 013, gasification of peat pellets, and BOM/FGT 011, gasification of peat sods. The test periods covered are November 9, 1983, June 5-10, 1984 and July 16-19, 1984 for test periods BOM/FGT-010, -011, and -013 respectively.

Section 1 gives a brief summary of the tests. Section 2 identifies test objectives. Section 3 contains a description of the fuels. Sections 4 and 5 describe the facility and monitoring systems. Sections 6 and 7 describe the conduct and results of the tests. Section 8 presents conclusions. Test data is included in the Appendices.

SECTION 1

TEST SUMMARY

Peat harvested in Northern Minnesota is available in several forms, among them are low-pressure extrusions referred to as sods and high pressure extruded pellets. Both of these physical forms of peat were provided to the gasification test program.

Gasification of the two peat types was conducted in a Wellman-Galusha gas producer. The raw gas was sampled for analysis and burned in a combustion chamber. The products of combustion were water-quenched, cleaned of sulfur oxides and particles, and then exhausted. Output stream characterization included ash, gas, tar, water, and unconverted dust.

The peat pellets gasified very well. Gas quality was steady and very high throughputs were achieved. Table 1-1 gives design point data for gasification of this fuel at 1.8 tons/hour and a blast saturation temperature of 139 F (59.4 C). Maximum throughput was limited by the inability of the grate to remove excessively fused ash generated at high throughputs. The ash fusion did not seem to respond to changes in blast saturation temperature during the relatively short time prior to depletion of the modest pellet inventory. The peat pellets are recommended as a fixed-bed gasifier feedstock.

The peat sods did not gasify well due to difficulties in feeding this low-density material into the retort and excessive gas channeling with resultant low gas quality. The peat sods are not recommended as a fixed-bed gasifier fuel.

Table 1-1

Design Point Characteristics for Gasification
of Peat Pellets

Throughput - 1.8 tons/hour (108 lb/hr/sq ft grate)

Air/Peat	1.29	lb/lb
Steam/Peat	.19	lb/lb
Blast Saturation Temperature	139	deg F
Gas Offtake Temperature	251	deg F
Wet Gas/Peat	41.5	scf/lb
Gas Dewpoint	153	deg F
Tar Yield	7.9	lb/100lb peat
Tar Analysis		
HHV (dry)	15552	Btu/lb
Pourpoint	+110	deg F
Viscosity (210 F)	56.9	SUS
Specific Gravity (60/60 F)	1.0491	
Dry Gas Composition (mol%)		
Hydrogen	17.2	
Carbon Monoxide	28.4	
Methane	1.46	
Ethane	.100	
Ethylene	.087	
Propane	.024	
Propylene	.040	
Carbon Dioxide	7.97	
Nitrogen + Argon	44.3	
Water	17.1	lb/1000 dscf
Dry Gas HHV	168	Btu/dscf
Dry Gas LHV	158	Btu/dscf
Thermal Efficiencies		
Hot, Raw	92 %	
Cold, with Tar	82 %	
Cold, without Tar	66 %	

SECTION 2

TEST OBJECTIVES

2.1 Selection of Fuel for Testing

Peat fuels were selected to expand the gasification data base to very low rank fuels. Pelletized peat was specified for the initial test to establish the ability of the fuel to maintain structural integrity inside the retort. Sod peat, a less expensive peat fuel to produce, was also selected.

The Minnesota Department of Natural Resources donated the peat pellets and sods gasified during these tests.

2.2 Test Objectives

- A. Determine gasifier performance (including throughput and conversion efficiency) gasifying peat.
- B. Investigate the influence of physical form of the peat (sods or pellets) on maximum throughput and thermal efficiency.
- C. Identify the operational requirements for gasifying peat.
- D. Characterize gasifier output including gas, dust, tar, water, and ash for several operating conditions.

2.3 Test Plan

BOM/FGT-010 had no formal test plan. As this was a short screening test, load and saturation temperature were left to the facility manager's discretion. The proposed test plans for BOM/FGT-011 and BOM/FGT-013, gasification of peat sods and peat pellets respectively, are shown in Figures 2-1 and 2-2. Several load levels are shown along with various blast saturation temperatures. Step changes in blast air flow are included. Agitator rate and vertical position are left to the facility manager's judgment based on observations made during operation as are establishment of maximum throughput and optimum blast saturation temperature.

Table 2-1 shows the grate spacings used during the three test periods.

Figure 2-1

Proposed Test Plan, BOM/FGT-011

Figure 2-2

Proposed Test Plan, BOM/FGT-013

Table 2-1
Grate Spacings Used

<u>Test</u>	<u>Top-Middle</u>	<u>Middle-Bottom</u>
BOM/FGT 010	6 inches	6.5 inches
BOM/FGT 011	6 inches	6.5 inches
BOM/FGT 013	5.5 inches	6 inches

SECTION 3

DESCRIPTION OF FUELS TESTED

3.1 Peat Pellets - BOM/FGT-010

The peat pellets gasified during BOM/FGT-010 were produced in St. Louis County, Minnesota. The peat was harvested, field-dried, and transported to a pelletizing mill in Virginia, Minnesota (Figure 3-1). At the mill the peat was further dried by heating and extruded into 7/8 inch diameter pellets. The pelletizer used was a typical animal feed pelleting machine. The material is extruded radially outwards through a die. The final pellets were approximately 1 1/2 inch in length.

Approximately 47 tons of the peat pellets were delivered to the test site by truck November 8 and 9, 1983. An analysis of these pellets is given in Table 3-1. Table 3-2 shows how the peat pellets fit into the coal test objective matrix. The pellets are a high-moisture, low ash fusion temperature fuel.

3.2 Peat Sods - BOM/FGT-011

The peat sods gasified during BOM/FGT-011 were produced by extruding a relatively thin layer of peat (4 inches) through a 3 inch die under very mild pressure in the field. The extruded sods are allowed to air dry in the field and are collected at 30-50% moisture.

The sods gasified during BOM/FGT-011 were produced during the summer of 1983 near Pierz, Minnesota (Figure 3-1). They were stored in an uncovered pile over the winter at the farm where they were harvested. The unscreened sods were transported 8 miles to a screening operation the end of May 1984. The sods were double screened at 2 1/2 X 1/4 inches.

Approximately 180 tons of sized sod peat was transported to the test site in live bottom trailers on June 5, 1984. During the test, the peat was covered with plastic to keep the rain off. Approximately 10 tons of -1/4 inch peat was removed at the test site.

Table 3-1 gives the analysis of the peat sods gasified during BOM/FGT-011. Table 3-2 shows how the sod peat fits in the coal test objective matrix. The peat is a high-moisture, low ash fusion temperature fuel.

3.3 Peat Pellets - BOM/FGT-013

Two types of peat pellets were gasified during BOM/FGT-013. Approximately 88 tons of 7/8 inch diameter pellets that were

Figure 3-1

Peat Production Locations

Table 3-1

Peat Analyses

Analysis of Peat Sods and Pellets

	Sods	7/8" Pellets	1/2" Pellets
<hr/>			
Proximate Analysis (%)			
Volatile Matter	31.4	42.1	39.8
Fixed Carbon	13.8	16.1	13.6
Ash	12.3	7.3	30.6
Moisture	42.5	34.4	16.0
 Sulfur	 0.24	 0.24	 0.24
Heating Value (Btu/lb)	4403	6092	4836
Ultimate Analysis (%)			
Carbon	26.9	34.3	31.56
Hydrogen	2.44	3.48	3.32
Nitrogen	1.23	1.56	1.39
Sulfur	0.24	0.24	0.24
Oxygen	14.4	18.7	16.85
Ash	12.3	7.3	30.6
Moisture	42.5	34.4	16.0
 Ash Fusion Temperatures (deg F):			
Oxidizing			
Initial deformation	2120	2135	2550
Softening	2170	2155	2635
Hemispherical	2270	2205	2700
Fluid	2505	2220	2800
Reducing			
Initial deformation	2065	2050	2500
Softening	2120	2085	2575
Hemispherical	2150	2100	2610
Fluid	2320	2135	2690
 Free Swelling Index:	 0	 0	 0

Table 3-2

Characteristics of Peat with Regard to the
Coal Test Objective Matrix.

COAL TEST OBJECTIVE MATRIX								
PHYSICAL CHARACTERISTICS		COAL RANK						
TYPE	RANGE	BITUMINOUS	SUB-BITUMINOUS			LIGNITE	PEAT/BIO MASS	PETROLEUM COKE
			A	B	C			
ASH CONTENT	H + 20%						O13(1/2)	
	M 10 - 20%						O11	
	L - 10%						O10, O13(1/8)	
ASH FUSION	H + 2700 F							
	M 2300-2700 F						O13(1/2)	
	L ~ 2300 F						O10, O11, O13(1/8)	
FREE SWELLING INDEX	H 3 +							
	M 1 - 3							
	L 0 - 1						O10, O11, O13	
MOISTURE CONTENT	H + 15%						O10, O11, O13	
	M 5 - 15%							
	L ~ 5%							
FRIABILITY (GRINDABILITY)	H							
	M							
	L						O10, O11, O13	

produced at the same time as those used during BOM/FGT-010 were passed over a 1/4 inch screen after being stored over winter under a roof.

The screenings were combined with screenings from the sod peat (Section 3.2) and extruded to form 1/2 inch diameter pellets. The analysis of the 1/2 inch pellets is also given in Table 3-1. As can be seen from the analysis, substantial contamination of the screenings occurred as evidenced by the large ash content of the 1/2 inch pellets. This contamination was also noted by the pellet mill operators as increased die pressure and wear. Both pellet sizings were delivered to the test site.

SECTION 4

FACILITY DESCRIPTION

The USBM/TCRC gasification facility is described in detail in Volume 1 of this series (Thimsen, Maurer et al, 1984). A brief description of the equipment and monitoring systems is given here.

4.1 Test Facility

The gasification test facility includes a 6.5 foot diameter Wellman-Galusha gas producer, a combustion chamber and a wet caustic scrubber. The site also includes an iron ore pelletizing kiln which was not used during this test. The entire stream of producer gas was consumed in the combustion chamber. A process flow schematic is shown in Figure 4-1. A bottom size screen removes fine material prior to transport to the overhead storage bin by bucket elevator.

The facility is equipped with standard industrial monitoring equipment for measurement of temperatures, pressures, flows, and process conditions. These are recorded by an automatic data acquisition system for subsequent process analysis.

4.1.1 Gas Producer

The gas producer is a 6.5 ID foot Wellman-Galusha, single-staged, fixed-bed, atmospheric-pressure gasifier. The gasifier has a gravity fuel feed system, a water-cooled agitator, and an eccentric step type grate for ash removal. The retort is water jacketed and has no refractory lining. Steam generated in the water jacket is mixed with blast air. Steam/air ratio in the blast is measured by the temperature of the saturated steam/air mixture. Steam is imported if that generated in the water jacket is not adequate.

4.1.2 Gas Combustor

The gas combustor includes a baffle burner and a refractory-lined combustion chamber, and is designed to burn the full gas output of the gasifier at a rated capacity of 30 MMBTU/hour. The combustion products exhaust through an impingement tray-type wet caustic scrubber for sulfur dioxide and particulate removal. An induced draft fan is used to exhaust the scrubbed products of combustion through a flue stack.

4.2 Gas Sampling and Conditioning System

Figure 4-2 is a schematic of the gas sampling and conditioning system used during the tests reported here. The sampling port is thermally insulated to prevent condensation. The hot producer gas is quenched rapidly upon entering the surface

Figure 4-1

Coal Gasifier Process Flow Schematic,
U.S. Bureau of Mines, Twin Cities Research Center.

Figure 4-2

Schematic Diagram of the Gas Sampling and Conditioning System

condenser, which is cooled by cold water or cold, compressed air. The rapid quenching causes tar, oil, and water to condense on the inner surface of the condenser tube. The tar fog generated during cooling is removed in the electrostatic precipitator. The detarred gas is refrigerated and dessicated to remove water remaining in the gas stream. The dry, detarred gas is metered and transported to the instruments. Condensate samples are collected from traps in the condenser, electrostatic precipitator, and refrigerator.

4.3 Gas Analysis Equipment

Carbon dioxide and carbon monoxide concentrations are continuously measured with individual Beckman 864 non-dispersive infrared (NDIR) analyzers. Oxygen is monitored continuously with a Beckman 755 paramagnetic oxygen analyzer. Higher heating value of the sample gas is measured with a SIGMA continuous flow calorimeter. These signals are all recorded by the automatic data acquisition system.

Detailed gas composition is determined approximately every 20 minutes with a Hewlett-Packard model 5880A gas chromatograph. The principal features of this chromatograph are listed in Table 4-1.

Sulfur species concentrations in the gas are determined with a HP 5793 gas chromatograph by manual injection of grab samples. The principal features of the HP 5793 are given in Table 4-2.

Table 4-1

Operating Configuration and Conditions,
Hewlett-Packard Model 5880A Gas Chromatograph

1. Columns used:
 - a. 1-10 ft x 1/8 inch SS Porapak Q
 - b. 1-10 ft x 1/8 inch SS Molecular Sieve 5A
 - c. 2-18 ft x 1/8 inch SS 2% OV-101 on WHP
2. Dual detectors - flame ionization detector in series with thermal conductivity detector
3. Set up for analysis of the following species:
Hydrogen, Carbon dioxide, Ethylene, Ethane, Propane, Propylene, Oxygen, Nitrogen, Methane, and Carbon monoxide
4. Argon Carrier Gas - flow rate of 28 ml/min
5. Programmed Temperature from 75 C to 165 C to 135 C
6. 1.0 ml sample
7. 18 minute analysis time

Table 4-2

Operating Configuration and Conditions,
Hewlett-Packard Model 5793 Gas Chromatograph

1. Flame photometric detector
2. Single column - 18" x 1/8" Teflon Supelpak-S (Porapak QS)
3. Ten port valve for sample injection and column backflush
4. Integrator with limited control capabilities
5. Nitrogen carrier gas: Carrier Flowrate = 32 ml/min
6. Sample loop size = 125 ul
7. Temperature program:
Initial temperature 30 C
Initial time 1.5 min
Program rate 35 C min
Final temperature 170 C
Final time 5.0 min
8. Analysis cycle time 25 min.

SECTION 5

TEST PROCEDURES

Test procedures are described in detail in Volume 1 of this series (Thimsen, Maurer et al, 1984). The following is a summary of the procedures including specific procedures used in this test only.

5.1 Test Teams

5.1.1 Gasifier Operation and Overall Coordination

The gasifier operations team was organized by Black, Sivalls & Bryson, Incorporated (BS&B) and consisted of the facility manager, facility engineers, three shift lead operators and additional helpers as required. The gasifier was staffed with a lead operator and two helpers, three shifts each day.

The gasifier operations team was responsible for overall operation of the gasifier and associated process equipment and coordination of the three test teams. This includes: gasifier start up, coal gas handling and incineration, exhaust gas cleanup, coal addition and sample collection, fire bed monitoring, process equipment maintenance and repair, operation of the boiler, changes in process conditions, sampling of waste water streams, and measurement of retort temperature and pressure profiles.

5.1.2 Gasifier Monitoring

The gas sampling and data retrieval/monitoring team was organized by the University of Minnesota Particle Technology Laboratory, and consisted of persons with individual responsibility for:

- 1) sample gas cleanup
- 2) gas chromatograph
- 3) continuous gas analysis and SIGMA continuous calorimeter
- 4) data acquisition system
- 5) safety evaluation personnel

and such equipment operators as were necessary. The monitoring systems were staffed 24 hours per day.

The monitoring team was responsible for recording continuous process signals, operations of the gas chromatographs and continuous gas analysis equipment, operation of the gas sampling and conditioning system, collection of tar and oil samples, analysis of coal, ash, and cyclone dust samples, retort exhaust particle sampling and evaluation of health and safety measures.

5.1.3 Stack Gas Sampling

Interpoll, Incorporated, Circle Pines, Minnesota, a subcontractor to the University of Minnesota, had a two-man team on site on June 8, 1984. They sampled for exhaust emissions from the gas combustor.

5.2 Gasifier Sampling and Data Acquisition Procedures

5.2.1 Continuous Data

An Analog Devices, Incorporated MACSYM 350 data acquisition system was used for this test. Process signals are sampled once a minute. Ten-minute signal averages are recorded on floppy disc. Thirty-minute signal averages are printed by line printer. The operating team also logs these signals hourly along with some twenty parameters not sampled by the data acquisition system. During observation of transients the sample time is reduced to 6 seconds with one-minute averages written to disc.

5.2.2 Gas Analysis Data

The continuous gas analyzers are calibrated daily, according to the manufacturer's recommendations. Output signals are recorded by the data acquisition system.

The HP 5880A gas chromatograph is calibrated using a mixture of oxygen, carbon monoxide, carbon dioxide, hydrogen, methane, ethane, ethylene, propane, propylene, and nitrogen at concentrations which nearly duplicate the gasifier offgas. Another calibration mixture with the concentrations of all the species except nitrogen increased by about 50%, and the nitrogen correspondingly reduced, is used to check the linearity of the detectors.

The HP 5793 gas chromatograph is calibrated before and after the test. Calibrations with varying levels of hydrogen sulfide in nitrogen have confirmed the square root response of the flame photometric detector to gas sulfur concentrations. The hydrogen sulfide FPD calibration factor is used for determination of carbonyl sulfide and mercaptan concentrations.

5.2.3 Tar and Oil Data

The condensed tar, oil, and water are removed from the accumulation reservoirs daily. Water collected in the surface condenser and sample electrostatic precipitator is decanted from the tar and combined with the water from the refrigerator. Tar from the surface condenser is combined with tar and oil collected in the sample electrostatic precipitator. Condensate yields are measured by weighing both the tar/oil sample and the water sample. Moisture content of each daily tar sample is

determined by distillation.

5.2.4 Coal Data

Coal samples are taken by the operations team during coal addition to the lock hopper four times each shift. These four samples are stored in one bucket and submitted as a composite shift sample. Detailed chemical analysis of the coal is performed on a composite of the shift samples.

5.2.5 Ash Data

An ash sample is taken by the operations team each time ash is discharged, and stored in a sealed container. For each ash sample the bulk density, particle size distributions, and carbon, sulfur, and moisture content of the ash are tabulated by the monitoring team. The carbon and sulfur content of each sample is determined from milled samples submitted by the monitoring team. The ash samples, on which detailed analyses are performed, are composited over the same time periods used for compositing the coal samples.

5.2.6 Dust Data

Samples of cyclone dust are grabbed daily from the dust accumulation bin. A single composite of all daily samples is submitted for analysis.

5.2.7 Exhaust Gas Sampling

The gas phase combustion exhaust is analyzed by EPA methods 5 and 6 for sulfur dioxide, nitrogen oxides, and particulates once during the test.

5.2.8 Retort Particle Sampling

Sampling of the gasifier offtake for particles is performed periodically as operating conditions permit.

5.2.9 Retort Temperature and Pressure Sampling

Vertical temperature and pressure profiles are taken at a single point periodically. These data are usually collected at the end of a relatively stable period of operation just before operational changes are made.

SECTION 6

CONDUCT OF THE TESTS

6.1 Pellet Screening Test - November 9, 1983

BOM/FGT-010, gasification of peat pellets began at 1:30 AM, November 9, 1983. Prior to this time, BOM/FGT-009, gasification of Benton Lignite had been underway (Volume 10, Thimsen, Maurer et al, 1985). The lock hoppers and feed pipes were emptied of the lignite before the peat was added to the gasifier. The peat fully occupied the retort by about 4:00 AM.

As this was a short screening test, the blast air flow was maintained at 600 cfm at a blast saturation temperature of 68 C for 6 1/2 hours to see if any operational anomalies would occur. As operation was very similar to that observed during the lignite test, the blast air flow was increased periodically during the day to 1000 scfm. At this air flow the peat consumption rate was about 2.7 tons/hr. The blast air flow of 1000 scfm was maintained for 7 hours. The entire screening test lasted about 20 hours.

No ash clinkering was noticed during firetests. Some fused ash chunks were removed from the ashpit. It is thought that these may have resulted from fluxing of the lignite and peat ashes. The small amount of peat ash produced was indistinguishable from the lignite ash.

On the basis of this screening test, there was no reason not to proceed with the full test in expectation of high throughputs and high gas quality gasifying peat pellets.

After the peat pellet test was terminated, the gasifier was dumped and inspected. The dust/tar mixture in the ductwork and cyclone downstream of the gasifier did not spontaneously ignite and burn as has happened after other tests. The cyclone was filled to the bottom of the vortex finder with a sludge. It was impossible to poke through this sludge to drain it, so a gallon of fuel oil was added to the top and it was ignited. The sludge burned slowly for 3 weeks until a hole was poked through the bottom, and air could draft through the mass. At this time the sludge burned violently for approximately 12 hours until it was essentially consumed. The bulk of this sludge accumulation occurred during the initial stages of the gasification of the lignite.

6.2 Gasification of Peat Sods

BOM/FGT-011, gasification of sod peat, began on June 5, 1984. The gasifier was loaded with 11.74 tons of metallurgical coke for start up. The modified start up procedure was used (Thimsen, Maurer et al, 1984). The fire was lit at 1:20 PM and

gas was sent to the combustor at 2:25 PM. The sod peat entered the retort at 9:30 PM. Figure 6-1 shows the operational history of the test.

Considerable difficulty was encountered getting the peat to feed evenly into the retort through the feed pipes. The offtake temperature climbed to over 1100 C (2000 F). The gasifier was banked at 10:55 PM due to declining gas quality and inability to get the sod peat through the feed pipes. The gasifier was banked through the night.

Efforts at poking the fuel in the bins were apparently successful in filling the feed pipes and retort. At 6:40 AM, June 6 the gasifier was warm started, flaring the product gas. Blast air flow (BAF) was set near 400 cfm. While gas quality was low, a steady flame was obtained in the combustion chamber by minimizing combustion air. Lower blast saturation temperatures (BST) (59 C, 138 F) seemed to give better gas quality.

Offtake temperatures remained high through the afternoon of June 7. Glowing was observed on the top of the bed and ash clinkering was observed in a few locations. Operation of the agitator was initiated to minimize glowing and burning through. Subsequent operation of the agitator resulted in low offtake temperatures (100-150 C, 210-300 F).

Three momentary losses of power were experienced beginning 4:15 PM on June 7. Due to continuing bad weather, the gasifier was banked from 7:00 PM, June 7 to 9:45 AM, June 8. Fire tests during this period showed very little fire, even after 15 minutes.

The gasifier was warm started at 9:45 AM, June 8 with BAF of 500 cfm, BST at 60 C (140F). The blast air flow was raised to 900 cfm over 2 hours and maintained at this level for 23 hours. During this period, fire tests showed a "cold" fire zone. The BST was reduced to 58C (136F) at one point, in attempt to heat up the fire zone, but was returned to 60 C (140F) as gas quality dropped.

At 8:30 AM, June 9, the BAF was increased to an indicated 1100 cfm. The BST was increased to 62 C (144 F). Fuel bed conditions did not warrant this increase in load, but these conditions were held long enough to make a single retort particle sample measurement at this BAF.

At 12:50 PM, the BAF was dropped from 1100 cfm to 500 cfm in a step change. The BST was correspondingly dropped from 62 C (144 F) to 58 C (136 F). These conditions were held for one hour, at which time the BAF was returned to 900 cfm to use up the sod peat inventory. The inventory was depleted at 9:20 on June 10, 1984. 11 tons of metallurgical coke was fed into the gasifier to heat up the cyclone and refractory ductwork in anticipation

Figure 6-1
Test History, BOM/FGT-011

of the end of the test. Any tar/oil and or dust accumulations would be softened and could ignite upon opening the duct work. The test was terminated at 8:30 PM, June 10 and the gasifier was dumped.

Fire tests throughout the test showed an unstable combustion zone. Seldom did all holes show a hot fire. The indications of hot fire would move around the retort from firetest to firetest. Double incandescent zones were also common. Occasional ash clinkering was noted, particularly when the BST was as low as 58 C (136 F). It is unlikely that stable operation was ever achieved due to these anomalies in the fire zone.

Moderate amounts of dust were removed through the cyclone. The dust would stick to the cyclone walls unless rather severe flushing measures were taken.

The ash generated during the test was almost all glassy pieces. Fusion of the ash was definitely occurring in the gasifier, but no difficulties were encountered removing ash through the grate. Typical ash particle sizes were 1-2 inches. Some particles as large as 5 inches were observed.

Temperature probings of the retort were performed as indicated in Figure 6-1. The temperature profiles generated from these probings indicated a very thin combustion zone and a very thin gasification zone. As much as half of the fuel in the retort was at a temperature less than 150 C (300 F).

6.3 Gasification of Peat Pellets

BOM/FGT-013 began at 0900 on July 16, 1984. The modified start-up procedure described in Volume 1 of this series (Thimsen, Maurer et al, 1984) was used. The gasifier was charged with 9.3 tons of petroleum coke. The gasifier was lit at 0908 and gas sent to the combustion chamber at 0928. The blast air flow was maintained at 400 cfm and the blast saturation temperature at 59 C (138 F) during the start-up period, while gasifying the coke. The operating test history is shown in Figure 6-2.

The 7/8 inch diameter peat pellets entered the retort at 1020 on July 16, and fully occupied the retort by 0200 on July 17. At this point, some crusting was noted at the incandescent zone. The BAF was maintained at 400 cfm and the blast saturation temperature at 59 C (138 F) during this period.

At 0800, July 17 the BAF was increased to 800 cfm and the BST to 60 C (140 F). These conditions were held for 26 hours. The blast saturation temperature was reduced to 59 C (138 F) at 1020 due to sticky bed conditions and relatively cold fire tests. Peat consumption averaged 1.7 tons per hour.

During this period the fire tests were, for the most part,

Figure 6-2

Test History, BOM/FGT-013

normal. Minimal crusting was noted until the end of the period. Late in the morning of July 18, hard clinkers were observed on one side of the retort. The blast saturation temperature was increased to 61 C (142 F) and then 62 C (144 F) in order to mitigate these problems. The clinker caused problems with ash removal. The grate drive motor kicked out several times on overload. Successive fire tests showed there was no reduction in ash level for substantial increases in grate speed. A temperature probing was performed at the end of this period.

The BAF was increased to 1200 cfm briefly at 1000, July 18 but had to be reduced to 1000 cfm at 1400 and then 800 cfm at 1800 due to increasing ash accumulation above the grate.

As the 7/8 inch pellets were consumed, the 1/2 inch pellets were fed to the gasifier. They entered the retort at 2200, July 18 and fully occupied the retort by approximately midnight. At this point, severe crusting and clinkering was noted during the fire tests. By 0300, July 19 there was channeling and burning through noted. At 0500 the blast air flow was reduced to 400 cfm. The offtake temperature continued in excess of 550 C (1022 F). During a fire test at 0730, all holes had hard clinker. Contamination of the 1/2 inch pellets with excessive inorganic material was suspected. The test was terminated at 0900 on July 19, due to unmanageable conditions in the ash zone and excessively high channeling, burning through and reduced pellet inventory.

The ash collected during most of the test was brown/orange in color and definitely fused. The cyclone dust was black and contaminated with tar.

Subsequent to the test, the refractory lined gas duct burned clean when it was opened to the air.

SECTION 7

TEST RESULTS

7.1 Data Summary

7.1.1 Continuous Output Transducer Data

The data acquisition system operated well over all three test periods. Figures 7-1(a-c) show the major physical operating conditions of each test.

Offtake temperatures were low (80-150 C) for all three tests during periods of comparatively stable operation. This is consistent with the high-moisture content of all the peat fuels. The periods of higher offtake temperature correlate with lower gas quality, indicating incomplete gasification as a result of shortened gas residence time due to gas channeling.

Dry gas heating value for the peat pellets ranged from 160-170 Btu/dscf during BOM/FGT-010 and 170-180 Btu/dscf during the stable operating periods of BOM/FGT-013. Dry gas heating value during BOM/FGT-011, gasification of peat sods, did not rise much above 135 Btu/dscf during the entire test.

Fire loss pressure was relatively low during all three tests, and generally followed blast air flow.

7.1.2 Peat, Ash, and Dust Data

7.1.2.1 Peat

A complete list of the tests performed on the bulk peat, ash, and cyclone dust samples collected during the three tests, together with the number of samples analyzed, is given in Table 7-1.

The peat pellet feed size distribution for BOM/FGT-010 is given in Figure 7-2. More than 85% of this material was above 3/4 inch and less than 3% smaller than 1/4 inch. Figures 7-3 (a,b) show the feed peat size analysis and geometric mean particle sizes for the peat sods and the pellets gasified during BOM/FGT-013. Figure 7-4 gives the average peat particle size distributions for the peat sods, 7/8 inch pellets and 1/2 inch pellets. All of these materials were screened at 1/4 inch. The amount of material less than 1/4 inch entering the gasifier was very small (<3%) indicating that the densified peat can be handled with minor size degradation.

The physical and chemical analysis of the various peat feedstocks is given in Table 7-2. Aside from the variations in moisture content, the only noticeable difference between the samples is the high ash content and different ash fusion temperatures of the 1/2 inch pellets gasified during BOM/FGT-

Figure 7-1a

Physical Characteristics of the Gasifier Operation

BOM/FGT-010

Figure 7-1b

Physical Characteristics of the Gasifier Operation

Figure 7-1c

Physical Characteristics of the Gasifier Operation

Table 7-1

Summary of Peat, Ash and Cyclone Dust Analysis

Material Type of Analysis		Number of Samples Collected and Analyzed	Number of composite Samples Analyzed
<hr/>			
Peat	Particle size distribution	23	---
	Proximate analysis	---	4
	Ultimate analysis	---	4
	Ash fusion temperature	---	4
	Free swelling index	---	4
<hr/>			
Ash	Particle size distribution	81	---
	Bulk density	81	---
	Moisture content	81	3
	Carbon content	81	3
	Sulfur content	81	3
	Chemical analysis	---	3
<hr/>			
Cyclone	Proximate analysis	---	1(**)
Dust	Ultimate analysis	---	1(**)

(**) Composite of 4 cyclone dust samples.

Figure 7-2

Average Particle Size Distribution of Feed Pellets
(BOM/FGT-010)

Figure 7-3a

Feed Peat Size Distribution Analysis and
Geometrical Mean Particle size

Figure 7-3b

Feed Peat Size Distribution Analysis and
Geometrical Mean Particle size

Figure 7-4

Average Particle Size Distribution of Feed Peat

Table 7-2

Physical and Chemical Properties of Peat and Cyclone Dust

Material	Peat				Cyclone Dust (dry basis)
	010	011	013 7/8"	013 1/2"	013 (7/8")
Type of Analysis (*)					
Proximate Analysis, wt % :					
Moisture	34.44	42.47	22.44	16.05	---
Volatile Matter	42.24	31.42	43.10	39.79	49.01
Ash	7.26	12.26	8.68	30.59	13.24
Carbon (**)	16.06	13.85	25.78	13.57	37.73
Ultimate Analysis, wt % :					
Hydrogen	3.48	2.44	3.92	3.32	4.97
Carbon	34.27	26.92	44.39	31.56	68.85
Nitrogen	1.56	1.23	1.50	1.39	3.27
Sulfur	0.24	0.24	0.93	0.24	1.38
Oxygen (**)	18.74	14.45	18.14	16.85	8.28
Ash	7.26	12.26	8.68	30.59	13.24
Moisture	34.44	42.47	22.44	16.05	---
Heating Value, btu/lb :					
As Received	6092	4403	7518	4836	---
Moisture Free	9293	7654	9693	5761	12277
Ash Fusion Temp. Deg F: (Oxidizing Atmosphere)					
Initial Def., IT	2135	2120	2125	2550	---
Softening, ST	2155	2170	2160	2635	---
Softening, HT	2205	2270	2195	2700	---
Fluid, FT	2220	2505	2330	2800	---
(Reducing Atmosphere)					
Initial Def., IT	2050	2065	2080	2500	---
Softening, ST	2085	2120	2135	2575	---
Softening, HT	2100	2150	2155	2610	---
Fluid, FT	2135	2320	2240	2690	---
Free Swelling Index	0	0	0	0	---

(*) All values as received unless otherwise noted.

(**) By difference.

013. The MAF heating value of the sods and the 1/2 inch pellets is somewhat lower than that of the 7/8 inch pellets.

7.1.2.2 Ash

The ash size distribution analysis results and geometrical ash particle size are shown in Figures 7-5(a,b) for BOM/FGT-011 and BOM/FGT-013 respectively.

The geometrical mean ash particle size, dry ash bulk density are shown in Figure 7-6, along with the gasifier operating conditions. In general, ash sulfur content tracks ash carbon content. Ash carbon content was generally low (<5%). Ash sulfur content observed when gasifying the peat sods was around 0.2%, while that observed while gasifying the pellets were substantial amounts of unreacted carbon were removed through the grate during the poor gasification observed initially in each test. Geometrical mean ash particle size and density appear to be relatively independent of operating conditions or the other parameters.

The elemental analysis of the ashes collected during each test is given in Table 7-3. As can be noted, there are only minor differences between ashes from the three tests. (Ashes from gasification of the 1/2 inch pellets are not analyzed here.)

7.1.2.3 Cyclone Dust

The chemical analysis of cyclone dust collected during BOM/FGT-013, gasification of 7/8 inch peat pellets is given in Table 7-2. A comparison of the dust analysis with the 7/8 inch pellet analysis, on a dry basis, shows that the dust has a 20% greater ash content, and on a moisture and ash free basis, the dust has a 23% greater ultimate carbon content and a 30% greater heating value. This suggests that the dust is partially carbonized peat.

7.1.3 Gas Analysis Data

The HP5880A gas chromatograph measuring the major gas species and hydrocarbons operated continuously during all three tests with the exception of calibration periods. The HP5793 gas chromatograph measuring gas sulfur species was operated with hand injections during BOM/FGT-010 and BOM/FGT-011. Attempts to use an automatic gas dilution system during BOM/FGT-011 were not successful due to the high moisture content of the gas. This resulted in the loss of all but about 18 hours of data. Just prior to BOM/FGT-013, it was discovered that the separation column was contaminated and that the sulfur species would not pass through the column. Due to this problem, no sulfur species data was collected during BOM/FGT-013.

The major gas species measured are shown in Figures 7-7(a-c) and the hydrocarbons are shown in Figures 7-8(a-c). The major gas

Figure 7-5a

Ash Size Distribution Analysis and
Geometrical Mean Ash Particle Size

Figure 7-5b

Ash Size Distribution Analysis and
Geometrical Mean Ash Particle Size

Figure 7-6a

Ash Characteristics and Operating Conditions

ASH ANALYSIS

BOM/FGT-011

Figure 7-6b

Ash Characteristics and Operating Conditions

BOM/FGT-013

TEST DATE (1984)

JULY

Table 7-3

Elemental Analysis of Moisture-Free Ash

Element	Mass Fraction % for Composite Samples: (*)		
	BOM/FGT-010	BOM/FGT-011	BOM/FGT-013
Fe	11.9	9.4	9.9
Fe(2+)	3.1	3.1	3.0
Si	24.1	27.0	24.2
Al	4.9	5.4	6.2
C	2.7	4.1	1.5
Ca	7.9	7.9	9.1
Mg	1.5	1.4	1.5
K	1.2	1.2	1.2
P	0.66	0.16	0.51
Na	0.53	1.2	1.1
S	0.29	0.19	0.43
Ti	0.40	0.36	0.27

(*) Unaccounted for mass is presumed to be oxygen bound onto metals as oxides.

Figure 7-7a

Major Gas Species Measured by the Gas Chromatograph.

BOM/FGT-010

Figure 7-7b

Major Gas Species Measured by the Gas Chromatograph.

Figure 7-7c

Major Gas Species Measured by the Gas Chromatograph.

Figure 7-8a

Minor Gas Species Measured by the Gas Chromatograph.

BOM/FGT-010

Figure 7-8b

Minor Gas Species Measured by the Gas Chromatograph.

Figure 7-8c

Minor Gas Species Measured by the Gas Chromatograph.

species along with operating conditions are shown in Figures 7-9(a-c). The periods of poor gasification noted in Sections 6.2 and 6.3 can be observed as low hydrogen and carbon monoxide, and high carbon dioxide and nitrogen. Carbon dioxide concentrations of 15% were typical during gasification of peat sods, while carbon dioxide concentrations of 7-8% were normal for gasification of the pellets during BOM/FGT-013. This is consistent with poorer reduction of the gas phase by the peat sod char. Hydrogen and carbon monoxide concentrations seem relatively unaffected by blast steam/air ratio (blast saturation temperature).

Hydrocarbon concentrations were low during the periods of poor gasification noted in Sections 6.2 and 6.3, and during the entire peat sod gasification test. Ethylene concentration jumped at the end of BOM/FGT-013 when the high ash 1/2 inch pellets entered the retort. This may be a result of hydrocarbon cracking at the higher offtake temperatures observed during this period.

The gas sulfur species measured are shown in Figure 7-10. Hydrogen sulfide made up approximately 70% of the total gas phase sulfur with carbonyl sulfide amounting to approximately 25% and mercaptans 5% of the total gas phase sulfur measured.

7.1.4 Tar and Water Yield Data

The tar and water yields observed during BOM/FGT-011, gasification of peat sods, and BOM/FGT-013, gasification of peat pellets, are shown with operating conditions in Figures 7-11(a, b). The resolution of these measurements is too poor to suggest relationships between operating conditions and yield. Physical and chemical analyses of these materials are shown in Table 7-4. On a moisture-free basis, the chemical analyses of the tars have only minor differences. The pour point of the tar collected during gasification of peat pellets was somewhat higher than the tar collected during the gasification of peat sods.

7.2 Material and Energy Balance Calculations

The procedure for calculating material and energy balances is fully explained in Volume 1 of this series (Thimsen, Maurer et al, 1984). Briefly, the material compositions presented in Section 7.1, the peat feed rate, the blast saturation temperature, the dust yield data (presented in Section 7.5), and the tar and water yields are used to calculate a material balance. The blast air flow and gas flow rates are calculated assuming atomic nitrogen and carbon conservation around the gasifier. The energy balance is calculated by assigning appropriate enthalpies to the material flows, and using measured heat losses.

Tables 7-5 to 7-7 show a single calculation for each test.

Figure 7-9a

Dry gas HHV, Major Gas Species and
Gasifier Operational Parameters.

BOM/FGT-010

Figure 7-9b

Dry gas HHV, Major Gas Species and
Gasifier Operational Parameters.

Figure 7-9c

Dry gas HHV, Major Gas Species and
Gasifier Operational Parameters.

Figure 7-10

Sulfur Species Measured by the Gas Chromatograph

BOM/FGT-010

Figure 7-11a

Tar/Oil Yield and Water Yield with Operating Conditions

Figure 7-11b

Tar/Oil Yield and Water Yield with Operating Conditions

BOM/FGT-013

Table 7-4

Condensed Material Analysis

	<u>BOM/FGT-010(*)</u>	<u>BOM/FGT-011</u>	<u>BOM/FGT-013</u>
Water			
Total Organics, %	0.88	1.02	0.93
Tar (As recieved)			
Heating Value, btu/lb (**)	15401 (16043)	15074 (16031)	14264 (15552)
Flash point, Deg. F	—	195	199
Water by distillation, %	4.00	5.97	8.28
Specific gravity, 60/60 Deg. F	—	1.0296	1.0491
Pour point, Deg. F	—	100	+110
Cold (solid) point, Deg. F	—	95	+105
Viscosity at :			
170 Deg. F Saybolt Universal, Sec.	—	97.00	80.60
170 Deg. F Kinematic, centistoks	—	19.72	15.63
210 Deg. F Saybolt Universal, Sec.	—	52.10	56.90
210 Deg. F Kinematic, centistoks	—	7.91	9.36
Ultimate Analysis, WT% (**)			
Hydrogen	9.05 (9.43)	8.29 (8.82)	8.21 (8.95)
Carbon	75.88 (79.04)	75.17 (79.94)	70.66 (77.04)
Nitrogen	2.66 (2.77)	3.25 (3.46)	2.98 (3.25)
Oxygen (by difference)	8.16 (8.50)	6.82 (6.68)	9.52 (10.38)
Sulfur	0.24 (0.25)	0.37 (0.39)	0.27 (0.29)
Moisture (total)	4.00	5.97	8.28
Ash	0.01 (0.01)	0.12 (0.13)	0.08 (0.09)
Sediment (solids)	—	0.63 (0.67)	0.87 (0.95)

(*) Sample not sufficient for complete analysis.

(**) Dry basis values in parentheses

Table 7-5

Material Balance and Thermal Efficiency Calculation
BOM/FGT-010

Input Data

Time period: Overall Average (11.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 2.40
Blast air flow (dry) , Scfm = 971.
Saturated air temperature, F= 156.
Steam/Air Ratio (lb./lb.) = 0.27
Ambient air temperature, F = 29.
Off-take temperature, F = 178.

Coal Data:

Type = Minnesota Peat
Mass Fraction Carbon % = 34.3
Mass Fraction Fixed Carbon = 16.06
Mass Fraction Moisture % = 34.44
Mass Fraction nitrogen % = 1.56
Mass Percent sulfur = 0.24
Heating value, Btu/lb = 6092

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 28.02
Tar yield, lb/1000 SCF = 3.29
Carbon in Tar (percent) = 79.1
Sulfur in Tar (percent) = 0.25
Tar HHV, thou. Btu/lb = 16.04

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 515.
Ash carbon ,percent = 2.7
Ash sulfur ,percent = 0.29
Ash moisture (wet),percent = 13.9
Cyclone dust,lb/hour(est.) = 28.

Gas Composition (Dry): (normalized to 99.90)

H2 % = 21.7	CH4 % = 0.61	H2S (est ppm)= 502
CO % = 23.9	C2H4 % = 0.148	COS (est ppm)= 104
CO2 % = 11.80	C2H6 % = 0.049	CH3SH (est ppm)= 206
N2 % = 41.0	C3H6 % = 0.062	C2H5SH (est ppm)= 134
O2 % = 0.00	C3H8 % = 0.031	HHV, Btu/SCF = 160
Molec. Weight= 24.08	Argon(est. %)= 0.482	LHV, Btu/SCF = 148

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -6.54)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 4795.	46.0	Dry gas	= 7145.	64.3
Steam (total)	= 1200.	11.5	Water in gas	= 3154.	28.4
Air(calc,dry)	= 4435.	42.5	Oil and tar	= 371.	3.3
			Ash(calc,dry)	= 414.	3.7
			Dust	= 28.	0.3
Total	= 10430.		Total	= 11112.	

Energy Balance (Percent unaccounted for: 6.67)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 29.2	Dry coal gas	= 18.0	63.2
Air	= -0.031	Oil and tar	= 5.95	20.9
Steam(import)	= 1.375	Sensible	= 0.42	1.5
Cooling water	= -0.066	Latent	= 3.374	11.9
		Ash	= 0.170	0.6
		Dust	= 0.343	1.2
		Cooling water	= 0.184	0.6
Total	= 30.4	Total	= 28.4	

Performance Data

Cold gas efficiency, percent = 59.0
Cold gas with tar efficiency, percent = 78.6
Hot gas without tar efficiency percent = 71.3
Hot gas with tar efficiency, percent = 90.9
Air/Coal (lb./lb.) = 0.925
Steam/Coal (lb./lb.) = 0.250
Air/Fixed Carbon (lb./lb.) = 5.760
Coal/Gasifier Area (lb./hr./sqft) = 144.5
Fixed Carbon/Area (lb./hr./sqft) = 23.2
Producer Gas/Coal (SCF/lb.) = 37.4
Producer Gas/Fixed Carbon (SCF/lb.) = 233.2
Tar Yield (lb./lb. coal) = 0.077

Table 7-6

Material Balance and Thermal Efficiency Calculation
BOM/FGT-011

Input Data

Time period: Overall Average (39.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 1.91
Blast air flow (dry) , Scfm = 902.
Saturated air temperature, F = 142.
Steam/Air Ratio (lb./lb.) = 0.17
Ambient air temperature, F = 67.
Off-take temperature, F = 226.

Coal Data:

Type = Peat sods
Mass Fraction Carbon % = 26.9
Mass Fraction Fixed Carbon = 13.85
Mass Fraction Moisture % = 42.47
Mass Fraction nitrogen % = 1.23
Mass Percent sulfur = 0.24
Heating value, Btu/lb = 4403

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 32.81
Tar yield, lb/1000 SCF = 0.92
Carbon in Tar (percent) = 79.9
Sulfur in Tar (percent) = 0.40
Tar HHV, thou. Btu/lb = 16.03

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 574.
Ash carbon ,percent = 2.2
Ash sulfur ,percent = 0.18
Ash moisture (wet),percent = 2.6
Cyclone dust,lb/hour(est.) = 18.

Gas Composition (Dry): (normalized to 99.90)

H2 % = 17.5	CH4 % = 1.15	H2S (est ppm) = 458
CO % = 17.9	C2H4 % = 0.247	COS (est ppm) = 331
CO2 % = 13.72	C2H6 % = 0.086	CH3SH (est ppm) = 164
N2 % = 48.6	C3H6 % = 0.062	C2H5SH (est ppm) = 86
O2 % = 0.00	C3H8 % = 0.025	HHV, Btu/SCF = 134
Molec. Weight = 25.39	Argon(est. %) = 0.573	LHV, Btu/SCF = 124

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -8.34)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 3825.	44.2	Dry gas	= 5907.	63.0
Steam (total)	= 696.	8.0	Water in gas	= 2895.	30.9
Air(calc,dry)	= 4136.	47.8	Oil and tar	= 81.	0.9
			Ash(calc,dry)	= 478.	5.1
			Dust	= 18.	0.2
Total	= 8657.		Total	= 9379.	

Energy Balance (Percent unaccounted for: 0.58)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 16.8	Dry coal gas	= 11.8	67.6
Air	= 0.015	Oil and tar	= 1.30	7.4
Steam(import)	= 0.732	Sensible	= 0.48	2.7
Cooling water	= 0.006	Latent	= 3.075	17.6
		Ash	= 0.160	0.9
		Dust	= 0.224	1.3
		Cooling water	= 0.433	2.5
Total	= 17.6	Total	= 17.5	

Performance Data

Cold gas efficiency, percent = 67.2
Cold gas with tar efficiency, percent = 74.6
Hot gas without tar efficiency percent = 87.3
Hot gas with tar efficiency, percent = 94.7
Air/Coal (lb./lb.) = 1.081
Steam/Coal (lb./lb.) = 0.182
Air/Fixed Carbon (lb./lb.) = 7.806
Coal/Gasifier Area (lb./hr./sqft) = 115.3
Fixed Carbon/Area (lb./hr./sqft) = 16.0
Producer Gas/Coal (SCF/lb.) = 39.0
Producer Gas/Fixed Carbon (SCF/lb.) = 281.9
Tar Yield (lb./lb. coal) = 0.021

Table 7-1

Material Balance and Thermal Efficiency Calculation
BOM/FGT-013

Input Data

Time period: 7/17/84 8:00 - 7/18/84 10:00 (26.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 1.52
Blast air flow (dry) , Scfm = 795.
Saturated air temperature, F= 139.
Steam/Air Ratio (lb./lb.) = 0.15
Ambient air temperature, F = 63.
Off-take temperature, F = 251.

Coal Data:

Type = Minnesota Peat Pellets (7/8)
Mass Fraction Carbon % = 44.4
Mass Fraction Fixed Carbon = 25.78
Mass Fraction Moisture % = 22.44
Mass Fraction nitrogen % = 1.50
Mass Percent sulfur = 0.93
Heating value, Btu/lb = 7518

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 17.12
Tar yield, lb/1000 SCF = 2.60
Carbon in Tar (percent) = 77.0
Sulfur in Tar (percent) = 0.29
Tar HHV, thou. Btu/lb = 15.55

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 211.
Ash carbon ,percent = 11.1
Ash sulfur ,percent = 1.12
Ash moisture (wet),percent = 6.0
Cyclone dust,lb/hour(est.) = 11.

Gas Composition (Dry): (normalized to 99.90)

H2	%	= 17.2	CH4	%	= 1.46	H2S	(est ppm)	= 3082
CO	%	= 28.4	C2H4	%	= 0.087			
CO2	%	= 7.97	C2H6	%	= 0.100			
N2	%	= 43.8	C3H6	%	= 0.040			
O2	%	= 0.00	C3H8	%	= 0.024	HHV,	Btu/SCF	= 168
Molec. Weight=		24.54	Argon(est. %)	=	0.518	LHV,	Btu/SCF	= 158

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -7.51)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 3037.	40.3	Dry gas	= 5973.	73.7
Steam (total)	= 590.	7.8	Water in gas	= 1581.	19.5
Air(calc,dry)	= 3911.	51.9	Oil and tar	= 240.	3.0
			Ash(calc,dry)	= 298.	3.7
			Dust	= 11.	0.1
Total	= 7538.		Total	= 8104.	

Energy Balance (Percent unaccounted for: 3.61)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 22.8	Dry coal gas	= 15.5	68.5
Air	= 0.003	Oil and tar	= 3.73	16.5
Steam(import)	= 0.596	Sensible	= 0.48	2.1
Cooling water	= 0.069	Latent	= 1.696	7.5
		Ash	= 0.474	2.1
		Dust	= 0.134	0.6
		Cooling water	= 0.612	2.7
Total	= 23.5	Total	= 22.7	

Performance Data

Cold gas efficiency, percent = 66.1
Cold gas with tar efficiency, percent = 82.0
Hot gas without tar efficiency percent = 75.1
Hot gas with tar efficiency, percent = 91.1
Air/Coal (lb./lb.) = 1.288
Steam/Coal (lb./lb.) = 0.194
Air/Fixed Carbon (lb./lb.) = 4.996
Coal/Gasifier Area (lb./hr./sqft) = 91.5
Fixed Carbon/Area (lb./hr./sqft) = 23.6
Producer Gas/Coal (SCF/lb.) = 41.5
Producer Gas/Fixed Carbon (SCF/lb.) = 160.9
Tar Yield (lb./lb. coal) = 0.079

Periods of relatively stable operation were chosen. Good closure of the material balances was not achieved. The balances indicate 6-8% more material leaving the retort than entering.

Examination of the elemental balances for hydrogen and oxygen indicate a systematic imbalance of 10-25% excess recovery of these elements. The oxygen/hydrogen mole ratio of the excess of these elements falls in the range of 0.5 to 1.0, indicating that some part of the imbalance could be accounted for by inaccurately measured water leaving or entering the retort, or fuel moisture content above the analysis used, or some combination of these causes. This problem has been noted before (Volume 10, Thimsen, Maurer et al, 1985) when large amounts of import steam are used to prepare the desired blast steam/air ratio. This suggests that the quality of the import steam is substantially less than 100%, and that unmetered liquid mist is entering with the blast. This liquid mist would not affect the steam-air ratio as measured by the blast saturation temperature.

There is also some concern that the moisture content of the peat samples analyzed is less than that of the peat fed to the gasifier. While care was taken to keep the sample containers sealed, some drying may have occurred during handling.

Energy losses in dust and ash, and thermal losses amount to less than 6% in all three cases, indicating a high overall fuel conversion efficiency during these analyses periods. Tar amounted to 16 - 20% of the output during the gasification of pellets, but only about 7% during the gasification of peat sods. In all cases, the dry gas contained about 65% of the output energy.

7.3 Grate Performance Model

The details of the grate performance model are presented in Volume 1 of this series (Thimsen, Maurer et al, 1984). Generally speaking, the model calculates the volume swept by the voids in the bottom two levels of the eccentric grate. This volume is a function of the grate spacings, eccentricity and rotational speed. This calculated volume is then compared to the volume of dry ash, determined by the dry ash weight and dry bulk density.

Figures 7-12(a,b) show the results of these calculations for BOM/FGT-011, gasification of peat sods, and BOM/FGT-013, gasification of peat pellets. The data collected during the peat pellet gasification test are fairly well correlated with the theory predictions, with a few exceptions. The data collected during the sod gasification test is less well correlated, but the trends are predicted by the theory.

Figure 7-12a

Comparison of the Geometrical Grate Performance Model
with Ash Removal Rates.

Figure 7-12b

Comparison of the Geometrical Grate Performance Model
with Ash Removal Rates.

7.4 Combustion Emissions Monitoring

On June 8, 1984, emissions measurements were performed on the exhaust gases leaving the combustion chamber. The full report on these measurements is contained in Appendix K.

The particulate concentration varied widely between 3 measurements, but averaged 0.017 gr/acf. The corresponding mass rate averaged 4.2 lb/hour and the particulate emission factor averaged 0.32 lb/million Btu. If this particulate is assumed to be ash, the particulate measured corresponds to about 1.3% of the ash generated during this period, and would imply 1% of the wet peat feed penetrating the cyclone.

The sulfur dioxide concentrations were measured to be 170 ppm, actual. This corresponds to a sulfur dioxide rate of 13.3 lb/hour and an emission factor of 1.07 lb/million Btu. The sulfur dioxide emission factor calculated from the fuel analysis is 1.09 lb/million Btu, indicating that most of the sulfur in the feed peat goes to the overhead product. This is consistent with the relatively low sulfur flow out the ash pit during this period (approximately 0.6 lb/hour).

Nitric oxide concentrations averaged 962 ppm (dry).

7.5 Retort Particle Sampling

A total of 16 particle samplings were made during these tests: 1 during BOM/FGT-010, 9 during BOM/FGT-011 and 6 during BOM/FGT-013. All filter samples included tar droplets. The total mass of particulate is taken to be the toluene insoluble portion of the samples collected during BOM/FGT-010 and BOM/FGT-011, and the acetone-methanol insoluble portion of the samples collected during BOM/FGT-013. Data for each sample is contained in Appendix G.

Figure 7-13a shows the same data collected during gasification of peat sods. No curve fitting is reasonable for this data. Figure 7-13b shows the dust carryover as a function of gas flow for the pellet gasification tests. The correlation line was used to calculate dust production for the pellet material and energy balance calculations.

A single sample of particles collected during peat sod gasification was analyzed for its size distribution. The results are included in Appendix G. The mass median diameter was found to be 160 μm . A bimodal size distribution function was found to fit the data well. The larger volume (mass) mode was 300 μm . The smaller volume mode was 44 μm .

Dust Carryover vs. Gas Flow Rate

Figure 7-13b

Dust Carryover vs. Gas Flow Rate

SECTION 8

CONCLUSIONS

1. The maximum throughput observed while gasifying peat pellets was 2.6 ton/hour corresponding to a thermal input of 39.1 million Btu/hour. This was achieved for 14 hours. This throughput was limited by clinkering of the ash and difficulty in removing the ash. A sustained throughput in excess of 1.8 tons/hour corresponding to 27.1 million Btu/hour was achieved for 24 hours.
2. The maximum throughput observed gasifying peat sods was 2.0 tons/hour corresponding to a thermal input of 17.6 million Btu/hour. The throughput was limited by gas channeling up the walls of the retort.
3. Stable operation gasifying peat sods was probably never achieved due to gas channeling and wide variations in combustion zone location and temperature. These problems resulted in overall lower throughput and poorer gas quality.
4. A peat pellet throughput of 1.8 tons/hour (assuming 22% moisture) or 108 lb/hour/sq. ft. grate is recommended for design purposes. Based on this throughput and a blast saturation temperature of 139 F (59.4 C), the following material and energy flows can be expected:

Material In (lb/lb Peat)		Energy In (million Btu/hr)	
Air	1.29	Peat	27.1
Steam	0.194	Steam	1.7
(Add'l water ?)	0.19		
Material Out (lb/lb Peat)		Energy Out (million Btu/hr)	
Dry Gas	1.97	Dry Coal Gas	18.9
Tar/Oil	0.079	Tar/Oil	5.2
Water	0.52	Sensible/Latent Heat	3.1
Dust	0.004	Dust	0.2
Ash	0.098	Ash	0.6
		Cooling Water	0.8

5. Blast saturation temperatures between 59 C and 63 C (138 F and 145 F) were used while gasifying peat pellets. Fusion of ash was observed at all blast saturation temperatures. Some clinkering was observed at the lower blast saturation temperatures.
6. Blast saturation temperatures between 59 C and 66 C (138 F and 151 F) were used while gasifying the peat sods. While fusion of the ash occurred during the entire test under these conditions, the grate experienced no difficulty in

removing the ash.

7. Gasification of the 1/2 inch pellets with a very high ash content (probably from contamination) resulted in severe clinkering in the ash zone which precluded successful gasification of this material.
8. Particle emissions from the combustion chamber were 0.32 lb/million Btu input. Sulfur dioxide emissions were 1.07 lb/million Btu input; essentially all of the sulfur in the peat.
9. Offtake temperatures during periods of relatively stable operation were low (250 F, 120 C). Tar generated during gasification of the peat is condensed as a fog at these temperatures.
10. Based on these tests, the pelletized peat is recommended as a fixed-bed gasifier feedstock due to high throughputs achievable and good gas quality. The sod peat is not recommended as a fixed-bed gasifier feedstock due to difficulties feeding the fuel into the gasifier and continuing instabilities in the fire zone.

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APPENDIX A

Gasifier Operator's Log

These are the comments recorded by the gasifier operators during the course of the test.

BOM/FGT 010 PEAT PELLETS

Test Log

November 9, 1983

- 0130 Dropped the Peat pellets into the gasifier.
- 0230 Pellet drop is 0.69 ton.
- 0300 Higher heating value is 165 BTU/ft³. The gas quality is improving slowly as the lignite is burning out of the bed. The offtake temperature is dropping.
- 0315 Loaded Peat pellets into the upper bin. Finish weight is 12.66 tons.
- 0330 Pellet drop is .67 ton.
- 0345 Higher heating value is now 167 BTU/ft³. The offtake temperature is 88 degrees C. The CO is 23%.
- 0400 The bars went in easily on this fire test. Ash average was 24.43 inches.
- 0430 Pellet drop was 1.17 tons.
- 0530 Pellet drop was 1.18 tons.
- 0600 The ash average was 20.14 inches during this fire test. The bed is loose and the bars went in easily. The higher heating value seems to have leveled off at 164 BTU/ft³.
- 0615 Finished loading the rest of the Peat pellets into the upper bin.
- 0720 Put the saturation steam on automatic.
- 0725 Second load of Peat pellets just arrived.
- 0810 Increased the saturation air flow to 650 cfm. Lowered the saturation temperature to 67 degrees C. Increased the grate speed 2 teeth. The fire test ash average is 18.86. The bars went in easily and are coming out cherry red.
- 0825 Increased the saturation air flow to 700 cfm.
- 0840 Increased the saturation air flow to 750 cfm.
- 0855 Increased the saturation air flow to 800 cfm.
- 0900 Started coaling up every half hour to keep the coal

legs full.

- 0910 Dumped 930 pounds of ash. This ash was contaminated with Benton lignite.
- 1000 The ash average during this fire test is 26.0 inches. The bars are going through a crust of 4-6 inches on the top of the fire zone. The bars are being left in for 6 minutes. Increased the grate speed 5 teeth in attempt to lower the ash average to 12-14 inches.
- 1030 The south side of the coal bin is empty. The north side was hung up, but this has been remedied. The weigh bin indicates that we have been feeding only from the south slide gate.
- 1100 Dropped 2.11 tons of pellets in the gasifier.
- 1110 Started loading pellets with a weigh bin weight of 2.11 tons. These pellets have a large amount of fines.
- 1135 Chanel 9 news crew have arrived. The Peat pellets were hung up again, but this time on the south side.
- 1200 This fire test average is 22.29 inches of ash. There is still a small crust on top of the fire zone. Increased the grate speed to 6 teeth. Still trying to lower the ash average to 12-14 inches.
- 1235 Dumped 1330 pounds of ash. Ash shows indications of clinkering. These ranged in size from fine to 6 inches.
- 1250 Grate drive is at 6/4.00.
- 1310 Increased the saturation air flow to 850 cfm. Increased the saturation temperature to 68 degrees C. The grate speed has been changed to 8/3.00.
- 1325 Increased the saturation air flow to 900 cfm. Increased the regulated steam supply.
- 1350 Increased the saturation air flow to 950 cfm. Increased the grate speed to 8/3.50
- 1405 Increased the saturation air flow to 1000 cfm.
- 1410 This fire test ash average was 19.57 inches. There is still a slight crust.
- 1420 Dumped 1115 pounds of ash. A small amount of clinkering is still evident.
- 1445 Loaded the last of the Peat pellets into the weigh

bin.

- 1530 Pellet feed over the last hour was 2.39 tons. The grate revolutions have jumped from 119 to 181 with the speed control at 3.5.
- 1537 Grate stopped running. It does not appear to be a power blip. Restarted it immediately.
- 1545 Dumped 1175 pounds of ash. Ash is brown in color and ranging in size from fine to 2.5 X3.5 inches.
- 1600 This fire test shows an ash average of 13.71 inches. The rods smell like hot silage. The bed seems dense and stiff but with no crusting. Possibly the bed is over saturated. Slowed the grate to 8/2.40.
- 1730 Pellet usage has been averaging 2.69 tons/hour.
- 1740 Dumped 1200 pounds of ash.
- 1800 This fire test shows 11.0 inches of ash after the bars have been in for 10 minutes. There were no cold bars or hot spots. Did notice a slight crust developing all around the top of the ash. Slowed the grate to 6/3.00 to maintain the ash level.
- 1900 There is now only 1.68 tons in the upper bin.
- 1930 We are down to 0.24 tons on top. During the last 4 hours with the saturation air flow at 1000 cfm, the saturation temperature has ranged between 74 and 80 degrees C.
- 1950 Dumped 1250 pounds of ash.
- 2000 The weigh bin is showing .22 tons. We will cycle the valves until the coal legs are empty. This fire test showed an 8 inch ash average. There is still a thin crust on the ash. Slowed the grate to 6/2.00.
- 2020 The lower heating value is 151 BTU/ft³ and the higher heating value is 163 BTU/ft³.
- 2030 The coal leg temperature remains at 15 degrees C. as the valves are cycled. They are cold to the touch.
- 2050 Coal leg temperature is still dropping.
- 2053 The coal leg temperature is now 7 degrees C.
- 2057 The north coal leg warmed up again to 14 degrees.
- 2100 Cycled the valves once more. The coal leg temperature is 17 degrees C. The University of Minnesota is

taking one more gas sample.

- 2105 University of Minnesota is finished taking their sample. The coal leg temperature is now 40 degrees C. and hot to the touch.
- 2107 Starting shutdown procedure. Flooded the cyclone. Opened the vent valve and lit the stack manually. Manually closed the air blower valve. Turned off the grate and steam. Shut off the upper water on the scrubber and shut down the number 2 scrubber pump. Saturation blower is off. Opened the downcomer.
- 2200 Took one last ash sample. 750 pounds of ash was left in the ash cone. Dumped this.
- 2225 Gas supply pressure is a positive 0.8-1.0 inches w.g. Checked the cyclone and found water leaking from the slide gate packing. Flooded the cyclone again and rechecked the flame on the roof. Flame is burning irregularly. Vent valve is open.

END OF BOM/FGT 010 PEAT PELLETS

TEST LOG

JUNE 5, 1984

- 1000 Finished loading 11.74 tons of metallurgical coke into the weigh bin.
- 1015 Started setting the bed.
- 1115 Finished setting the bed with 1575 pounds of ash and 400 pounds of lump charcoal.
- 1130 Added fuel oil and began the gravity feed of coke into the retort.
- 1145 Dropped coke, leaving 0.63 tons in the weigh bin. Noticed, initially, a plugging in the south leg.
- 1215 Closed the retort and filled the traps.
- 1322 Lit the gasifier.
- 1350 Combustion gas is available at the test port.
- 1425 Lit the combustor.
- 1740 Rotated the agitator 1 revolution.
- 1755 Reduced the saturation air flow to 1200 cfm from 1460 cfm.
- 1830 Reduced the saturation air flow to 1000 cfm from 1200 cfm.
- 2015 Started the grate drive at 6/2.00.
- 2020 The bed is clinkered. Increased the saturation temperature from 65 C to 69 C.
- 2040 Dumping the cyclone produced 5 rakesful of particulate.
- 2130 The coal legs are now empty and we are dropping peat into the retort.
- 2140 Started loading peat into the upper bin.
- 2200 Dropped .69 tons of peat. The offtake temperature is now at 875 C.
- 2210 Reduced the saturation air flow to 400 cfm as we are now burning peat and can commence with the test plan.

2220 Noticed a power blip. Did not loose the saturation blower, but the grate drive went down in midstroke. Tried to restart the grate, but was unsuccessful.

2240 Finally restarted the grate at 3/? ("9" on the dial).

2250 Noticed the offtake is again pushing 800 C. Tried to drop peat, but cannot. The lower bin is full to the weigh bin gate valves, but there is no flow into the retort.

2255 Still no success in feeding the peat into the retort. The offtake temperature is now 1100 C. The decision was made to bank the gasifier for 3 reasons:

1. Inability to feed fuel down the coal pipes.
2. Excessively high offtake temperatures.
3. Combustor is out due to poor gas quality.

2300 Vent valve functioned properly. The cyclone is flooded.

June 6, 1984

0600 Will attempt to restart the grate pushing 4 teeth and will probe the bed, one hole at a time. This, in attempt to determine where we stand for possible restart.

0615 Poked a rod up through both coal pipe valve openings. The bed is crusty 2 feet above the grate. The grate drive is now wired direct.

0640 Restarted the saturation blower. The saturation air is at 200 cfm. We are venting.

0648 Saturation air flow is at 450 cfm. No gas flow has been detected through the cleanout port on the coal leg when opened.

0652 Poked through the top lock hopper valve. No voids were detected in the lower lock hopper.

0702 Attempting to take a fire test on a few holes to check ash level and bed condition.

0740 Saturation air flow is 400 cfm.

0756 Started the agitator at a slow speed to promote flow into the retort. The pipes appear to be packed with peat.

0835 Increased the saturation air flow to 500 cfm.

0840 Decreased the saturation air flow to 400 cfm.

0845 Increased the grate to 6 teeth.

0900 Increased the saturation air flow to 500 cfm.

0920 We will try to deliver gas to the combustor. Turned on the combustor and scrubber fans.

0955 Main flame will not remain on.

1000 Venting gas out the stack.

1015 Working on the combustor to increase the natural gas flame, thus aiding ignition of the peat gas.

1055 Lowered the saturation temperature to 59 C in attempt to improve the gas quality.

1057 Increased the jacket water flow from 5 gpm to 10 gpm.

1130 Delivered gas to the combustor. Flame is maintaining with the primary and secondary air closed.

1145 Reduced the grate from 6 teeth to 1.

1340 Adjusted the grate to 3 teeth.

1420 Flushed the cyclone for the first time. First pH test was done on the scrubber also.

1435 Closed the induced draft vane valve to 25% open in attempt to hold the cyclone outlet pressure at 0.5 inches wc.

1530 Increased the saturation air flow to 690 cfm.

1800 Fire test showed a very thin ash layer. Reduced the grate speed to 3/2.50.

2100 Reduced the saturation air flow from 750 cfm to 700 cfm. to stabilize the offtake temperature.

2300 Freeboard average is 47 inches. Holes number 3, 4 & 5 are glowing brightly. Ash level was very low, with numbers 2, 3 & 5 having only 2 inches. Slowed the grate to 3/1.35. This is as slow as it will go.

June 7, 1984

0005 Fire test results show we have gained ash. We are now averaging 5.4 inches. Leaving the grate at 3/1.35. The poke rods are going in easily, with a slight crust evident near the bottom. The bed shows

a tendency to be cooler on the number 1,6 & 7 side. The bars were barely red after 3 minutes.

- 0040 Reset the offtake alarm set point to go off at 600 C.
- 0100 Noticed that the steam input has increased from 450 pph to 1050 pph. The ashpit pressure is at 5.0 inches wc.
- 0120 Steam flow is now up to 1160 pph.
- 0130 The delta p at the steam orifice is now 24 inches wc and the steam flow is 1350 pph. Ashpit pressure is 5.1 inches wc. Offtake temperature was momentarily at 640 C. and then dropped back to 575 C level.
- 0200 Fire test ash level is averaging 7.1 inches after leaving the bars in for 3.5 minutes. Hole number 3 produced multiple zones on the poke rod. Leaving the grate at 3/1.35.
- 0210 Dumped 590 pounds of ash. The ash was dry with many chunks 2-3 inches in diameter and a few clinkers 7" X 4" X 5".
- 0230 The scrubber seive discharge thermocouple is now functioning. This time we were only able to feed .25 ton of peat. Both the north and south weigh bin cones are plugged.
- 0240 We were able to feed an additional .96 ton of peat from the weigh bin. The offtake temperature is now over 700 C. We are getting no particulate from the cyclone.
- 0250 Started loading peat into the weigh bins at 1.51 tons. We will go to a maximum of 5 tons.
- 0300 Gas quality has gradually deteriorated over the last 2 hours, as the offtake temperature has climbed. The offtake temperature is now at 720 C and we are getting no "high temp" alarm, though the "high temp" light is on.
- 0310 The offtake is still at 720 C and it is half an hour past the last peat feed.
- 0400 Fire test indicated an average of 8.9 inches of ash with clinkers developing. Had to use the sledge on rods number 2 & 3. Number 2 rod came out cold after 4 minutes. No multiple zones were evident this fire test. Leaving the grate at 3/1.35.
- 0515 Dumped 507 pounds of ash. There were many clinkers 5-6 inches in diameter. The pH is 5.0. Increasing

the caustic speed to 40/40.

- 0600 Firetest ash average is 9.6 inches. The bed is now fairly even. The zones are still very narrow, however. Number 6 rod was cold after 4 minutes. Number 3 rod went in with difficulty.
- 0630 Started filling the weigh bin to 5 tons.
- 0710 Increased the water to the upper spray nozzles to lower the scrubber temperature from 292 C to 66 C.
- 0730 Reset the caustic pump to the scrubber at 50/40 to increase the pH.
- 0800 Bar number 2 had multiple zones as did number 4.
- 0820 Opened the back pressure valve to 85.2% to guard against plugging lines.
- 0830 Turned off the agitator to do the pressure and temperature bed probe test.
- 0845 Freeboard average is 40 inches. Increased the agitator speed to 8 sweeps/hour.
- 0930 Scrubber inlet temperature has increased from 65 C to 404 C. The top spray ring is off. Turned the spray ring on.
- 0955 The scrubber inlet temperature is 72 C.
- 1215 Ash average is 43 inches. Changed the teeth on the grate from 3 to 6. Changed the primary air flow to 20% open and the secondary air flow to 10% open.
- 1330 The north side of the coal bin is hanging up. Had to pound it down.
- 1615 We experienced a power blip, which shut us down.
- 1628 Made the water seal at the cyclone.
- 1751 We are back in business. Everything is on.
- 1850 Increased the agitator speed to 27 sweeps/hour to bring the freeboard height up.
- 1900 Power blip shut us down once more.
- 1915 Power is out on site now.
- 2000 Power to the site is back on but the weather is so bad, we are waiting to make sure the power is going to stay on.

2030 While waiting to start up again, the decision was made to coal up. We began normal coal up procedure, when it was noticed the coal weight was not moving up normally. Immediately the crew stopped loading. The bucket elevator had failed. After taking the drive motor and gear box apart, it was discovered that the shaft keyway had worked it's way out. We repaired it and are, once again, waiting for the weather to settle down. There are tornado warnings for the area until 0200.

2330 Gasifier is still in a banked state. The weather is still excessively wet. The peat piles and pad area are water logged. We are attempting to clear off the water. Will keep watch on the bed condition and shoot for restart at 0300.

0030 The vent stack is not lit and we are unable to re-light it as the gas quality is too poor.

0130 The peat piles are saturated and now resembles mud. As water is pushed off the pad, more runs out from under the piles.

0200 Flushed the caustic line. Looks like we lost the big tree out by the duck pond, due to the storm.

0245 Checked the condition of the bed and found it to be cold after 15 minutes.

0300 Cycled the coal valves will start the saturation blower for 45 minutes to liven up the bed.

0310 The weigh bin is at 1.89 tons. Cycled 1.32 tons into into the lower bin. The north slide is plugged. Started the saturation blower. It is still raining.

0400 Stopped the saturation blower. Started work on the poke hole steam lines.

0530 Rechecked the bed. The bed is very stiff with no zones after 15 minutes. The vent stack is now lit.

0600 The sun is up. Will take the tarps off the peat piles to aid in drying out of the piles.

0945 Started the saturation blower at 500 cfm. The saturation temperature is 60 C.

1000 Started the grate drive at 5/0.80. Started the agitator at 8.0 sweeps/hour.

1030 Increased the saturation air flow to 600 cfm.

1055 System is back on line. Increased the saturation air

flow to 800 cfm.

- 1100 Sample freeboard showed 45 inches average. Increased the agitator speed to 14.1 sweeps/hour.
- 1115 Increased the grate speed to 1.37.
- 1145 Increased the saturation air flow to 900 cfm.
- 1400 The coal legs are hot (plugged).
- 1430 Increased the grate drive teeth from 5 to 7.
- 2045 Caustic barrel went empty. The pH went down to 6.0 before we got the new barrel open.
- 2330 Dumped ash at 629 pounds. The ash is dry, hot and very hard. The particles were mostly under 2 inches in diameter.

June 9, 1984

- 0005 Fire test results were hard to determine as 4 of the 7 bars were cold after 4 minutes insertion time. Had to slow the agitator during the fire test. A narrow ash zone was evident. Slowed the grate to 7/1.00 to increase the ash level. The bed is very cold and sticky.
- 0030 Using about 2 tons of peat/hour at the current load. The south leg is still plugging during the peat feed. Started loading peat into the weigh bin. Dumping ash for the second time during the last hour. Grate speed will remain slower until the 0200 fire test.
- 0130 Cyclone particulate remains light (3-4 rakesful). Noticed a few 3 inch sized floating chunks from the walls of the cyclone. The grate is still churning out over 500 pounds of ash per hour.
- 0200 Fire test results were better this time. The bed is still thick and sticky. The ash average was 12.4 inches. Adjusting the grate to 7/1.25 to maintain the ash level at 1 foot.
- 0230 Dumped ash again. This is the 4th time in a 3 hour period.
- 0300 Loading peat into the weigh bin. Will fill to 5 tons.
- 0345 Stopped loading peat into the weigh bin at 5.12 tons.
- 0400 Back to the cold bars again on this fire test. Bars

number 1, 4, 5 & 7 were cold after 4-5 minutes in the fire. No dirty bars. The bed is a little looser, but is still sticky. Number 6 showed some bottom crust.

0420 Dumped ash again at 890 pounds.

0430 Trying the full close to full open position on the cyclone dump procedure. This is how we ended up last year. The results were over a foot of accumulation in the bottom of the tank.

0530 Loading peat into the upper bin again at 1.19 tons.

0600 Fire test shows a 9.4 inch ash average. The bars were left in 5-8 minutes. All were cold but number 3. The bed is less sticky, with a bottom crust. Slowed the grate to 7/1.15 to maintain ash.

0620 Advised to reduce the saturation temperature to 58 C. Hopefully this will make the bed hotter.

0630 Increase the scrubber upper nozzle flow as the spray ring solenoid valve failed and have had an increased scrubber inlet temperature over the last 3 hours.

0645 Saturation temperature is back to 60 C as the CO/CO2 ratio is deteriorating.

0648 Slowed the agitator to 15 sweeps/hour to accomodate the pressure and temperature bed probe.

0655 The ash cone weight indicator is not increasing. Inspection shows the upper valve was closed. Dropped dry ash, then sprayed the underside of the grate to loosen the packed ash.

0725 Closed the back pressure valve to 45% open to increase the gas supply pressure from 0.1 to 1.0 inch wc.

0730 Scrubber is running hot. 485 C breaker tripped for the top spray ring - no water flow.

0830 Increased the saturation air flow to 1100 cfm. Opened the back pressure valve to 66.9%.

0940 Increased the agitator speed to 30.0 sweeps/hour.

1015 Lowered the agitator arm from 36" to 38" and slowed the speed down from 30 to 20 sweeps/hour.

1020 Slowed the grate from 1.79 to 1.40.

1030 Increased the saturation steam temperature from 60 to

62 degrees.

- 1040 Cyclone dump produced a large amount of particulate.
- 1250 Starting load swings. The saturation air flow will be reduced from 1100 cfm to 500 cfm. The saturation temperature will be reduced from 62 to 58 C. Decreasing the agitator speed from 25.2 to 8.0 sweeps/hour. Decreasing the grate speed from 0.90 to 0.40 at 7 teeth. Closed the back pressure valve from 76.9% to 31.4%.
- 1350 Increased the saturation air flow back to 1100 cfm. The saturation temperature is brought back to 62 C. The agitator speed is now at 27.0 sweeps/hour and the grate is at 0.80.
- 1650 Reduced the saturation air flow to 900 cfm and the saturation temperature to 60 C. Reduced the grate speed to 0.70.
- 1830 Increased the grate speed to 0.80. The ash depth average is coming up.
- 2030 Ash is still building up. Turned the grate speed up to 0.95.
- 2320 Discovered that the upper ashpit valve was closed. The last ash dump was at 2230 hours. Dumped and flushed 550 pounds from under the grate.
- 2330 Operators outside were trying to clear out the water build up on the pad. It has finally quit raining! The peat piles were covered with plastic.

June 10, 1984

- 0005 Fire test shows high ash levels on numbers 1, 2, 3 & 6. Number 3 bar was bright orange and a channel was evident all the way to the grate. This test took 20 minutes as we had to straighten 5 of the 7 poke rods. Increased the grate speed to 7/1.50 to regain a 12 inch ash level average.
- 0045 Started loading peat into the upper bin. The peat under the plastic is still dry. Dumped 750 pounds of ash.
- 0100 Filling the weigh bin is a continuous process at 2 tons/hour and not being able to put more than 5 tons on top at any time.
- 0200 Fire test shows an ash average of 11.1 inches. Number 2 bar showed multiple zones. Large clinkers were

evident under holes number 2 & 6. Slowed the grate to 7/0.75 to maintain a 12 inch ash average.

0330 All is well outside. The peat piles will be used up by morning. The pH has gone from 7.5 to 6.0. Changed caustic barrels.

0400 Fire test shows a 13 inch ash average. There were multiple zones on bars number 1 & 2. Leaving the grate speed at 7/1.00.

0430 The drain at the bottom of the gasifier building is plugged. Operators are trying to unplug it.

0530 The last 4.27 tons of peat is now in the weigh bin.

0600 Fire test shows an ash average of 12.6 inches. There was a layer of crust evident under number 2. The other bars went in easily. Slowed the grate to 7/0.85 to build up ash.

0620 The offtake temperature is now at the highest it has been all night (144 C).

0730 Cleaned the upper bin of the peat.

0800 Started loading coke into the upper bin for the system cleanout burn.

0920 Coal leg alarm sounded. We are now dropping coke into the retort.

0950 Slowed the agitator to 22.0 sweeps/hour. Freeboard average is 37.5 inches.

1015 Changed the grate teeth to 3 from 7.

1045 Freeboard average is 37.6 inches. Slowed the agitator to 18.0 sweeps/hour. Lowered the offtake pressure and closed the induced draft vane valve to 10% open (70 psi).

1225 Increased the saturation air flow to 1200 cfm from 900 cfm.

1330 There was a great deal of sludge in the cyclone.

1625 Saturation temperature is rising. Turned the agitator up and cut the steam input.

1630 Dumped the last of the coke - 1.51 tons.

1730 Cycled the coal valves. Left the top valve open. Flooded the cyclone. Shut down the saturation blower

interlocks - induced draft fan and agitator control.

END OF BOM/FGT 011 PEAT SODS

BOM/FGT 013 PEAT PELLETS

TEST LOG

JULY 16, 1984

- 0730 Readied the gasifier for start-up. Filled the jacket, agitator and scrubber tanks. Filled the cyclone to overflow. Fuel oil is in. Saturation blower is 10% open.
- 0850 Dropped 9.3 tons of petroleum coke.
- 0900 Set the draft.
- 0908 Light off.
- 0915 Repaired the caustic feed system.
- 0928 Have combustable gas. Lit the flare and will continue to vent on the roof until further notice.
- 1005 Delivered gas to the combustor.
- 1020 Saturation air flow is 400 cfm and the saturation temperature is 59 C.
- 1100 Increased the jacket water to lower the saturation temperature which was fluctuating in the area of 70 C.
- 1200 Fire test shows an even 11-12 inch ash bed. Readjusted the steam purge on holes number 2 & 6.
- 1300 The offtake temperature is staying in the range of 430-450 C. Jacket water flow is 17 gpm. The steam valve is 6-7% open. Took the initial set of readings, temperatures and pressures.
- 1345 Stopped loading pellets into the weigh bin at 9.38 tons. Ten tons should be our limit in the weigh bin as the peat is not very dense. These pellets are the rescreened 7/8" pellets from last year's run which have been in covered storage over the winter.
- 1400 Fire test shows the bed to have 8.3 inches of ash (average). Number 7 bar showed multiple zones.
- 1630 The weather, again, is not cooperating. There are severe thunderstorm warnings out. There is very heavy rain and lightening and possibility of golf ball sized hail. Hopefully this will pass. We are ready to introduce the peat to the retort, but are waiting for the weather to ease up.
- 1700 Offtake temperature is 518 C. We are still waiting

to drop the peat.

- 1720 The offtake temperature is 520 C. It has finally quit raining.
- 1800 This fire test shows an even ash bed. The offtake temperature dropped to 390 C when we did the fire test, but now it has gone back up to 500 C.
- 2210 The offtake temperature is 520 C. The coal legs are hot. You can see cherry red coals through the poke holes so we are going to drop the peat.
- 2215 Cycled the valves 3 times. This first peat drop took 4.78 tons. The offtake temperature dropped to 325 C. Cutting the jacket water inlet to 16 inches wc from 18.5 inches wc.
- 2330 Dropped a little less than half a ton of peat during this peat feed.
- 2345 Ran out of paper on the air flow graph. The paper had been inserted backwards. Will start it at 0000.

July 17, 1984

- 0005 Ash average is 5.14 inches.
- 0020 Opened the back pressure valve to 83% open to maintain 1.5 inches wc.
- 0040 Increased the jacket water flow to 20 gpm. Saturation temperature is 60 C. The steam line is closed.
- 0100 Started loading peat into the weigh bin at 3.76 tons.
- 0145 Stopped loading peat at 9.28 tons.
- 0200 This fire test showed an ash average of 9.9 inches. The bed is deepening and staying fairly level. The rods went in with ease to the crust zone and then had to pound them in for the last 10 inches.
- 0400 Fire test ash average is 9.9 inches. The bed condition is staying level.
- 0600 Fire test ash average is 9.42 inches.
- 0630 Adjusted the scrubber water, both the upper ring and the main supply. It had been making things too wet around the fines chute.
- 0730 All charts are showing stable straight lines. The

grate is still off as the ash depth is still under 12 inches. The offtake temperature is 290 C. We are dropping 1/2 ton/hour at the saturation air flow of 400 cfm. We will try to gradually cut back the jacket water to see if the steam will maintain the saturation temperature at 59 C. Currently the jacket water flow is 18-19 gpm.

- 0800 This fire test shows a 9.7 inch ash average. Bottom crust was evident on holes 2,3,5 & 6. We will start the grate to loosen up the bed. We are also preparing to increase the saturation air flow.
- 0810 Increased the saturation air flow to 800 cfm and the saturation temperature to 60 C. The jacket water flow is currently at 16.5 gpm. Starting the grate at 2/1.00. Increased the combustor air flow to maintain 0.5-1.0 inches wc on the cyclone outlet.
- 0900 Retook the fire test on the two lowest holes seen at 0800. Both have lost some ash. Slowed the grate speed to 2/0.75. Over the past 24 hours, the saturation temperature readout has been reading 3 C above the actual according to the strip chart indicator. Our previous deviation was 2 C.
- 0940 Succeeded in repairing the air flow indicator on the secondary combustion blower. Now it is reading 5000 cfm. The valve is 28% open. The annubar delta p on the saturation air flow indicator is now functioning again and reading correctly at 0.12 inches wc.
- 0945 Uncovered the peat piles to allow them to breathe and dry out after yesterday's rain.
- 1000 This fire test showed a multiple zone on rod number 6. The bed has loosened, somewhat. Leaving the grate at 2/0.75.
- 1020 Reduced the saturation temperature to 59 C. The CO2 seems to increase as the offtake temperature decreases.
- 1130 The bed continues to cool down. Offtake temperature is 218 C. Gas quality is steadily improving. Cyclone particulate is almost nil. There is some light colored floating silt and a few chunky pieces on the bottom.
- 1200 Fire test showed that we have lost considerable ash as the average is down to 5.7 inches. The bed seems to alternate from low hole to high hole all the way around and it is getting cooler. Leaving the grate speed at 2/0.75 until 1300 and then we will retake the fire test.

- 1210 Dumped 550 pounds of ash. The ash was damp with mostly 1-3 inch pieces.
- 1300 Approximately 24 tons of 1/2" X 1/4" pellets arrived along with another 28 tons of 7/8" X 1/4". The 1/2" sized pellets were isolated and covered.
- 1400 This fire test shows a 6.6 inch ash average. The bars went in easily. Leaving the grate at 2/0.75 to level out the bed. Offtake temperature is down to 155-160 C and the gas quality is steadily improving.
- 1410 Started loading peat into the weigh bin at 3.95 tons.
- 1500 Saturation air flow is 800 cfm with the offtake temperature at 120 C.
- 1600 The fire test ash average is up to 8.1 inches.
- 1800 Fire test ash average is again up; this time to 13.4 inches.
- 2000 Ash average is 17 inches. Increasing the grate speed slightly (2/1.00) to bring down the ash level a bit.
- 2130 The offtake temperature is 120 C. Everything is running smoothly. There has been almost no particulate in the cyclone all evening. Co is reading 30% and the CO2 is 8%.
- 2200 Ash average is 14 inches. Reducing the grate speed to 2/0.85.
- 2245 The offtake temperature is 109 C. All readings are stable.

July 18, 1984

- 0000 Fire test ash average is 18 inches. All rods went in easily. The crust level is about 24 inches from the bottom.
- 0015 Increased the grate speed to 2/1.00.
- 0030 Dumped 600 pounds of ash mostly 3/4 inch across (a few 4-5 inches).
- 0035 This cyclone dump produced only a trace of brown floating silt.
- 0045 The pH is 8.0. Reduced pump and stroke to 30 & 40 respectively.
- 0200 Fire test ash average is 16.7 inches. Increased the

grate speed to 2/1.15. There is a distinct 10-12 inch fire zone.

0230 Started loading peat into the weigh bin at 2.91 tons.

0400 Fire test ash average is 24.3 inches.

0600 Fire test ash average is 23.2 inches. Rods number 2 & 6 showed multiple zones. Increased the grate speed to 2/1.45. Replaced the caustic barrel.

0620 Started the outside cleanup.

0730 Gas quality is good with the CO at 30%, the CO₂ at 7% and the higher heating value is 176 BTU/ft³. The offtake temperature is 100 C. There is still very little particulate coming from the cyclone.

0800 Fire test ash average is 18.3 inches. We are hitting hard crust all around. Increased the grate speed to 4/1.45.

0830 Started the pressure and temperature probe for 800 cfm saturation air flow.

0920 Dumped 650 pounds of damp ash. The texture is very fine and an orangish-brown in color.

1000 We are hitting clinkers on the holes 1-3. There were multiple zones on bars 2 & 6. Increased the grate to 6 teeth. We will poke holes 1, 2, 4 & 7 in half an hour.

1015 Started loading peat into the weigh bin at 3.21 tons.

1100 After poking the above mentioned holes, it should be noted that we are still hitting very hard clinkers in the region of holes 1-3.

1200 This fire test shows the bed loosening up a little. The clinkers are still very evident in the region of holes 1-3 and 6. Number 4 is now a cold spot.

1205 Grate drive kicked out during the fire test. The heaters are not adequate. The drive kicks out in mid-stroke. Have some huge clinkers as the drive is pulling over 6 amps.

1255 Finally got the grate back on line and pulling 10 teeth. Letting it run full out at 10/2.18. The saturation air flow back from 1200 cfm. We are currently feeding 3 tons/hour.

1303 The grate is out again. This time it went out with the mid point at 3 o'clock. Installed larger heaters

in the box.

- 1312 Got the grate started again. It is still pulling 5-8 amps when driving. Started loading peat into the upper bin. Increased the saturation temperature to 62 C to aid in loosening the bed.
- 1320 The grate drive continues to kick out. It is now pulling 12-14 amps when driving. Decided to shorten the stroke thus cutting the torque necessary to drive the grate. We can only push 6 teeth with the drive rod in the lowest hole. Grate speed is now 6/2.21.
- 1400 This fire test shows 23.9 inches ash average. There is an accumulated mass on the wall in the region of holes 1 & 2. The bed is extremely hard. Decreasing the saturation air flow to 1000 cfm to see if the grate can keep up.
- 1440 Continued to poke holes number 1 & 2.
- 1500 Holes number 1 & 2 are still heavy with clinker.
- 1600 Fire test ash average is 28 inches. Number 6 rod had multiple zones. The grate is running full out.
- 1800 Fire test ash average is 31.8 inches. Decreasing the saturation air flow to 800 cfm and the furnace pressure to 65 inches wc.
- 1945 Dumped the last of the 7/8" peat and will let it run out before adding the 1/2" peat.
- 2000 Fire test ash average is 23 inches average.
- 2200 The offtake temperature went up to 230 C. Coal leg temperature went up to 55 C. Dropped 5.48 tons of the 1/2" peat. Decreased the grate speed to 1.80.
- 2205 The offtake came down to 70 C after the peat feed.
- 2230 Dropped 2.31 tons of peat. Started loading peat into the weigh bin at 1.67 tons.
- 2300 Finished loading the rest of the 1/2" peat.
- 2330 Dumped 830 pounds of ash.

July 19, 1984

- 0000 Fire test ash average is 6.7 inches. Reduced the grate speed to 3/0.41 to increase the ash level.
- 0200 Fire test ash average is 17.9 inches. Increased the

grate speed to 3/1.25. the rods went in easily until they reached the 36 inch mark then had to be pounded down the rest of the way.

- 0300 Dumped 790 pounds of ash. The size of the ash varied from golf ball to softball size.
- 0310 Increased the grate speed to 3/1.8. Burning through is evident on holes 2,3,4 & 5. The offtake temperature is beginning to increase rapidly. Will poke the holes that are burning through to bring the offtake down.
- 0400 Fire test ash average is 26.42 inches. Increased the grate to 6/1.00. Holes 2,3,4 & 5 are still burning through. We will poke them every 20 minutes.
- 0500 Due to poor bed conditions, we are lowering the saturation air flow to 400 cfm and the saturation temperature to 60 C. We will continue to poke the bed. Reduced the furnace pressure to 60 inches wc. The back pressure valve is 75% open. Reduced the grate speed to 3/1.00.
- 0600 Fire test ash average is 27 inches. We have burning through on all holes except number 6. Increased the grate speed to 3/1.80.
- 0645 Decreased the grate speed to 3/1.00. The caustic barrel is almost empty, we will change it soon.
- 0700 The bed continues to burn through. The offtake temperature is over 550 C. Turned the agitator on for 3 or 4 passes to spread the peat toward the outside walls for a more even fuel distribution. Offtake temperature is staying in the range of 78-90 C. As soon as the agitator is turned off the burning through reappears.
- 0730 During this fire test we had to use the sledge on all poke rods. The ash bed has hardened into one large clinker. One wonders if the 1/2 inch pellets could be contaminated with dirt and sand.
- 0800-0830 Continued to run the agitator periodically, but it does not help the situation appreciably. We will shut down as the fuel quality is poor.
- 0848 Started flooding the cyclone.
- 0900 Opened the vent valve. Cut back on the scrubber water. Opened the downcomer to facilitate burn out of the horizontal duct. We will let the pipes burn out today and clean out the retort tomorrow.

APPENDIX B

Weather Data for Testing Days

These data were taken from NOAA weather station 72658
approximately 3 miles from the test site.

Note: Barometric pressure has been adiabatically normalized to
sea level from 840 feet elevation and ambient temperature.

Temperature in degrees Farenheit

Relative Humidity in %

Barometric Pressure in inches mercury

Precipitation in inches

BOM/FGT 010 Peat Pellets

WEATHER DATA

DATE: November 9, 1983

HOURLY	TEMP	RELATIVE	BAROMET	RAIN
		HUMIDITY	PRESS	SNOW

0100	36	92	29.130	.09
0200	37	92	29.130	.03
0300	37	92	29.125	.02
0400	37	89	29.105	.06
0500	35	92	29.095	.08
0600	35	92	29.085	.04
0700	34	92	29.140	.01
0800	33	92	29.140	.12
0900	34	92	29.125	.07
1000	33	92	29.115	.07
1100	33	96	29.103	.10
1200	33	96	29.175	.05
1300	33	96	29.105	.05
1400	33	96	29.130	.01
1500	33	96	29.130	.01
1600	34	92	29.150	.01
1700	34	89	29.180	T
1800	33	92	29.190	T
1900	34	89	29.220	T
2000	33	85	29.210	
2100	33	78	29.220	
2200	33	82	29.210	
2300	32	82	29.230	
2352	31	82	29.220	

General Conditions: Cloudy sunrise and sunset. No sunshine. Maximum wind speed is 23 mph.

BOM/FGT 011 Peat Sods

WEATHER DATA

DATE: June 5, 1984

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
0100	66	93	28.685	0.31
0200	66	97	28.675	
0300	68	93	28.705	
0400	66	97	28.685	
0500	66	97	28.685	
0600	70	87	28.685	
0700	71	87	28.695	
0800	72	87	28.705	
0900	75	82	28.705	
1000	76	79	28.705	
1100	77	77	28.710	
1200	78	76	28.715	
1300	79	77	28.725	
1400	82	72	28.725	
1500	83	70	28.725	
1600	84	61	28.725	
1700	84	59	28.715	
1800	82	65	28.705	
1900	81	67	28.705	
2000	80	72	28.705	
2100	77	85	28.685	0.01
2200	77	82	28.705	
2300	78	79	28.695	
2400	79	74	28.725	

General Conditions: Cloudy sunrise and sunset. 701 minutes of sunshine (76%). Maximum wind speed was 22 mph.

DATE: June 6, 1984

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
0100	77	74	28.715	
0200	75	84	28.725	
0300	74	87	28.730	
0400	73	90	28.715	
0500	71	90	28.715	
0600	71	90	28.740	
0700	72	90	28.740	
0800	76	83	28.730	
0900	77	79	28.725	
1000	78	74	28.725	
1100	80	69	28.715	
1200	82	69	28.695	
1300	83	63	28.695	
1400	85	59	28.675	
1500	88	50	28.635	T
1600	85	51	28.635	T
1700	83	59	28.635	
1800	82	63	28.645	
1900	80	65	28.650	
2000	79	65	28.665	T
2100	76	71	28.680	
2200	76	74	28.725	
2300	72	79	28.735	
2400	70	84	28.750	

General Conditions: Cloudy sunrise and sunset. 672 minutes of sunshine (72%). Maximum wind speed was 31 mph.

DATE: June 7, 1984

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
0100	67	90	28.740	
0200	66	93	28.740	
0300	66	93	28.740	
0400	65	96	28.750	
0500	67	96	28.760	
0600	69	93	28.755	
0700	73	87	28.760	
0800	76	79	28.755	
0900	77	79	28.730	
1000	80	69	28.730	
1100	82	58	28.725	
1200	82	56	28.705	
1300	84	51	28.685	
1400	80	62	28.675	
1500	75	79	28.625	0.12
1600	68	97	28.645	1.26
1700	67	97	28.585	0.86
1800	66	100	28.565	0.47
1900	69	100	28.480	0.10
2000	71	90	28.350	0.08
2100	68	90	28.430	0.01
2200	66	96	28.430	0.01
2300	65	100	28.460	
2400	65	93	28.460	

General Conditions: Cloudy sunrise and sunset. 487 minutes of sunshine (52%). Maximum wind speed was 35 mph.

DATE: June 8, 1984

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
0100	65	97	28.450	T
0200	65	97	28.470	0.03
0300	64	90	28.490	
0400	64	93	28.490	
0500	64	87	28.510	
0600	66	87	28.535	
0700	67	84	28.565	
0800	68	78	28.585	
0900	69	78	28.625	
1000	71	73	28.655	
1100	73	68	28.685	
1200	73	68	28.715	
1300	74	62	28.725	
1400	74	62	28.750	
1500	73	62	28.770	
1600	73	62	28.790	
1700	75	60	28.810	
1800	74	60	28.830	
1900	74	58	28.850	
2000	70	73	28.880	
2100	68	78	28.925	
2200	68	78	28.925	
2300	65	87	28.937	
2400	62	93	28.955	

General Conditions: Clear sunrise and sunset. 784 minutes of sunshine (84%). Maximum wind speed was 30 mph.

DATE: June 9, 1984

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
0100	62	93	28.955	
0200	61	97	28.945	
0300	62	93	28.945	
0400	61	97	28.965	
0500	61	97	28.995	
0600	61	97	28.995	
0700	64	97	28.995	
0800	68	84	28.995	
0900	70	78	28.985	
1000	71	79	28.955	
1100	72	76	28.945	
1200	74	71	28.955	
1300	76	64	28.935	
1400	77	60	28.910	
1500	76	58	28.900	
1600	73	68	28.890	
1700	72	71	28.880	T
1800	68	90	28.850	0.01
1900	67	90	28.830	0.01
2000	65	100	28.820	0.30
2100	65	100	28.800	0.17
2200	65	100	28.780	0.08
2300	66	100	28.770	
2400	66	100	28.760	

General Conditions: Cloudy sunrise and sunset. 548 minutes of sunshine (59%). Maximum wind speed was 18 mph.

DATE: June 10, 1984

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
0100	66	100	28.740	
0200	66	97	28.740	
0300	65	97	28.730	
0400	64	93	28.730	
0500	61	90	28.250	
0600	60	93	28.770	
0700	62	87	28.810	T
0800	62	80	28.830	
0900	61	82	28.860	T
1000	59	90	28.900	T
1100	58	97	28.975	T
1200	58	100	29.025	T
1300	62	80	29.065	0.01
1400	66	75	29.085	T
1500	65	78	29.115	
1600	67	73	29.125	
1700	64	78	29.051	
1800	63	81	29.150	
1900	62	81	29.160	
2000	62	81	29.180	
2100	61	84	29.210	
2200	60	84	29.230	
2300	59	90	29.250	
2400	59	87	29.250	

General Conditions: Cloudy sunrise and sunset. 520 minutes of sunshine (56%). Maximum wind speed was 24 mph.

BOM/FGT 013 Peat Pellets

WEATHER DATA

DATE: July 16, 1984

HOURL	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
0100	64	67	29.130	
0200	62	72	29.125	
0300	59	81	29.125	
0400	58	83	29.125	
0500	56	90	29.115	
0600	62	75	29.115	
0700	67	65	29.105	
0800	71	59	29.095	
0900	75	52	29.085	
1000	78	48	29.065	
1100	81	44	29.040	
1200	82	44	29.005	
1300	80	47	28.990	
1400	72	71	29.000	
1500	67	78	28.940	
1600	65	84	28.920	
1700	66	87	28.890	
1800	66	84	28.880	
1900	66	84	28.860	
2000	67	84	28.850	
2100	66	87	28.890	
2200	66	87	28.920	
2300	60	81	28.935	
2400	57	90	28.935	

General Conditions: Clear sunrise
and cloudy sunset. 629 minutes of
sunshine (69%). Maximum wind
speed was 25 mph.

DATE: July 17, 1984

HOURL	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
0100	56	93	28.935	
0200	57	83	28.925	
0300	56	90	28.935	
0400	57	86	28.945	
0500	57	83	28.855	
0600	59	78	28.975	
0700	62	70	28.985	
0800	65	63	28.975	
0900	67	56	28.975	
1000	68	53	28.975	
1100	68	53	28.975	
1200	69	53	28.975	
1300	72	51	28.985	
1400	74	46	28.985	
1500	74	46	28.995	
1600	73	46	29.005	
1700	74	44	29.015	
1800	74	44	29.015	
1900	73	44	29.035	
2000	68	61	29.055	
2100	65	68	29.085	
2200	62	78	29.095	
2300	59	87	29.105	
2400	59	87	29.105	

General Conditions: Clear sunrise
and cloudy sunset. 892 minutes
of sunshine (98%). Maximum wind
speed was 25 mph.

APPENDIX C
Peat Sizing Data

Feed Peat Size Distribution for BOM/FGT-010

Sample Number	Date	Shift Start Time	Screen Mesh Size inch	Cumulative Mass Fraction, % less than stated mesh size, inch				
				1/4	1/2	3/4	1	1 1/2
1	11/ 9/84	0: 0	ROS*	0.5	3.2	10.8	51.2	75.0
2	11/ 9/84	8: 0	ROS	5.1	13.0	20.2	88.6	99.4
3	11/ 9/84	16: 0	ROS	0.4	2.3	6.5	86.5	100.0
AVERAGE				2.6	7.4	14.0	76.9	92.2

*) RUN OF SHIPMENT

Feed Peat Size Distribution for BOM/FGT-011

Sample Number	Date	Shift Start Time	Screen Mesh Size inch	Cumulative Mass Fraction, % less than stated mesh size, inch				
				1/4	1/2	3/4	1	1 1/2
1	6/ 5/84	16:00	+1/4	4.1	16.4	31.7	47.1	72.2
2	6/ 6/84	8:00	+1/4	2.3	14.0	30.3	49.6	84.3
3	6/ 6/84	16:00	+1/4	2.9	17.9	35.2	51.9	78.1
4	6/ 7/84	0:00	+1/4	3.2	18.2	37.3	51.0	75.1
5	6/ 7/84	8:00	+1/4	2.0	11.2	27.9	50.3	79.2
6	6/ 7/84	16:00	+1/4	4.6	22.2	38.3	51.0	72.3
7	6/ 8/84	8:00	+1/4	3.1	17.5	33.0	45.7	67.5
8	6/ 8/84	16:00	+1/4	5.7	24.6	45.4	64.3	86.8
9	6/ 9/84	0:00	+1/4	4.1	22.4	44.1	66.1	89.6
10	6/ 9/84	8:00	+1/4	3.2	18.1	34.8	51.0	82.3
11	6/ 9/84	16:00	+1/4	4.7	23.9	48.2	67.6	92.0
12	6/10/84	0:00	+1/4	5.4	27.2	50.7	64.1	84.9
1 - 12 AVERAGES				3.7	19.4	38.3	55.8	81.4

Feed Peat Size Distribution for BOM/FGT-013

Sample Number	Date	Shift Start Time	Pellet Size inch(*)	Cumulative Mass Fraction, % less than stated mesh Size, inch				
				1/4	1/2	3/4	1	1 1/2
2	7/17/84	0:00	7/8	0.6	5.0	14.6	71.0	97.3
3	7/17/84	8:00	7/8	0.8	10.1	21.1	83.5	100.0
4	7/17/84	16:00	7/8	0.9	8.3	18.4	84.3	100.0
5	7/18/84	0:00	7/8	0.5	5.1	17.6	90.4	98.4
6	7/18/84	8:00	7/8	1.8	11.2	22.5	87.0	100.0
8	7/18/84	16:00	1/2	1.4	44.1	100.0	100.0	100.0
9	7/19/84	0:00	1/2	0.6	36.4	100.0	100.0	100.0
10	7/19/84	8:00	1/2	1.7	45.1	100.0	100.0	100.0

Averages								
Samples : 2-6, (7/8")				0.8	7.0	17.8	82.0	98.7
8-10 (1/2")				1.1	41.1	100.0	100.0	100.0

(*) A 1/4" screen was used for the feed peat throughout the test.

DATE: July 18, 1984

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
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0100	58	90	29.115	
0200	57	90	29.115	
0300	57	90	29.130	
0400	55	96	29.140	
0500	55	96	29.150	
0600	57	93	29.160	
0700	62	84	29.170	
0800	66	73	29.175	
0900	70	61	29.180	
1000	73	48	29.175	
1100	75	42	29.170	
1200	76	40	29.150	
1300	77	40	29.135	
1400	78	41	29.125	
1500	78	42	29.105	
1600	79	41	29.095	
1700	78	42	29.085	
1800	77	45	29.075	
1900	74	51	29.065	
2000	70	59	29.065	
2100	68	63	29.075	
2200	67	68	29.065	
2300	64	75	29.055	
2400	64	75	29.055	

General Conditions: Clear sunrise and sunset. 912 minutes of sunshine (100%). Maximum wind speed was 16 mph.

DATE: July 19, 1984

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
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0100	65	73	29.055	
0200	64	78	29.055	
0300	65	78	29.065	
0400	63	81	29.055	
0500	63	81	29.075	
0600	64	78	29.085	
0700	67	75	29.075	
0800	71	64	29.065	
0900	74	62	29.055	
1000	76	62	29.035	
1100	77	60	29.035	
1200	81	55	29.025	
1300	81	56	29.015	
1400	81	56	29.015	
1500	81	61	29.015	
1600	81	60	29.020	
1700	81	58	29.015	
1800	81	58	29.015	
1900	79	62	29.015	
2000	77	67	29.035	
2100	76	69	29.035	
2200	73	76	29.045	
2300	73	71	29.065	
2400	71	68	29.060	

General Conditions: Cloudy sunrise and sunset. 764 minutes of sunshine (84%). Maximum wind speed was 13 mph.

APPENDIX D

Peat Addition Log

Peat weights are given in short tons.

BOM/FGT 010 PEAT PELLETS

PEAT FEED

DATE	TIME	SAMPLE NUMBER	SCREEN IN	WASH?	START WT.	STOP WT.	NET WT.
11-09	0130	010-C1	.25	NO	12.85	11.59	1.26
11-09	0230	010-C1	.25	NO	11.59	10.90	.69
11-09	0330	010-C1	.25	NO	12.66	11.99	.67
11-09	0430	010-C1	.25	NO	11.99	10.82	1.17
11-09	0530	010-C1	.25	NO	10.82	9.64	1.18
11-09	0630	010-C1	.25	NO	11.41	10.28	1.13
11-09	0730	010-C1	.25	NO	10.71	9.26	1.45
11-09	0830	010-C2	.25	NO	9.26	7.97	1.29
11-09	0900	010-C2	.25	NO	7.97	7.10	.87
11-09	0930	010-C2	.25	NO	7.10	6.30	.80
11-09	1000	010-C2	.25	NO	6.30	5.53	.77
11-09	1030	010-C2	.25	NO	5.53	4.54	.99
11-09	1100	010-C2	.25	NO	4.54	2.43	2.11
11-09	1130	010-C2	.25	NO	8.26	6.74	1.52
11-09	1200	010-C2	.25	NO	12.85	12.23	.62
11-09	1230	010-C2	.25	NO	12.23	11.37	.86
11-09	1300	010-C2	.25	NO	11.37	10.27	1.10
11-09	1330	010-C2	.25	NO	10.27	9.16	1.11
11-09	1400	010-C2	.25	NO	9.16	7.96	1.20
11-09	1430	010-C2	.25	NO	10.92	9.66	1.26
11-09	1500	010-C2	.25	NO	12.81	11.80	1.01
11-09	1530	010-C3	.25	NO	11.80	10.42	1.38
11-09	1600	010-C3	.25	NO	10.42	9.07	1.35
11-09	1630	010-C3	.25	NO	9.07	7.72	1.35
11-09	1700	010-C3	.25	NO	7.72	6.44	1.28
11-09	1730	010-C3	.25	NO	6.44	5.04	1.40
11-09	1800	010-C3	.25	NO	5.04	3.74	1.30
11-09	1830	010-C3	.25	NO	3.74	2.58	1.16
11-09	1900	010-C3	.25	NO	2.58	1.68	0.90
11-09	1930	010-C3	.25	NO	1.68	.24	1.44
11-09	2000	010-C3	.25	NO	.24	.22	.02
11-09	2030			CYCLED THE VALVES			
11-09	2100			CYCLED THE VALVES			

END OF BOM/FGT 010 PEAT PELLETS

BOM/FGT 011 PEAT SODS

PEAT FEED

DATE	TIME	SAMPLE NUMBER	START WT.	STOP WT.	NET WT.	SCREEN (IN)	
6/ 5	1145	COKE	11.74	0.63	11.11	0.25	SODS
6/ 5	1255	COKE	2.21	0.29	1.92	0.25	SODS
6/ 5	1530	COKE	3.45	0.78	2.67	0.25	SODS
6/ 5	1730	COKE	0.78	0.57	0.21	0.25	SODS
6/ 5	2130	P1	3.35	0.54	2.81	0.25	SODS
6/ 5	2200	P1	2.38	1.69	0.69	0.25	SODS
6/ 5	2250	P1	1.92	0.00	1.92	0.00	SODS
6/ 6	0730	P2	1.89	1.78	0.11	0.25	SODS
6/ 6	0900	P2	1.79	1.63	0.16	0.25	SODS
6/ 6	0930	P2	4.10	3.72	0.38	0.25	SODS
6/ 6	1030	P2	3.72	3.44	0.28	0.25	SODS
6/ 6	1145	P2	3.45	3.00	0.45	0.25	SODS
6/ 6	1240	P2	2.99	2.73	0.26	0.25	SODS
6/ 6	1330	P2	2.73	2.48	0.25	0.25	SODS
6/ 6	1430	P2	5.41	4.91	0.50	0.25	SODS
6/ 6	1530	P2	4.90	4.39	0.51	0.25	SODS
6/ 6	1630	P2	4.29	3.57	0.72	0.25	SODS
6/ 6	1730	P2	3.55	2.76	0.79	0.25	SODS
6/ 6	1840	P2	2.76	1.74	1.02	0.25	SODS
6/ 6	1930	P2	1.74	1.21	0.53	0.25	SODS
6/ 6	2030	P2	1.21	0.63	0.58	0.25	SODS
6/ 6	2130	P2	4.70	3.90	0.80	0.25	SODS
6/ 6	2230	P2	5.75	4.93	0.82	0.25	SODS
6/ 6	2330	P4	4.93	4.19	0.74	0.25	SODS
6/ 7	0030	P4	4.19	3.38	0.81	0.25	SODS
6/ 7	0130	P4	3.38	2.71	0.67	0.25	SODS
6/ 7	0230	P4	2.71	2.47	0.24	0.25	SODS
6/ 7	0240	P4	2.47	1.51	0.96	0.25	SODS
6/ 7	0330	P4	4.35	3.70	0.65	0.25	SODS
6/ 7	0430	P4	4.85	4.10	0.75	0.25	SODS
6/ 7	0530	P4	4.10	3.23	0.87	0.25	SODS
6/ 7	0630	P4	3.23	2.46	0.77	0.25	SODS
6/ 7	0730	P5	4.83	4.06	0.77	0.25	SODS
6/ 7	0830	P5	4.06	3.34	0.72	0.25	SODS
6/ 7	0930	P5	3.34	2.00	1.34	0.25	SODS
6/ 7	1030	P5	2.00	0.69	1.31	0.25	SODS
6/ 7	1130	P5	3.45	1.90	1.55	0.25	SODS
6/ 7	1230	P5	1.90	1.00	0.90	0.25	SODS
6/ 7	1330	P5	5.85	4.40	1.45	0.25	SODS
6/ 7	1430	P5	4.40	3.14	1.26	0.25	SODS
6/ 7	1630	P6	6.70	5.25	1.45	0.25	SODS
6/ 7	1730	P6	5.25	3.72	1.53	0.25	SODS
6/ 7	1830	P6	3.72	1.70	2.02	0.25	SODS
6/ 7	2330	P6	0.00	0.00	0.00	0.25	SODS
6/ 8	0310	P6	1.89	0.57	1.32	0.25	SODS
6/ 8	920	P7	4.03	3.79	0.24	0.25	SODS
6/ 8	1030	P7	3.79	3.19	0.60	0.25	SODS
6/ 8	1130	P7	3.19	1.92	1.27	0.25	SODS

DATE.	TIME	SAMPLE NUMBER	START WT.	STOP WT.	NET WT.	SCREEN (IN)	
6/ 8	1230	P7	1.92	0.37	1.55	0.25	SODS
6/ 8	1330	P7	4.31	2.20	2.11	0.25	SODS
6/ 8	1400	P7	4.47	3.84	0.63	0.25	SODS
6/ 8	1430	P7	4.97	4.35	0.62	0.25	SODS
6/ 8	1530	P8	4.35	2.49	1.86	0.25	SODS
6/ 8	1630	P8	2.49	1.49	1.00	0.25	SODS
6/ 8	1730	P8	2.24	0.55	1.69	0.25	SODS
6/ 8	1830	P8	4.85	2.64	2.21	0.25	SODS
6/ 8	1930	P8	5.27	3.02	2.25	0.25	SODS
6/ 8	2030	P8	5.75	3.59	2.16	0.25	SODS
6/ 8	2130	P8	6.56	4.29	2.27	0.25	SODS
6/ 8	2230	P8	5.42	3.85	1.57	0.25	SODS
6/ 8	2330	P9	4.67	2.67	2.00	0.25	SODS
6/ 9	30	P9	2.67	0.78	1.89	0.25	SODS
6/ 9	130	P9	5.08	3.03	2.05	0.25	SODS
6/ 9	230	P9	3.03	1.02	2.01	0.25	SODS
6/ 9	330	P9	4.36	2.49	1.87	0.25	SODS
6/ 9	430	P9	5.12	3.19	1.93	0.25	SODS
6/ 9	530	P9	3.19	1.19	2.00	0.25	SODS
6/ 9	630	P9	4.57	2.54	2.03	0.25	SODS
6/ 9	730	P10	5.53	3.44	2.09	0.25	SODS
6/ 9	830	P10	3.44	1.07	2.37	0.25	SODS
6/ 9	900	P10	2.92	1.48	1.44	0.25	SODS
6/ 9	930	P10	4.37	3.05	1.32	0.25	SODS
6/ 9	1000	P10	5.09	3.94	1.15	0.25	SODS
6/ 9	1030	P10	3.94	2.62	1.32	0.25	SODS
6/ 9	1100	P10	2.61	1.33	1.28	0.25	SODS
6/ 9	1130	P10	4.00	2.64	1.36	0.25	SODS
6/ 9	1200	P10	5.54	4.03	1.51	0.25	SODS
6/ 9	1230	P10	4.03	2.91	1.12	0.25	SODS
6/ 9	1330	P10	2.91	1.38	1.53	0.25	SODS
6/ 9	1430	P10	6.82	5.51	1.31	0.25	SODS
6/ 9	1500	P10	5.51	4.90	0.61	0.25	SODS
6/ 9	1530	P11	4.90	3.80	1.10	0.25	SODS
6/ 9	1600	P11	4.87	2.31	2.56	0.25	SODS
6/ 9	1630	P11	2.31	1.27	1.04	0.25	SODS
6/ 9	1700	P11	2.85	1.76	1.09	0.25	SODS
6/ 9	1730	P11	4.65	3.44	1.21	0.25	SODS
6/ 9	1800	P11	4.32	0.45	1.21	0.25	SODS
6/ 9	1830	P11	7.22	6.45	0.77	0.25	SODS
6/ 9	1900	P11	6.45	5.09	1.36	0.25	SODS
6/ 9	1930	P11	5.09	4.34	0.75	0.25	SODS
6/ 9	2000	P11	4.35	3.45	0.90	0.25	SODS
6/ 9	2030	P11	3.45	2.67	0.78	0.25	SODS
6/ 9	2100	P11	2.67	1.68	0.99	0.25	SODS
6/ 9	2130	P11	3.30	2.25	1.05	0.25	SODS
6/ 9	2200	P11	6.39	4.76	1.63	0.25	SODS
6/ 9	2300	P11	4.76	3.24	1.52	0.25	SODS
6/ 9	2330	P12	3.25	2.11	1.14	0.25	SODS
6/10	0	P12	2.11	1.27	0.84	0.25	SODS
6/10	30	P12	2.95	2.06	0.89	0.25	SODS
6/10	100	P12	2.32	1.38	0.94	0.25	SODS

DATE	TIME	SAMPLE NUMBER	START WT.	STOP WT.	NET WT.	SCREEN (IN)	
6/10	130	P12	4.24	2.61	1.63	0.25	SODS
6/10	200	P12	2.61	1.52	1.09	0.25	SODS
6/10	230	P12	4.06	3.16	0.90	0.25	SODS
6/10	300	P12	3.16	2.22	0.94	0.25	SODS
6/10	330	P12	3.81	2.46	1.35	0.25	SODS
6/10	400	P12	2.46	1.46	1.00	0.25	SODS
6/10	430	P12	2.72	1.75	0.97	0.25	SODS
6/10	500	P12	3.43	2.48	0.95	0.25	SODS
6/10	530	P12	4.12	3.11	1.01	0.25	SODS
6/10	600	P12	4.27	3.16	1.11	0.25	SODS
6/10	630	P12	3.16	2.13	1.03	0.25	SODS
6/10	700	P12	2.13	1.13	1.00	0.25	SODS
6/10	730	P13	1.13	0.83	0.30	0.25	SODS
6/10	920	COKE	11.12	7.27	3.85	0.25	SODS
6/10	1045	COKE	9.25	6.55	2.70	0.25	SODS
6/10	1100	COKE	6.55	6.22	0.33	0.25	SODS
6/10	1130	COKE	6.22	5.70	0.52	0.25	SODS
6/10	1230	COKE	5.70	4.74	0.96	0.25	SODS
6/10	1330	COKE	4.73	3.43	1.30	0.25	SODS
6/10	1430	COKE	3.43	2.36	1.07	0.25	SODS
6/10	1530	COKE	2.35	1.65	0.70	0.25	SODS
6/10	1630	COKE	1.65	0.14	1.51	0.25	SODS

BOM/FGT-013 PEAT PELLETS

PEAT FEED

DATE	TIME	SAMPLE NUMBER	START WT.	STOP WT.	NET WT.	SCREEN WASH? (IN)	
7/16	850	COKE	9.83	0.63	9.20	0.25	NO
7/16	1030	COKE	0.91	0.63	0.28	0.25	NO
7/16	1130	COKE	0.88	0.30	0.58	0.25	NO
7/16	1230	COKE	0.30	0.02	0.28	0.25	NO
7/16	2215	-	9.45	4.77	4.68	0.25	NO NO SAMPLE
7/16	2330	P2	4.77	4.31	0.46	0.25	NO 7/8" PELLETS
7/17	30	P2	4.31	3.76	0.55	0.25	NO 7/8" PELLETS
7/17	130	P2	8.75	8.12	0.63	0.25	NO 7/8" PELLETS
7/17	230	P2	9.29	8.77	0.52	0.25	NO 7/8" PELLETS
7/17	330	P2	8.77	8.05	0.72	0.25	NO 7/8" PELLETS
7/17	430	P2	8.05	7.43	0.62	0.25	NO 7/8" PELLETS
7/17	530	P2	7.43	6.81	0.62	0.25	NO 7/8" PELLETS
7/17	630	P2	10.62	9.88	0.74	0.25	NO 7/8" PELLETS
7/17	730	P3	9.88	9.38	0.50	0.25	NO 7/8" PELLETS
7/17	830	P3	9.38	8.60	0.78	0.25	NO 7/8" PELLETS
7/17	930	P3	8.60	7.75	0.85	0.25	NO 7/8" PELLETS
7/17	1030	P3	7.75	6.91	0.84	0.25	NO 7/8" PELLETS
7/17	1130	P3	6.91	5.98	0.93	0.25	NO 7/8"
7/17	1230	P3	5.98	5.00	0.98	0.25	NO 7/8"
7/17	1330	P3	5.00	3.95	1.05	0.25	NO 7/8"
7/17	1430	P3	7.68	6.43	1.25	0.25	NO 7/8"
7/17	1530	P4	10.22	8.96	1.26	0.25	NO 7/8"
7/17	1630	P4	8.97	7.47	1.50	0.25	NO 7/8"
7/17	1730	P4	7.47	5.94	1.53	0.25	NO 7/8"
7/17	1830	P4	5.94	4.35	1.59	0.25	NO 7/8"
7/17	1930	P4	4.35	2.77	1.58	0.25	NO 7/8"
7/17	2030	P4	2.77	1.42	1.35	0.25	NO 7/8"
7/17	2130	P4	8.62	6.85	1.77	0.25	NO 7/8"
7/17	2230	P4	11.88	10.19	1.69	0.25	NO 7/8"
7/17	2330	P5	10.19	8.46	1.73	0.25	NO 7/8"
7/18	30	P5	8.46	6.69	1.77	0.25	NO 7/8"
7/18	130	P5	6.69	4.79	1.90	0.25	NO 7/8"
7/18	230	P5	4.79	2.91	1.88	0.25	NO 7/8"
7/18	330	P5	9.22	7.43	1.79	0.25	NO 7/8"
7/18	430	P5	7.43	5.84	1.59	0.25	NO 7/8"
7/18	530	P5	8.25	6.37	1.88	0.25	NO 7/8"
7/18	630	P5	10.56	8.76	1.80	0.25	NO 7/8"
7/18	730	P6	8.76	6.86	1.90	0.25	NO 7/8"
7/18	830	P6	6.86	5.07	1.79	0.25	NO 7/8"
7/18	930	P6	5.07	3.21	1.86	0.25	NO 7/8"
7/18	1030	P6	5.14	3.08	2.06	0.25	NO 7/8"
7/18	1130	P6	9.40	6.69	2.71	0.25	NO 7/8"
7/18	1245	P6	7.74	4.62	3.12	0.25	NO 7/8"
7/18	1245	P6	7.74	4.62	3.12	0.25	NO 7/8"
7/18	1343	P6	7.97	5.00	2.97	0.25	NO 7/8"
7/18	1430	P6	9.28	7.20	2.08	0.25	NO 7/8"
7/18	1530	P7	9.38	7.03	2.35	0.25	NO 7/8"
7/18	1630	P7	7.03	4.49	2.54	0.25	NO 7/8"

APPENDIX E
Ash Analysis Data

ASH ANALYSIS FOR BOM/FGT-010

Sample Number	Date	Time	Cumulative Mass Fraction, % less than stated size, inch					Bulk Density gm/cc	Moisture content %	Carbon content %	Sulfur content %
			1/4	1/2	3/4	1	2				
1	11/ 9/84	9: 0	28.9	46.2	57.6	73.0	95.8	0.76	25	5.2	1.00
2	11/ 9/84	12:35	35.9	45.8	52.2	57.3	79.8	0.87	17	2.8	0.12
3	11/ 9/84	14:19	40.4	70.8	81.7	87.2	94.7	0.92	12	1.5	0.11
4	11/ 9/84	16: 0									
5	11/ 9/84	18: 0	15.2	35.7	52.3	63.7	92.0	0.67	5	1.5	0.10
6	11/ 9/84	20: 0									
7	11/ 9/84	22: 0	34.7	59.1	73.5	82.7	100.0	0.69	11	2.7	0.11
AVERAGE											
Samples, 3 - 7			30.1	55.2	69.2	77.9	95.6	0.76	9.2	1.9	0.11

ASH ANALYSIS FOR BOM/FGT-011

Sample Number	Date	Time	Cumulative Mass Fraction, % less than stated size, inch					Bulk Density gm/cc	Moisture content %	Carbon content %	Sulfur content %
			1/4	1/2	3/4	1	2				
2	6/ 6/84	7:44	55.2	74.6	87.5	90.8	99.4	—	22	26.5	0.77
3	6/ 6/84	9:00	9.1	28.8	28.8	58.8	72.5	—	6	18.1	0.47
4	6/ 6/84	10:30	16.7	24.3	24.3	36.6	45.7	—	13	10.4	0.65
5	6/ 6/84	13:00	1.0	1.8	1.8	7.7	54.8	—	13	10.4	0.22
6	6/ 6/84	17:00	7.6	24.0	24.0	63.4	95.7	0.94	0	10.4	0.24
7	6/ 6/84	18:20	0.2	4.8	31.4	31.4	72.3	—	0	25.5	0.47
8	6/ 6/84	20:20	3.8	17.6	36.2	54.3	94.0	0.92	1	10.6	0.20
9	6/ 6/84	22:29	4.4	19.7	36.0	52.3	82.1	1.01	1	4.3	0.25
10	6/ 7/84	2:09	7.0	20.3	37.7	51.8	80.6	0.93	2	4.1	0.34
11	6/ 7/84	5:19	1.0	1.5	2.4	3.4	32.2	0.85	1	3.9	0.18
12	6/ 7/84	9:14	1.6	3.7	10.2	23.4	64.7	0.81	3	3.6	0.23
13	6/ 7/84	12:14	5.9	16.9	29.0	40.1	83.4	0.70	4	2.5	0.19
15	6/ 7/84	13:00									
16	6/ 7/84	16:00	8.1	21.7	41.7	56.1	90.0	0.63	2	1.2	0.17
17	6/ 7/84	18:00									
18	6/ 7/84	20:10	19.5	39.2	55.3	64.6	82.1	0.75	4	2.2	0.13
19	6/ 8/84	11:30	29.5	38.8	46.2	51.1	74.0	0.76	5	2.7	0.24
23	6/ 8/84	13:00									
24	6/ 8/84	14:35	30.0	51.8	63.1	71.8	96.0	0.72	9	1.0	0.26
25	6/ 8/84	15:30									
26	6/ 8/84	16:14	14.4	29.0	41.3	51.7	76.6	0.74	3	2.0	0.17
27	6/ 8/84	18:00									
28	6/ 8/84	18:50	12.1	30.5	45.6	59.0	88.7	0.71	1	5.9	0.23
29	6/ 8/84	19:39									
30	6/ 8/84	20:29	9.0	21.2	35.4	52.3	81.5	0.66	2	2.3	0.11
31	6/ 8/84	21:14									
32	6/ 8/84	23:00	17.2	36.2	51.5	66.5	87.6	0.68	1	3.8	0.12
33	6/ 8/84	23:29									
34	6/ 9/84	0:25	30.1	49.6	63.7	72.1	91.2	0.66	1	2.8	0.09
35	6/ 9/84	2:50									
36	6/ 9/84	4:30	29.5	53.7	70.0	79.7	93.7	0.67	1	1.5	0.10
37	6/ 9/84	5:40									
38	6/ 9/84	7:00	21.6	36.4	48.8	60.1	84.0	0.65	8	0.9	0.05
42	6/ 9/84	11:14									
43	6/ 9/84	13:00	47.5	59.6	74.9	85.0	89.9	0.70	1	1.0	0.12
44	6/ 9/84	15:10	15.5	30.0	40.4	49.5	64.6	0.67	4	2.0	0.16

ASH ANALYSIS FOR BOM/FGT-011

Sample Number	Date	Time	Cumulative Mass Fraction, % less than stated size, inch					Bulk Density gm/cc	Moisture content %	Carbon content %	Sulfur content %
			1/4	1/2	3/4	1	2				
45	6/ 9/84	16:29	25.0	37.6	51.9	61.1	75.1	0.61	5	1.4	0.15
46	6/ 9/84	17:29	27.3	42.5	50.6	56.9	69.9	0.69	4	1.1	0.15
47	6/ 9/84	19:00									
48	6/ 9/84	21:00	29.2	46.3	57.2	66.2	86.7	0.74	3	0.8	0.12
49	6/ 9/84	22:00									
50	6/ 9/84	23:10	16.3	34.4	46.9	57.0	86.3	0.63	4	0.8	0.13
51	6/10/84	0:30									
52	6/10/84	1:29	14.3	27.2	36.3	42.7	66.2	0.67	0	5.5	0.38
53	6/10/84	2:50									
54	6/10/84	4:15	7.1	13.7	20.5	29.4	47.3	0.59	0	3.8	0.18
55	6/10/84	6:15									
56	6/10/84	9:19	35.4	55.6	67.6	79.3	88.1	0.69	2	1.8	0.18
58	6/10/84	12:19	27.4	41.2	51.0	59.6	80.0	0.74	15	3.3	0.24
59	6/10/84	13:55									
60	6/10/84	15:10	25.2	38.0	48.3	57.6	79.0	0.73	14	4.2	0.21
61	6/10/84	17:00									
5 - 61 AVERAGE			16.9	30.5	42.5	53.4	78.7	0.733	3.7	4.1	0.19

ASH ANALYSIS FOR BOM/FGT-013

Sample Number	Date	Time	Cumulative Mass Fraction, % less than stated size, inch					Bulk Density gm/cc	Moisture content %	Carbon content %	Sulfur content %
			1/4	1/2	3/4	1	2				
1	7/17/84	12:14	1.1	3.8	7.1	15.0	51.1	0.75	4	6.6	0.53
2	7/17/84	16:00	6.2	20.3	34.0	54.1	83.0	0.76	4	45.4	2.90
3	7/17/84	21:29	1.4	3.0	6.9	12.2	44.1	0.75	5	6.0	0.80
4	7/18/84	0:30	5.7	12.9	19.8	25.9	49.3	0.76	7	4.9	1.00
5	7/18/84	4:19	8.0	47.5	58.6	86.7	100.0	0.73	—	1.8	0.76
6	7/18/84	6:40									
7	7/18/84	9:30	13.6	31.4	45.9	57.0	74.3	0.85	10	1.7	0.75
8	7/18/84	11:00									
9	7/18/84	13:00	18.3	46.9	65.4	78.9	95.7	0.88	11	1.6	0.95
10	7/18/84	14:30									
11	7/18/84	15:39	9.9	28.4	47.7	64.1	88.9	0.94	3	1.0	0.25
12	7/18/84	16:45									
13	7/18/84	18:10	4.7	19.1	35.7	52.0	87.1	0.81	2	0.4	0.22
14	7/18/84	19:00									
15	7/18/84	19:50	5.3	18.3	36.9	50.0	87.0	0.73	2	0.2	0.12
16	7/18/84	20:39									
17	7/18/84	21:29	4.4	13.4	25.4	37.9	75.3	0.78	1	0.1	0.19
19	7/18/84	22:50									
20	7/18/84	23:20	3.1	9.7	20.6	34.1	78.9	0.71	1	0.6	0.15
21	7/19/84	3:00	5.3	19.4	37.0	48.1	76.1	0.89	3	4.9	0.59
22	7/19/84	4:50									
23	7/19/84	8:00	53.9	65.1	70.3	75.8	79.1	—	—	2.8	0.29
5 - 22 AVERAGES			8.1	26.0	41.5	56.8	84.8	0.813	4.1	1.5	0.43

DATE	TIME	SAMPLE NUMBER	START WT.	STOP WT.	NET WT.	SCREEN WASH? (IN)
7/18	1730	P7	6.00	3.69	2.31	0.25 NO 7/8"
7/18	1830	P7	3.69	1.44	2.25	0.25 NO 7/8"
7/18	1930	P7	1.44	0.00	1.44	0.25 NO 7/8"
7/18	2200	P8	10.44	4.98	5.46	0.25 NO 1/2"
7/18	2230	P8	4.98	1.67	3.31	0.25 NO 1/2"
7/18	2330	P9	10.43	8.40	2.03	0.25 NO 1/2"
7/19	30	P9	10.76	9.00	1.76	0.25 NO 1/2"
7/19	130	P9	10.76	9.22	1.54	0.25 NO 1/2"
7/19	230	P9	9.22	7.64	1.58	0.25 NO 1/2"
7/19	330	P9	9.22	7.79	1.43	0.25 NO 1/2"
7/19	430	P9	7.79	6.49	1.30	0.25 NO 1/2"
7/19	530	P9	6.49	5.63	0.86	0.25 NO 1/2"
7/19	630	P9	5.63	4.85	0.78	0.25 NO 1/2"
7/19	730	P10	4.85	3.38	1.47	0.25 NO 1/2"
7/19	830	P10	3.38	1.90	1.48	0.25 NO 1/2"

END OF BOM/FGT 013 PEAT PELLETS

APPENDIX F

Ash Removal Log

Ash weights are given in pounds.

Flush water is given in gallons.

BOM/FGT 010 PEAT PELLETS

GASIFIER ASH

DATE	TIME	SAMPLE NUMBER	INITIAL DRY	FINAL DRY	NET DRY	INITIAL WET	FINAL WET	NET WET	NET DRY +NET WET	FLUSH WATER
1109	0900	PA1	929	195	734	591	170	421	1155	
1109	1035	PA2	1339	145	1194	511	144	367	1561	30U
1109	1420	PA3	1133	168	965	700	149	551	1516	30L
1109	1600	PA4	1267	148	1119	688	149	539	1658	30L
1109	1800	PA5	1293	167	1126	627	161	466	1592	30L
1109	2000	PA6	1234	173	1061	562	152	410	1471	30L
1109	2200	PA7	735	156	579	471	154	317	896	30L

END OF BOM/FGT 010 PEAT PELLETS

BOM/FGT-011 PEAT SODS

GASIFIER ASH

DATE	TIME	SAMPLE NUMBER	INIT DRY	FINAL DRY	NET DRY	INIT WET	FINAL WET	NET WET	NT +NT	DRY DRY	FLUSH WATER
6/ 5	2130	A1	626	18	608	360	14	346	954	0	
6/ 6	745	A2	810	26	784	226	20	206	990	30	
6/ 6	900	A3	746	27	719	135	22	113	832	30	
6/ 6	1030	A4	2076	16	2060	0	0	0	2060	30	
6/ 6	1130	A5	1258	13	1245	290	2	288	1533	30	
6/ 6	1700	A6	1691	461	1230	781	279	502	1732	30	
6/ 6	1820	A7	768	2	766	278	0	278	1044	30	
6/ 6	2020	A8	594	3	591	271	4	267	858	30	
6/ 6	2230	A9	538	3	535	281	6	275	810	30	
6/ 7	200	A10	592	14	578	294	12	282	860	30	
6/ 7	520	A11	512	12	500	287	11	276	776	30	
6/ 7	915	A12	565	19	546	279	17	262	808	30	
6/ 7	1215	A13	550	19	531	375	19	356	887	30	
6/ 7	1300	A14	675	49	626	397	121	276	902	30	
6/ 7	1420	A15	675	8	667	305	24	281	948	30	
6/ 7	1600	A16	875	2	873	366	22	344	1217	30	
6/ 7	1800	A17	694	6	688	337	0	337	1025	30	
6/ 7	2000	A18	495	0	495	282	0	282	777	30	
6/ 8	1130	A19	581	10	571	343	32	311	882	30	
6/ 8	1300	A23	736	19	717	300	31	269	986	30	
6/ 8	1435	A24	665	18	647	330	32	298	945	30	
6/ 8	1530	A25	598	14	584	398	32	366	950	30	
6/ 8	1615	A26	590	31	559	332	0	332	891	30	
6/ 8	1800	A27	528	20	508	402	16	386	894	30	
6/ 8	1850	A28	1071	14	1057	594	19	575	1632	30	
6/ 8	1940	A29	594	23	571	343	6	337	908	30	
6/ 8	2030	A30	607	13	594	342	83	259	853	30	
6/ 8	2115	A31	544	0	544	319	18	301	845	30	
6/ 8	2300	A32	785	0	785	352	6	346	1131	30	
6/ 8	2330	A33	629	16	613	430	71	359	972	30	
6/ 9	25	A34	578	33	545	380	28	352	897	30	
6/ 9	250	A35	809	36	773	385	38	347	1120	30	
6/ 9	430	A36	890	31	859	420	44	376	1235	30	
6/ 9	540	A37	625	73	552	417	76	341	893	30	
6/ 9	700	A38	131	61	70	660	61	599	669	30	
6/ 9	745	A39	637	61	576	485	65	420	996	30	
6/ 9	915	A40	826	64	762	476	54	422	1184	30	
6/ 9	1015	A41	625	62	563	406	58	348	911	30	
6/ 9	1115	A42	538	45	493	406	61	345	838	30	
6/ 9	1300	A43	516	60	456	406	60	346	802	30	
6/ 9	1330	A43	115	88	27	352	64	288	315	30	
6/ 9	1510	A44	537	67	470	440	65	375	845	30	
6/ 9	1630	A45	640	96	544	405	67	338	882	30	
6/ 9	1830	A46	656	41	615	360	17	343	958	30	
6/ 9	1950	A47	570	35	535	359	9	350	885	30	
6/ 9	2100	A48	574	32	542	343	15	328	870	30	
6/ 9	2230	A49	677	26	651	364	31	333	984	30	
6/ 9	2310	A50	70	38	32	550	33	517	549	30	

DATE	TIME	SAMPLE NUMBER	INIT DRY	FINAL DRY	NET DRY	INIT WET	FINAL WET	NET WET	NT +NT	DRY DRY	FLUSH WATER
6/10	30	A51	767	19	748	445	34	411	1159	30	
6/10	130	A52	660	16	644	346	8	338	982	30	
6/10	150	A53	520	5	515	341	22	319	834	30	
6/10	415	A54	671	2	669	332	19	313	982	30	
6/10	615	A55	935	5	930	364	13	351	1281	30	
6/10	920	A56	880	13	867	390	39	351	1218	30	
6/10	1025	A57	690	47	643	325	2	323	966	30	
6/10	1220	A58	610	7	603	379	7	372	975	30	
6/10	1355	A59	503	11	492	368	3	365	857	30	
6/10	1600	A60	582	35	547	409	18	391	938	30	
6/10	1800	A61	625	16	609	410	15	395	1004	30	
6/10	1800	A61	625	16	609	410	15	395	1004	30	

APPENDIX G

Retort Particle Sampling Data

Reference: Volume 1, Thimsen, Maurer et al, 1984

G-1. Dust Loading Data

G-2. Cumulative Dust Data

G-3. Cumulative Dust Size Distributions (1 included)

G-4. Dust Size Distribution Modal Analysis (1 included)

G-5. Explanation of Modal Fitting Parameters

TABLE G-1
DUST LOADING DATA

SAMPLE NUMBER	DATE	TIME	MASS PARTICLES (mg)	SAMPLE TIME (min)	DUST/ PEAT (%)	BLAST AIR (acfm)	OFFTAKE TEMP (deg C)	FREEBOARD HEIGHT (in)	SWEEP RATE (/HOUR)	AGITATOR ANGLE (deg)	PROBE DEPTH (in)
010-01	11-9-83	14:34	72.49	2.00	0.66	1028.1	81.0	43.0	0.0	300	34
011-01	6-6-84	15:55	9.90	3.33	0.22	715.6	307.3	43.5	3.0	0	34
011-02	6-6-84	16:28	7.80	3.33	0.18	715.6	285.8	44.5	3.0	30	34
011-03	6-6-84	16:51	5.70	3.33	0.11	715.7	298.0	44.5	3.0	330	34
011-04	6-8-84	14:06	12.60	0.37	1.11	907.2	136.4	42.3	27.4	325	34
011-05	6-8-84	14:55	14.00	0.42	1.22	906.0	157.6	42.3	24.0	270	34
011-06	6-8-84	15:39	18.50	0.42	1.48	906.2	141.6	42.3	24.0	210	34
011-07	6-9-84	09:17	17.30	0.42	0.80	1107.2	79.2	41.5	24.0	270	34
011-08	6-9-84	09:47	29.70	0.33	1.81	1109.9	82.1	41.5	30.0	325	34
011-09	6-9-84	10:30	39.70	0.50	1.60	1109.5	77.3	41.5	20.1	210	34
013-01	7-17-84	04:25	19.60	5.00	0.32	404.5	273.0	40.0	0.0	X	33
013-02	7-17-84	04:42	11.30	5.00	0.18	406.2	282.0	40.0	0.0	X	33
013-03	7-17-84	05:55	32.40	9.50	0.26	406.0	270.1	37.5	0.0	X	33
013-04	7-18-84	04:20	56.90	5.00	0.33	799.5	100.2	37.5	0.0	X	33
013-05	7-18-84	05:19	64.30	3.25	0.57	799.3	111.3	37.5	0.0	X	33
013-06	7-18-84	05:30	33.70	3.00	0.32	801.9	110.1	37.5	0.0	X	33

TABLE G-2

BOM/FGT-011 CUMULATIVE DUST DATA

SIEVING			Sample #
			011-08
ASTM SIEVE NUM.	SIEVE SIZE (um)	SHIFT SIZE (um)	Percent Less Than Stated Size (%)
20	841	1136.5	97.4
30	595	804.1	90.3
40	420	567.5	79.2
60	250	337.8	62.2
100	149	201.4	43.0
200	74	100.0	19.9
MICROSCOPY			
	PARTICLE DIAMETER		Percent Less Than Stated Size
	(um)		(%)
	100.0		19.9
	56.0		14.0
	32.0		8.0
	17.8		2.9
	10.0		0.86
	5.60		0.15
	3.20		0.02

Table G-3

Cumulative Dust Size Distribution

Table G-4

Dust Size Distribution Modal Analysis

011-08 VOLUME DIST.

CHN= 6E-03 CHS= .043 CHU= .046
 F1= 0 DG1= 1 SG1= 2
 F2= 3.72E+10 DG2= 43.9 SG2= 2.4
 F3= 1.66E+11 DG3= 300 SG3= 2.3

011-08 SURFACE DIST.

CHN= 6E-03 CHS= .043 CHU= .046
 F1= 0 DG1= 1 SG1= 2
 F2= 7.57E+09 DG2= 20.4 SG2= 2.4
 F3= 4.7E+09 DG3= 150 SG3= 2.3

011-08 NUMBER DIST.

CHN= 6E-03 CHS= .043 CHU= .046
 F1= 0 DG1= 1 SG1= 2
 F2= 2.69E+07 DG2= 4.4 SG2= 2.4
 F3= 266000 DG3= 32.4 SG3= 2.3

Table G-5

Description of Modal Fitting Parameters
(Associated with Figure G-4)

CHN: CHI square for the number distribution
CHS: CHI square for the surface distribution
CHV: CHI square for the volume distribution

If CHI square is less than 0.04 the fit is good.
If CHI square is less than 0.15 the fit is fair.

F1: Total number, surface, or volume of Mode 1 for the
 respective weighting. (*)
F2: Total number, surface, or volume of Mode 2 for the
 respective weighting.
F3: Total number, surface, or volume in Mode 3 for the
 respective weighting.

DG1: Geometrical mean diameter of Mode 1 for the given
 weighting (*)
DG2: Geometrical mean diameter of Mode 2 for the given
 weighting
DG3: Geometrical mean diameter of Mode 3 for the given
 weighting

SG1: Geometric Standard Deviation of Mode 1 (*)
SG2: Geometric Standard Deviation of Mode 2
SG3: Geometric Standard Deviation of Mode 3

(*) Unused modes are set to $F1 = 0$, $DG1 = 1$, and $SG1 = 2$, etc.

APPENDIX H

Gasifier Operator Logged Data

Included are three tables of data:

H-1. Freeboard Data

H-2. Firetest Data

H - Relatively hot incandescent zone

D - Multiple incandescent zones

C - Relatively cold incandescent zone

H-3. Operator Logged Data I

Water flows in gpm.

Water totals in gallons.

Steam flows in lb/min.

H-4. Operator Logged Data II

Agitator counter in (total revolutions * 2)

Grate Gear counter in (total grate revolutions * 116)

Further description of these data are given in Volume 1 of this series (Thimsen, Maurer et al, 1984).

TABLE H-1
FREEBOARD DATA

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
1109	0130	46			45			45.5
1109	0230			43			45	44.0
1109	0330	45			45			45.0
1109	0430		47			47		47.0
1109	0530			44			46	45.0
1109	0630	47			47			47.0
1109	0730		43			43		43.0
1109	0830			43			44	43.5
1109	0930	44			44			44.0
1109	1030		42			43		42.5
1109	1130			43			44	43.5
1109	1230	42			41			41.5
1109	1330		42			44		43.0
1109	1430			43			43	43.0
1109	1530	42			42			42.0
1109	1630		42.5			40.5		41.5
1109	1730			43			41	42.0
1109	1830	42			40			41.0
1109	1930		44			41		42.5
1109	2030			41			39	40.0

END OF BOM/FGT 010 PEAT PELLETS

BOM/FGT-011 PEAT SODS

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
6/ 5	1600	44.0				42.0		43.0
6/ 5	1700		47.0				69.0	58.0
6/ 5	1800			36.0			40.0	38.0
6/ 5	2000	25.0			24.0			24.5
6/ 5	2100		35.0			37.0		36.0
6/ 6	0835			39.0			39.0	39.0
6/ 6	1000	40.0	40.0	40.0	41.0	4.0	41.0	40.4*
		* AVERAGE INCLUDES HOLE #7 WHICH WAS						40.0
6/ 6	1200	41.0	42.0	40.0	39.0	41.0	40.0	37.3*
		* AVERAGE INCLUDES HOLE #7 WHICH WAS						18.0
6/ 6	1400	43.0	42.0	41.0	41.0	42.0	41.0	41.6*
		* AVERAGE INCLUDES HOLE #7 WHICH WAS						41.0
6/ 6	1530	42.0			45.0			43.5
6/ 6	1700			45.0			44.0	44.5
6/ 6	1800	45.0			48.0			46.5
6/ 6	1900		42.0			42.0		42.0
6/ 6	2000			45.0			46.0	45.5
6/ 6	2100	43.0			44.0			43.5
6/ 6	2200		48.0				48.0	48.0
6/ 6	2300			46.5			47.5	47.0
6/ 6	2300		41.0			40.0		40.5
6/ 7	0000			40.0			42.0	41.0
6/ 7	0100	41.0			41.0			41.0
6/ 7	0200		42.0			42.0		42.0
6/ 7	0300			42.0			41.0	41.5
6/ 7	0400	41.0			43.0			42.0
6/ 7	0500		41.0			40.0		40.5
6/ 7	0600			42.0			41.0	41.5
6/ 7	0800	40.0	41.0	41.0	40.0	41.0	41.0	40.5
6/ 7	0900	40.0	40.0		40.0	39.0		40.0
6/ 7	0950	41.0	42.0	42.0	43.0	42.0	42.0	42.0
6/ 7	1050	42.0		40.0	42.0		42.0	41.5
6/ 7	1150	42.0	43.0	41.0	42.0	41.0	43.0	42.0
6/ 7	1230	39.0	39.0	39.0	38.0	38.0	39.0	38.7
6/ 7	1300	39.0	38.0	38.0	37.0	40.0	40.0	38.6
6/ 7	1400	37.0	37.0	39.0	37.0	39.0	39.0	38.0
6/ 7	1500	41.0	42.0	42.0	41.0	42.0	41.0	41.5
6/ 7	1600	39.0	40.0	41.0	41.0	42.0	42.0	41.0
6/ 7	1800	40.0	42.0	42.0	40.0	44.0	42.0	41.7
6/ 7	1900	41.0	41.0	43.0	42.0	42.0	41.0	41.7
6/ 8	1100	45.0	45.0	46.0	45.0	44.0	44.0	44.8
6/ 8	1220	44.0	44.0	44.0	43.0	45.0	45.0	44.1
6/ 8	1300	40.0	41.0	42.0	42.0	42.0	41.0	41.3
6/ 8	1500	41.0	41.0	45.0	42.0	42.0	43.0	42.3
6/ 8	1700	43.0	42.0	42.0	42.0	41.0	41.0	42.0
6/ 8	1800		43.0			41.0		42.0
6/ 8	1900			41.0			42.0	41.5
6/ 8	2015	47.0			46.0			46.5
6/ 8	2100		44.0			42.0		43.0
6/ 8	2200			42.0			42.0	42.0
6/ 8	2300	41.0			39.0			40.0

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
6/ 9	0		39.0			39.0		39.0
6/ 9	100			42.0			40.0	41.0
6/ 9	200	41.0			40.0			40.5
6/ 9	300		39.0			40.0		39.5
6/ 9	400			38.0			39.0	38.5
6/ 9	500	39.0			40.0			39.5
6/ 9	600		40.0			39.0		39.5
6/ 9	700			43.0			43.0	43.0
6/ 9	745	39.0	41.0	41.0	40.0	40.0	41.0	40.3
6/ 9	935	41.0	43.0	42.0	39.0	42.0	42.0	41.5
6/ 9	1025	41.0	42.0	42.0	41.0	41.0	42.0	41.5
6/ 9	1110	42.0	43.0	43.0	42.0	43.0	42.0	42.5
6/ 9	1200	39.0	39.0	41.0	41.0	41.0	41.0	40.3
6/ 9	1300	40.0	40.0	42.0	41.0	41.0	41.0	41.0
6/ 9	1420	40.0	42.0	42.0	40.0	41.0	42.0	41.1
6/ 9	1500	38.0	39.0	39.0	40.0	40.0	40.0	39.3
6/ 9	1600			47.0			45.0	46.0
6/ 9	1700	40.0			41.0			40.5
6/ 9	1800		43.0			44.0		43.5
6/ 9	1900			41.0			38.0	39.5
6/ 9	2000	43.0			43.0			43.0
6/ 9	2100		40.0			38.0		39.0
6/ 9	2200			41.0			40.0	40.5
6/ 9	2300			38.0			38.0	38.0
6/10	0	37.0			38.0			37.5
6/10	100		38.0			37.0		37.5
6/10	200			38.0			38.0	38.0
6/10	300	36.0			38.0			37.0
6/10	400		41.0			39.0		40.0
6/10	500			38.0			39.0	38.5
6/10	600	38.0			36.0			37.0
6/10	700		37.0			37.0		37.0
6/10	810	40.0	42.0	42.0	41.0	41.0	41.0	41.1
6/10	900	41.0	39.0	39.0	38.0	38.0	38.0	38.8
6/10	930	38.0	38.0	39.0	39.0	39.0	39.0	38.6
6/10	1030	37.0	37.0	39.0	39.0	37.0	37.0	37.6
6/10	1110	36.0	37.0	36.0	36.0	36.0	37.0	36.3
6/10	1150	36.0	36.0	37.0	37.0	37.0	37.0	36.6
6/10	1200	39.0	39.0	40.0	39.0	40.0	39.0	39.5
6/10	1315	37.0	36.0	39.0	37.0	38.0	38.0	37.5
6/10	1430	40.0	40.0	39.0	39.0	40.0	40.0	39.6
6/10	1500	40.0	38.0	39.0	38.0	38.0	36.0	38.0
6/10	1600	40.0	41.0	40.0	41.0	41.0	42.0	40.8
6/10	1700	34.0	32.0	36.0	34.0	32.0	30.0	33.0

BOM/FGT-013

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
7/16	1300	37.0			37.0			37.0
7/16	1330			37.0			38.0	37.5
7/16	1430		40.0			40.0		40.0
7/16	1600			40.0			39.0	39.5
7/16	1700	39.0			41.0			40.0
7/16	1800		39.0			39.0		39.0
7/16	1900			39.0			39.0	39.0
7/16	2000	38.0			38.0			38.0
7/16	2100		39.0			41.0		40.0
7/16	2200			41.0			40.0	40.5
7/16	2300	38.0			37.0			37.5
7/16	2330	39.0			39.0			39.0
7/17	30		40.0			40.0		40.0
7/17	130			41.0			41.0	41.0
7/17	230	37.0			37.0			37.0
7/17	330		40.0			39.0		39.5
7/17	430			40.0			40.0	40.0
7/17	530	37.0			38.0			37.5
7/17	630		41.0			41.0		41.0
7/17	730	37.0			35.0			36.0
7/17	830		41.0			40.0		40.5
7/17	930			37.0			37.0	37.0
7/17	1030		40.5			39.5		40.0
7/17	1130			37.0			35.0	36.0
7/17	1230	36.0			35.0			35.5
7/17	1			36.0			38.0	37.0
7/17	1430		41.0			41.0		41.0
7/17	1600	36.0			37.0			36.5
7/17	1700		40.0			41.0		40.5
7/17	1800			39.0			39.0	39.0
7/17	1900	38.0			36.0			37.0
7/17	2000		41.0			42.0		41.5
7/17	2100			39.0			41.0	40.0
7/17	2200	40.0			38.0			39.0
7/17	2300		41.0			39.0		40.0
7/17	2330	37.0			38.0			37.5
7/18	30		40.0			39.0		39.5
7/18	130			40.0			38.0	39.0
7/18	230	38.0			39.0			38.5
7/18	330		39.0			39.0		39.0
7/18	430			37.0			38.0	37.5
7/18	530	36.0			39.0			37.5
7/18	630		38.0			39.0		38.5
7/18	730	36.0			36.0			36.0
7/18	830		40.0			40.0		40.0
7/18	930			37.0			37.0	37.0
7/18	1030	36.0			39.0			37.5
7/18	1130		41.0			39.0		40.0
7/18	1230			34.0			35.0	34.5
7/18	1330	34.0			36.0			35.0
7/18	1430		38.0			39.0		38.5

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
7/18	1600			40.0			40.0	40.0
7/18	1700	38.0			37.0			37.5
7/18	1800		39.0			40.0		39.5
7/18	1900			38.0			38.0	38.0
7/18	2000	36.0			36.0			36.0
7/18	2100		39.0			40.0		39.5
7/18	2200			39.0			40.0	39.5
7/18	2300	36.0			35.0			35.5
7/17	2330	35.0			37.0			36.0
7/18	30		41.0			40.0		40.5
7/18	130			39.0			39.0	39.0
7/18	230	36.0			35.0			35.5
7/18	330		42.0			41.0		41.5
7/18	430			38.0			37.0	37.5
7/18	530	36.0			36.0			36.0
7/18	630		39.0			39.0		39.0
7/18	730			33.0			32.0	32.5
7/18	830	33.0			32.0			32.5

END OF BOM/FGT 013 PEAT PELLETS

TABLE H-2

BOM/FGT 010 PEAT PELLETS

FIRE TEST DATA

Date	Time	Insertion Time (min)	#1	#2	#3	#4	#5	#6	#7	Average
11-09	0200	3	47	19	17	14	9	8	13	18.14
11-09	0400	3	55	14	42	18	13	16	13	24.43
11-09	0600	3	46	17	14D	19D	17	15	13D	20.14
11-09	0800	5	12	32C	14	20	21	16	17	18.86
11-09	1000	6	17	34	27	32	34	23	15	26.00
11-09	1200	6	14	35C	18	31	26	15	17	22.29
11-09	1400	6	14	14	33	24	30	8	14	19.57
11-09	1600	10	17C	8	12C	7	16	26	10	13.71
11-09	1800	10	5	12	16	9	10	16	9	11.00
11-09	2000	10	4C	8	5C	9	11	9	10	8.00

END OF BOM/FGT 010 PEAT PELLETS

BOM/FGT 011 PEAT SODS

FIRE TEST DATA

Date	Time	Insertion Time (min)	#1	#2	#3	#4	#5	#6	#7	Average
0605	1600	3	1	8	8	1	6	17	1	6.0
0605	1700	3	13	12	9	4D	16	16	8	11.1
0605	2000	2	8	12	18	13	16	23	8	14.0
0605	2200	3	16	20	20	14	21	19	5	16.4
0606	0705	4	17	-	13	16	-	13	16	15.0
0606	0805	4	20	16	13	25	17	11.5	15	16.8
0606	1100	4	3	4	8	3	8	26	10	8.9
0606	1300	4	9	18	14	6	9	14.5	8.5	11.3
0606	1500	4	8	7	10	10	8	7	0	7.1
0606	1800	4	1	1	7	7	7	8	7	5.4
0606	2000	4	1	3	6	17	10	1.5	7	6.5
0606	2200	4	3	2	2D	3	2D	7	5	3.4
0607	0000	3	6	8	3	5	2	5	9	5.4
0607	0200	3.5	10	7	4D	6	2	12	9	7.1
0607	0400	4	8	5C	10H	12	5	15	7	8.9
0607	0600	4	9	13	7	9	8	11C	10	9.6
0607	0800	4	9C	13D	12C	19D	20H	17C	16H	15.1
0607	1000	3	C	10	C	36	22C	32C	14	22.8
0607	1200	4	30D	60H	36H	60H	60H	17H	12	39.3
0607	1400	4	29D	11C	30D	29H	C	C	10C	21.8
0607	1700	3	14	13D	19	C	15D	C	C	17.6
0608	1200	4	36C	25C	29H	32H	28D	26H	35H	30.0
0608	1400	4	23C	22D	32H	28H	33C	31H	C	28.2
0608	1600	4	5	C	11	22	30	23	C	18.2
0608	1800	4	19	20	20	23	20	C	13	19.2
0608	2000	4	C	14	24	36	21	6	2	17.2
0608	2200	4	C	22	22	14	11	2	8	11.3
0609	0000	4	6	6C	14C	12C	7	4C	4	7.6
0609	0200	5-6	9	13	22D	11D	12	13H	7C	12.4
0609	0400	4-5	11C	11	8	12C	7C	4H	4C	8.1
0609	0600	5-8	11C	9C	13	8C	10C	11C	4C	9.4
0609	0800	8	13C	13H	17H	21H	13C	11H	C	14.6
0609	1000	8	12C	9C	C	16D	1C	17H	4H	9.8
0609	1200	8	C	11H	23H	38H	15H	17H	10H	19.0
0609	1400	6	C	9C	15H	29C	11H	15H	10H	14.8
0609	1600	4	19	24	8D	10	13	12	19D	17.5
0609	1800	4	25	24	C	36	30	12	6	20.5
0609	2000	4	19	13D	40	26	21	15	10	20.6
0609	2200	4	22	30	32	15	13	12	5	18.4
0610	0000	5	25	36H	26D	7	13	22H	4C	19.0
0610	0200	5	21	9D	9C	15	12	9C	3C	11.1
0610	0400	5	6D	5D	28C	19	9	22	2C	13.0
0610	0600	5	9C	14D	5D	6C	7C	11	26H	11.1
0610	0800	8	19H	33H	C	6C	22H	C	11D	18.2
0610	1000	4-8	30H	11C	C	C	19C	10H	14C	16.8
0610	1200	4-8	29H	29H	9D	14C	15H	18C	C	19.0
0610	1400	2-3	24H	23H	6H	19H	6H	27H	7C	16.0
0610	1600	3	15	11	3	18	8	2	10	9.6
0610	1720	4			3			7D		5.0

BOM/FGT 013 PEAT PELLETS

FIRE TEST DATA

Date	Time	Insertion Time (min)	#1	#2	#3	#4	#5	#6	#7	Average
0716	1200	3	11	12	11	11	12	12	1	10.0
0716	1400	3	13	15	7	5	10	8	0D	8.3
0716	1600	3	4	8	4	4	11	11	6	6.9
0716	1800	3	13	12	13	12	9	12	0	10.1
0716	2000	1.5	4	11	7	9	12	12	0	7.9
0716	2200	1	4	13	13	9	10	5	6	8.6
0717	0000	4-5	7.5H	9.5H	0H	6H	13H	0H	0H	5.1
0717	0200	4-5	12H	9H	15H	6H	9H	10H	8H	9.9
0717	0400	3-4	10H	13H	15H	9H	8H	10H	4H	9.9
0717	0600	3-4	11H	12H	8H	9H	10H	12H	4H	9.4
0717	0800	4-5	12	14	10	7	12	13	0	9.7
0717	0900	3.5	-	-	8	6	-	-	-	7.0
0717	1000	3.5	10	11	7	4	11	11D	3	8.1
0717	1200	3.5	4	8	1	11	10	3	3	5.7
0717	1400	3.5	9	5	11	8	5	8	0	6.6
0717	1600	3	11	0	9	9	11	13	4	8.1
0717	1800	3	0C	20	14	13	18	13	6	12.0
0717	2000	3	6	29	9	25	18	20	12	17.0
0717	2200	3	10	26	10	17	13	13	8	13.9
0718	0000	4-5	28H	11H	14D	19H	19H	17H	18H	18.0
0718	0200	4-5	13H	12H	22H	20H	23H	18H	9H	16.7
0718	0400	4-5	42C	15H	13H	36D	12H	29D	23H	24.3
0718	0600	4-5	-C	17D	18H	42C	17H	28D	17H	23.2
0718	0800	5	15D	15	26	18	14	35	5	18.3

TABLE H-3

BOM/FGT 010 PEAT PELLETS

OPERATOR LOG I

DATE	TIME	AGIT. WATER FLOW	JACKET WATER FLOW	JACKET W. F. TOTAL	JACKET WATER HRLY USE	METER INLET PRESS.	REG. STEAM PRESS.	STEAM TEMP. F.	ORIFICE DELTA P	VALVE POSIT.
1109	0130	4.5	14	26431		+30	+30			20
1109	0230	4.5	14	26439	800	+30	+30			20
1109	0330	4.5	14	26446	700	+30	+30			20
1109	0430	4.5	14	26454	800	+30	+30			20
1109	0530	4.5	14	26462	800	+30	+30			20
1109	0630	4.5	14	26469	700	+30	+30			20
1109	0730	4.5	14	26476	700	20	22			30
1109	0830	4.5	7	26480	400	24	25			28
1109	0930	4.5	7	26484	400	20	22			40
1109	1030	4.5	7	26487	300	21	21			37
1109	1130	4.5	7	26491	300	17	19			50
1109	1230	4.5	7	26495	400	16	18			55
1109	1330	4.5	7	26498	300	+30	+30			30
1109	1430	4.5	7	26501	300	+30	+30			30
1109	1530	4.5	7.4	26506	500	+30	+30			38
1109	1630	4.5	7.4	26510	400	+30	+30			32
1109	1730	4.5	7.4	26514	400	+30	+30			38
1109	1830	4.5	7.4	26518	400	29.8	21.8			45
1109	1930	4.5	7.4	26521	300	27.1	28.9			44
1109	2030	4.5	7.4	26525	400	+30	29.3			40

BOM/FGT 011 PEAT SODS

OPERATOR LOG I

DATE	TIME	AGIT. WATER FLOW	JACKET WATER FLOW	JACKET W. F. TOTAL	JACKET WATER HRLY USE	METER INLET PRESS.	REG. STEAM PRESS.	STEAM TEMP. F.	ORIFICE DELTA P	VALVE POSIT.
0605	1530	3.0	13.0	26584	0	72	40	292	0	25
0605	1630	3.0	13.0	26602	1800	88	41	290	0	25
0605	1730	3.0	13.0	26616	1400	75	40	295	0	26
0605	1830	3.0	13.0			75	40	295	0	26
0605	2130	3.0	13.0	26628	1200		85	290	0	32
0606	0830	3.0	5.5	26659	3100	80	40	290		11
0606	1030	3.0	5.5	26663	400	76	40	275	2	10
0606	1130	3.0	10.0	26669	600	88	40	290	5	10
0606	1230	3.0	10.0	26674	500	80	40	290	3	7
0606	1330	3.0	10.0	26679	500	78	40	290	4	11
0606	1730	3.0	10.0	26690	1100	76	40	290	6	19
0606	1830	3.0	10.0	26700	1000	84	40	290	4	16
0606	1930	2.5	9.5	26710	1000	90	40	290	4	16
0606	2030	2.5	10.0	26710		85	40	290	3.5	18.5
0606	2130	2.5	10.0	26720	1000	86	40	290	3	16
0606	2230	2.5	10.0	26720		81	40	290	4	20
0606	2330	2.5	9.5	26731	1100	85	40	290	3.8	17
0607	0030	2.5	10.0	26737	600	82	40	290	4.3	18
0607	0130	2.5	9.5	26742	500	82	40	290	24	20
0607	0230	2.5	10.0	26747	500	82	40	290	27.2	18
0607	0330	2.5	10.0	26752	500	88	40	290	19	20
0607	0430	2.5	10.0	26758	600	82	40	290	27.5	20
0607	0530	2.5	10.0	26762	400	80	40	290	36	23
0607	0630	2.5	10.0	26767	500	74	39	285	26.5	22
0607	0730	2.5	10.0	26773	600	80	40	290	15.5	20
0607	0830	2.5	10.0	26778	500	90	40	290		19
0607	0930	2.5	10.0	26783	500	86	40	290		22
0607	1030	2.5	10.0	26788	500	90	40	295	2	21
0607	1130	2.5	10.0	26793	500	80	40	290	2	21
0607	1230	2.5	10.0	26800	700	76	40	280	3	22
0607	1330	2.5	10.0	26803	300	76	39.5	290	3	21
0607	1430	2.5	10.0	26808	500	76	40	290	3	21
0607	1530	2.5	10.0	26810	200	89	40	290	4.5	23
0607	1630	2.5	10.0	26820	1000	89	40	290		30
0607	1730	2.6	10.0	26830	1000	84	40	290	2	27
0608	1130	2.5	10.0	26917		85	40	285		26
0608	1230	2.5	10.0	26922	500	90	40	290	3	25
0608	1330	2.5	10.0	26928	600	80	40	290	2	26
0608	1430	2.5	10.0	26934	600	90	40	280	3	25
0608	1530	2.5	10.0	26939	500	90	40	290	6	26
0608	1630	2.5	10.0	26944	500	75	40	290		25
0608	1730	2.5	10.0	26948	400	83	40	290		23
0608	1830	2.5	10.0	26954	600	81	40	290		25
0608	1930	2.5	10.0	26960	500	85	40	290		25
0608	2030	2.5	10.0	26964	400	82	40	290		22
0608	2130	2.5	10.0	26969	500	80	40	290		20

DATE	TIME	AGIT. WATER FLOW	JACKET WATER FLOW	JACKET W. F. TOTAL	JACKET WATER HRLY USE	METER INLET PRESS.	REG. STEAM PRESS.	STEAM TEMP. F.	ORIFICE DELTA P	VALVE POSIT.
0608	2230	2.5	10.0	26974	500	88	40	290		24
0608	2330	2.5	10.0	26981	700	84	40	285		17
0609	0030	2.5	10.0	26986	500	80	40	285		20
0609	0130	2.5	10.0	26991	500	78	40	290		22
0609	0230	2.5	10.0	26996	500	80	40	290		22
0609	0330	2.5	10.0	27001	500	80	40	285		28
0609	0430	2.5	10.0	27006	500	84	40	285		24
0609	0530	2.5	10.0	27011	500	80	39	285		25
0609	0630	2.5	10.0	27016	500	88	40	285		25
0609	0730	2.5	10.0	27022	600	80	40	290		25
0609	0830	2.5	10.0	27028	600	85	40	290	24	25
0609	0930	2.5	10.0	27031	300	90	40	290		28
0609	1030	2.5	10.0	27037	600	78	39	290		24
0609	1130	2.5	10.0	27041	400	85	40	280		26
0609	1230	2.5	10.0	27048	700	80	40	290		30
0609	1330	2.5	10.0	27053	500	90	40	295	22	12
0609	1430	2.5	10.0	27057	400	85	40	285		20
0609	1530	2.5	10.0	27063	600	80	40	290	4.5	31
0609	1630	2.5	10.0	27069	600	75	40	290	4.5	31
0609	1730	2.5	10.0	27073	400	79	40	290	4.5	26
0609	1830	2.5	10.0	27078	500	90	40	290	3	24
0609	1930	2.5	10.0	27083	500	78	40	290	3	29
0609	2030	2.5	10.0	27089	600	90	40	290	2	27
0609	2130	2.5	10.0	27093	400	87	40	290	2	27
0609	2230	2.5	10.0	27099	600	87	40	290	2	27
0609	2330	2.5	9.0	27104	500	83	40	284	1.3	26
0610	0030	2.5	9.5	27109	500	73	40	285	2.1	28
0610	0130	2.5	10.0	27114	500	73	40	285	2.1	26
0610	0230	2.5	10.0	27119	500	73	40	285	2.5	29
0610	0330	2.5	10.0	27125	600	86	40	283	3	29
0610	0430	2.5	10.0	27130	500	90	40	285	2.9	26
0610	0530	2.5	10.0	27135	500	74	40	283	3.5	27
0610	0630	2.5	10.0	27140	500	88	40	283	3	26
0610	0830	2.5	10.0	27151	1100	90	40	290	3	26
0610	0930	2.5	10.0	27157	600	88	40	290	3	28
0610	1030	2.5	10.0	27163	600	76	39.5	290	2	27
0610	1130	2.5	10.0	27169	600	90	40	290	2	24
0610	1230	2.5	10.0	27174	500	90	40	285	1	22
0610	1330	2.5	10.0	27180	600	85	40	285	1	22
0610	1430	2.5	10.0	27186	600	80	40	290		11
0610	1530	2.5	10.0	27190	400	85	40	290		
0610	1630	2.5	10.0	27197	700	84	5	235		

END OF BOM/FGT 011 PEAT SODS

BOM/FGT 013 PEAT PELLETS

OPERATOR LOG I

DATE	TIME	AGIT. WATER FLOW	JACKET WATER FLOW	JACKET W. F. TOTAL	JACKET WATER HRLY USE	METER INLET PRESS.	REG. STEAM PRESS.	STEAM TEMP. F.	ORIFICE DELTA P	VALVE POSIT.
0716	1300	2.5	17.0	29058	-	90	43	285	29	7
0716	1330	2.5	17.0	29064	600	78	43	285	28	2
0716	1430	2.5	18.5	29074	1000	77	43	285	28	8
0716	1530	2.5	18.5	29084	1000	78	43	290	30	6
0716	1630	2.5	18.5	29094	1000	78	43	290	30	8
0716	1730	2.5	18.5	29106	1200	87	43	290	29	2
0716	1830	2.5	18.5	29114	800	85	43	290	29	0
0716	1930	2.5	18.5	29124	1000	78	43	290	29	0
0716	2030	2.5	18.5	29136	1200	84	43	290	29	4
0716	2130	2.5	18.5	29145	900	82	43	290	29	0
0716	2230	2.5	16.0	29158	1300	81	43	290	29	11
0716	2330	2.0	16.0	29166	800	90	42	290	30	0
0717	0030	2.0	16.0	29175	900	78	41	290	30	0
0717	0130	2.0	19.0	29184	900	75	41	290	29	12
0717	0230	2.0	19.0	29194	1000	90	42	290	30	11.5
0717	0330	2.0	19.0	29207	1300	90	42	290	29	16
0717	0430	2.0	19.0	29217	1000	85	41	290	29	15
0717	0530	2.0	19.0	29227	1000	80	41	290	29	16
0717	0630	2.0	19.0	29239	1200	75	41	290	29	16
0717	0730	3.0	18.5	29248	900	90	41	275	28.5	12.5
0717	0830	3.0	16.5	29260	1200	90	41	285	22	16
0717	0930	3.0	16.5	29267	700	85	42	285	0	15
0717	1030	3.0	18.5	29279	1200	74	41	285	3.5	23
0717	1130	3.0	18.5	29288	900	83	42	285	5	19
0717	1230	3.0	18.5	29300	1200	86	39.8	285	0	21
0717	1330	3.0	18.5	29310	1000	87	39.6	285	0	28
0717	1430	3.0	18.5	29323	1300	80	39.5	285	0	25
0717	1530	3.0	18.5	29331	800	85	39	285	0	23
0717	1630	3.0	14.0	29340	900	81	39	285	0	18
0717	1730	3.0	14.0	29351	1100	85	39	285	0	25
0717	1830	3.0	14.0	29361	1000	80	39	285	0	27
0717	1930	3.0	14.0	29372	1100	84	39	285	0	28
0717	2030	3.0	14.0	29384	1200	84	39	285	0	29
0717	2130	3.0	14.0	29394	1000	75	39	285	0	29
0717	2230	3.0	14.0	29404	1000	75	39	285	0	29
0717	2330	2.5	14.0	29417	1300	85	39.5	290	0	25
0718	0030	2.5	14.0	29427	1000	90	39.5	290	0	28
0718	0130	2.5	14.0	29438	1100	80	39.5	290	0	26
0718	0230	2.5	14.0	29449	1100	85	29.5	290	0	26
0718	0330	2.5	14.0	29459	1000	80	39.5	290	0	26
0718	0430	2.5	14.0	29468	900	80	39.5	290	0	28
0718	0530	3.0	14.0	29480	1200	80	39.5	290	0	26
0718	0630	3.0	14.0	29492	1200	80	39.5	290	0	26
0718	0730	3.0	14.0	29502	1000	84	39.5	285	0	25
0718	0830	3.0	14.0	29512	1000	80.5	39.5	285	0	25
0718	0930	3.0	14.0	29524	1200	82	39.5	285	0	26

DATE	TIME	AGIT. WATER FLOW	JACKET WATER FLOW	JACKET W. F. TOTAL	JACKET WATER HRLY USE	METER INLET PRESS.	REG. STEAM PRESS.	STEAM TEMP. F.	ORIFICE DELTA P	VALVE POSIT.
0718	1030	3.0	10.0	29532	800	86	39.5	280	0	33
0718	1130	3.0	10.0	29537	500	85	39.5	283	0	34
0718	1230	3.0	10.0	29543	600	76	39.2	285	0	36
0718	1330	3.0	10.0	29550	700	78	39.5	285	0	32
0718	1430	3.0	10.0	29554	400	86	39.5	285	0	32
0718	1530	3.0	10.0	29559	500	79	39	290	0	32
0718	1630	3.0	10.0	29563	400	88	39	290	0	30
0718	1730	3.0	10.0	29569	600	84	39	290	0	30
0718	1830	3.0	10.0	29579	1000	74	39	290	0	29
0718	1930	3.0	10.0	29579	0	89	39	290	0	28
0718	2030	3.0	10.0	29586	700	84	39	290	0	25
0718	2130	3.0	10.0	29590	400	78	39	290	0	29
0718	2230	3.0	10.0	29597	700	82	39	290	0	30
0718	2330	3.0	10.0	29602	500	85	39.5	290	0	24
0719	0030	3.0	10.0	29607	500	90	39.5	290	0	26
0719	0130	3.0	10.0	29612	500	75	39.5	290	0	28
0719	0230	3.0	10.0	29618	600	90	39.5	290	0	26
0719	0330	3.0	10.0	29624	600	80	39.5	290	0	26
0719	0430	3.0	10.0	29629	500	80	39.5	290	0	24
0719	0530	3.0	10.0	29634	500	80	39.5	290	0	20
0719	0630	3.0	10.0	29640	600	80	39.5	290	0	22
0719	0730	3.0	10.0	29646	600	82	39.5	285	0	22
0719	0830	3.0	10.0	29651	500	82	39.5	283	0	22

END OF BOM/FGT 013 PEAT PELLETS

TABLE H-4

BOM/FGT 010 PEAT PELLETS

OPERATOR LOG II

DATE	TIME	AGIT. COUNT RDING	AGIT SWEEP PER HR	AGIT DRIVE SETNG	GRATE		GRATE DRIVE SETNG	FLUE GAS SCRUBBER		
					GEAR COUNTER READING	GEAR RPH		pH	REAGENT PUMP SPEED	REAGENT PUMP STROKE
1109	0130				6924		1	7	45	50
1109	0230				6941	17	1	7	45	50
1109	0330				6957	16	1	7	45	50
1109	0430				6973	16	1	7	45	50
1109	0530				6988	15	1	7	45	50
1109	0630				7005	17	1	7	45	50
1109	0730				7022	17	1	7	45	50
1109	0830				7044	22	2	7	45	50
1109	0930				7064	20	2	7	45	50
1109	1030				7140	76	5	7	45	50
1109	1130				7221	81	5	7	45	50
1109	1230				7308	87	6	7	45	50
1109	1330				7411	103	8/3.00	7	45	50
1109	1430				7520	109	8/3.50	7	45	50
1109	1530	9	9		7701	181	8/3.50	7	40	45
1109	1630	9			7829	128	8/2.40	7	40	45
1109	1730	9			7938	109	8/2.40	7	40	45
1109	1830	9			8023	85	6/3.00	7	40	45
1109	1930	9			8118	95	6/3.00	7	40	45
1109	2030	9			8188	70	6/2.00	7	40	45

BOM/FGT 011 PEAT SODS

OPERATOR LOG II

DATE	TIME	AGIT. COUNT RDING	AGIT SWEEP PER HR	AGIT DRIVE SETNG	GRATE GEAR COUNTER READING	GRATE GEAR RPH	GRATE DRIVE SETNG	FLUE GAS SCRUBBER		
								pH	REAGENT PUMP SPEED	REAGENT PUMP STROKE
0605	1530	0	0	0	0	0	0	0	30	30
0605	1630	2	2	0	0	0	0	0	30	30
0605	1730	2	2	0	0	0	0	0	30	30
0605	1830	2	2	0	0	0	0	0	30	30
0605	2130	55	53	0	0	0	6/2.0	0	30	30
0606	0830	69	16	1	271	271	5	0	30	30
0606	1030	73	4	1	394	123	5.5	0	30	30
0606	1130	77	4	0	498	104	5.5	0	30	30
0606	1230	79	2	0	513	15	5.5	0	30	30
0606	1330	81	2	0	528	15	3	0	30	30
0606	1730	81	0	0	694	166	3	0	30	30
0606	1830	90	9	0	759	65	2.5	0	30	30
0606	1930	91	1	0	801	42	2.5	0	30	30
0606	2030	94	3	0	856	55	2.39	0	30	30
0606	2130	95	1	0	877	21	2.28	0	30	30
0606	2230	97	2	0	917	40	1.71	0	30	30
0606	2330	99	2	0	947	30	3/1.35	7	30	30
0607	0030	101	2	0	969	22	3/1.35	7	30	30
0607	0130	103	2	0	993	24	3/1.35	7	30	30
0607	0230	104	1	0	1014	21	3/1.35	7	30	30
0607	0330	106	2	0	1035	21	3/1.35	7	30	30
0607	0430	108	2	0	1060	25	3/1.35	7	30	30
0607	0530	109	1	0	1078	18	3/1.35	5	40	40
0607	0630	111	2	0	1108	30	3/1.35	5	40	40
0607	0730	113	2	0	1126	18	3/1.35	5	40	40
0607	0830	113	0	0	1145	19	3/1.35	5	50	40
0607	0930	128	15	7	1165	20	3/1.35	6	50	40
0607	1030	148	20	8	1189	24	3/	7	50	40
0607	1130	174	26	24.1	1245	56	3/1.36	6	50	40
0607	1230	203	29	24.1	1344	99	6/1.37	6	50	40
0607	1330	215	12	24.1	1393	49	6/1.37	6	50	40
0607	1430	235	20	24.2	1473	80	6/1.37	6	50	40
0607	1530	261	26	24.0	1593	120	6/1.36	8.5	50	40
0607	1630	292	31	24.1	1725	132	6/1.36	8.0	50	40
0607					GASIFIER BANKED					
0608	1130	331	39	14.1	1942	117	5/1.37	5.5	50	40
0608	1230	341	10	14.1	2044	102	5/1.36	5.5	50	40
0608	1330	368	27	27.5	2153	109	5/1.37	5.0	50	40
0608	1430	394	26	24.0	2305	152	7/2.0	5.5	50	50
0608	1530	417	23	24.0	2476	171	7/2.0	7.5	50	50
0608	1630	437	20	24.0	2646	170	7/1.73	7.5	50	50
0608	1730	454	17	24.0	2758	112	7/1.73	7.5	50	50
0608	1830	479	25	24.0	2945	187	7/1.73	9.0	50	50
0608	1930	508	29	24.0	3133	188	7/1.75	8.5	50	50

DATE	TIME	AGIT. COUNT	AGIT SWEEP	AGIT DRIVE	GRATE	GRATE GEAR	GRATE DRIVE	FLUE GAS SCRUBBER	PUMP SPEED	PUMP STROKE
					GEAR COUNTER			PH		
		RDING	PERHR	SETNG	READING	RPH	SETNG			
0608	2030	519	11	24.0	3243	110	7/1.75	6.0	50	50
0608	2130	541	22	24.0	3391	148	7/1.75	9.0	50	50
0608	2230	554	13	24.0	3545	154	7/1.75	8.5	50	50
0608	2330	583	29	24.0	3742	197	7/1.74	7.5	50	50
0609	0030	599	16	24.0	3887	145	7/1.00	7.5	50	50
0609	0130	624	25	24.0	3977	90	7/1.00	7.5	50	50
0609	0230	638	14	24.0	4069	92	7/1.50	7.5	50	50
0609	0330	660	22	24.0	4183	114	7/1.50	7.5	50	50
0609	0430	681	21	24.0	4303	120	7/1.25	7.5	50	50
0609	0530	704	23	24.0	4395	92	7/1.10	7.0	50	50
0609	0630	723	19	24.0	4500	105	7/1.15	7.0	50	50
0609	0730	745	22	24.0	4621	121	7/1.15	7.0	50	50
0609	0830	763	18*	24.1	4741	120	7/1.80	7.0	50	50
0609	0930	777	14	24.0	4831	90	7/1.79	7.0	50	50
0609	1030	802	25	20.1	5017	186	7/1.41	7.0	50	50
0609	1130	813	11	20.1	5104	87	7/0.75	7.0	50	50
0609	1230	840	33	20.1	5199	95	7/0.75	7.0	50	50
0609	1330	849	9*	10.5	5239	40	7/0.41	7.0	50	50
0609	1430	854	6*	10.3	5267	28	7/0.41	7.0	50	50
0609	1530	879	25	0.8	5332	65	7/0.80	7.0	50	50
0609	1630	904	25	27.0	5417	85	7/0.80	7.0	50	50
0609	1730	925	21	27.0	5466	49	7/0.70	7.0	50	50
0609	1830	940	15	27.0	5526	40	7/0.70	8.0	50	50
0609	1930	970	30	27.0	5606	80	7/0.80	8.0	50	50
0609	2030	982	12	27.0	5678	72	7/0.80	8.0	50	50
0609	2130	1005	23	27.0	5750	72	7/0.95	8.0	50	50
0609	2230	1025	20	27.0	5853	103	7/0.95	7.5	50	50
0609	2330	1051	26	27.1	5936	83	7/0.95	7.5	50	50
0610	0030	1072	21	27.0	6037	101	7/1.50	7.5	50	50
0610	0130	1098	26	27.0	6171	134	7/1.50	7.5	50	50
0610	0230	1120	22	27.0	6278	107	7/0.75	7.5	50	50
0610	0330	1148	28	27.0	6360	82	7/1.00	6.0	50	50
0610	0430	1171	23	27.0	6460	100	7/1.00	6.5	50	50
0610	0530	1193	22	27.0	6537	77	7/1.15	7.0	50	50
0610	0630	1214	21	27.0	6627	90	7/0.85	7.0	50	50
0610	0830	1253	39	27.1	6774	147	7/0.85	7.5	50	50
0610	0930	1284	31	27.2	6863	89	7/0.85	7.5	50	50
0610	1030	1298	14	21.9	6935	72	3/1.44	7.0	50	50
0610	1130	1316	18	12.0	6996	61	3/1.44	7.0	50	50
0610	1230	1323	7	9.0	7053	57	3/1.90	7.0	50	50
0610	1330	1333	10	11.1	7125	72	3/1.90	7.0	50	50
0610	1430	1343	10	11.0	7204	79	3/1.21	7.0	50	50
0610	1530	1352	9	11.1	7240	36	3/1.21	7.0	50	50
0610	1630	1366	14	20.0	7297	57	3/1.21	7.0	50	50

END OF BOM/FGT 011 PEAT SODS

BOM/FGT 013 PEAT PELLETS

OPERATOR LOG II

DATE	TIME	AGIT. COUNT	AGIT SWEEP	AGIT DRIVE	GRATE GEAR COUNTER READING	GRATE GEAR RPH	GRATE DRIVE SETNG	FLUE GAS SCRUBBER			ANNUBAR DELTA P
								pH	REAGENT PUMP SPEED	REAGENT PUMP STROKE	
0716	1300	0	0	0	0	0	0	0	0	0	1.92
0716	1330	0	0	0	0	0	0	0	0	0	1.92
0716	1430	0	0	0	0	0	0	0	0	0	2.00+
0716	1530	0	0	0	0	0	0	0	0	0	2.00+
0716	1630	0	0	0	0	0	0	0	0	0	2.00+
0716	1730	0	0	0	0	0	0	0	0	0	2.00+
0716	1830	0	0	0	0	0	0	0	0	0	2.00+
0716	1930	0	0	0	0	0	0	0	0	0	2.00+
0716	2030	0	0	0	0	0	0	0	0	0	2.00+
0716	2130	0	0	0	0	0	0	0	0	0	2.00+
0716	2230	0	0	0	0	0	0	0	0	0	2.00+
0716	2330	0	0	0	0	0	0	5.0	40	30	
0717	0030	0	0	0	0	0	0	5.5	50	50	
0717	0130	0	0	0	0	0	0	6.0	50	50	
0717	0230	0	0	0	0	0	0	6.0	50	50	
0717	0330	0	0	0	0	0	0	6.0	50	50	
0717	0430	0	0	0	0	0	0	6.0	50	50	
0717	0530	0	0	0	0	0	0	6.0	50	50	
0717	0630	0	0	0	0	0	0	6.0	50	50	
0717	0730	0	0	0	0	0	0	6.0	50	50	2.00+
0717	0830	0	0	0	8	8	2/1.0	6.0	50	50	2.0+
0717	0930	0	0	0	26	18	2/0.75	6.0	50	50	0.12
0717	1030	0	0	0	47	21	2/0.75	6.0	50	50	0.10
0717	1130	0	0	0	64	17	2/0.75	6.0	50	50	0.10
0717	1230	0	0	0	87	23	2/0.75		50	50	0.10
0717	1330	0	0	0	104	17	2/0.5	5.0	40	30	0.11
0717	1430	0	0	0	124	20	2/0.75	5.5	50	50	0.10
0717	1530	0	0	0	140	16	2/0.75	6.0	50	50	0.10
0717	1630	0	0	0	157	17	2/0.75	6.0	50	50	0.10
0717	1730	0	0	0	176	19	2/0.75	6.0	50	50	0.10
0717	1830	0	0	0	195	19	2/0.75	7.0	50	50	0.10
0717	1930	0	0	0	215	20	2/0.75	7.0	50	50	0.10
0717	2030	0	0	0	239	24	2/1.0	7.0	50	50	0.10
0717	2130	0	0	0	262	23	2/1.0	7.0	50	50	0.10
0717	2230	0	0	0	287	25	2/0.85	5.5	50	50	0.10
0717	2330	0	0	0	313	26	2/0.85	7.5	50	50	0.10
0718	0030	0	0	0	335	22	2/1.0	8.0	50	50	0.10
0718	0130	0	0	0	362	27	2/1.0	7.0	30	40	0.10
0718	0230	0	0	0	390	28	2/1.15	6.0	30	40	0.10
0718	0330	0	0	0	417	27	2/1.15	6.0	30	40	0.10
0718	0430	0	0	0	443	26	2/1.15	5.5	30	40	0.10
0718	0530	0	0	0	478	35	2/1.15	5.0	40	40	0.10
0718	0630	0	0	0	513	35	2/1.15	5.0	40	40	0
0718	0730	0	0	0	551	38	2/1.45	7.0	40	40	0.
0718	0830	0	0	0	597	46	4/1.45	7.0	40	40	0.11

DATE	TIME	AGIT. COUNT RDING	AGIT SWEEP PER HR	AGIT DRIVE SETNG	GRATE GEAR COUNTER READING	GRATE GEAR RPH	GRATE DRIVE SETNG	FLUE GAS SCRUBBER			ANNUBAR DELTA P
								pH	REAGENT PUMP SPEED	REAGENT PUMP STROKE	
0718	0930	0	0	0	675	78	4/1.45	7.0	40	40	0.12
0718	1030	0	0	0	742	67	6/1.6	7.0	40	40	0.25
0718	1130	0	0	0	848	106	6/1.6	7.0	40	40	0.25
0718	1230	0	0	0	910	62	10/2.2	7.5	40	40	0.25
0718	1330	0	0	0	1047	137	6/2.2	7.5	40	40	0.19
0718	1430	0	0	0	1159	112	6/2.2	7.5	40	40	0.19
0718	1530	0	0	0	1321	162	6/2.2	7.5	40	40	0.19
0718	1630	0	0	0	1452	131	6/2.2	7.5	40	40	0.19
0718	1730	0	0	0	1635	183	6/2.2	7.5	40	40	0.19
0718	1830	0	0	0	1808	173	6/2.2	7.5	40	40	0.19
0718	1930	0	0	0	1935	127	6/2.2	7.5	40	40	0.11
0718	2030	0	0	0	2121	186	6/2.2	7.5	40	40	0.11
0718	2130	0	0	0	2234	113	6/2.2	7.5	40	40	0.11
0718	2230	0	0	0	2436	202	6/1.8	8.0	40	40	0.11
0718	2330	0	0	0	2560	124	6/1.8	7.5	50	40	0.12
0719	0030	0	0	0	2643	83	3/0.41	7.5	50	40	0.12
0719	0130	0	0	0	2659	16	3/0.41	7.5	50	40	0.12
0719	0230	0	0	0	2683	24	3/1.25	7.5	50	40	0.12
0719	0330	0	0	0	2740	57	3/1.8	7.5	50	40	0.12
0719	0430	0	0	0	2807	67	6/1.0	7.5	50	40	0.12
0719	0530	0	0	0	2866	59	3/1.8	7.5	50	40	0.02
0719	0630	0	0	0	2891	25	3/1.8	5.0	50	40	0.02
0719	0730	6	6	0	2932	41	3/1.8	6.5	50	40	0.01
0719	0830	17	11	0	3073	141	6/2.2	6.5	50	40	0.02

END OF BOM/FGT 013 PEAT PELLETS

BOM/FGT-013 PEAT PELLETS

GASIFIER ASH

DATE	TIME	SAMPLE NUMBER	INIT DRY	FINAL DRY	NET DRY	INIT WET	FINAL WET	NET WET	NT +NT	DRY	FLUSH WATER
7/17	1215	A1	575	135	440	420	145	275	715	30	
7/17	1730	A2	700	125	575	420	123	297	872	30	
7/17	2130	A3	650	127	523	417	125	292	815	30	
7/18	30	A4	614	149	465	418	127	291	756	30	
7/18	420	A5	770	129	641	433	125	308	949	30	
7/18	640	A6	517	129	388	433	129	304	692	30	
7/18	930	A7	655	150	505	454	150	304	809	30	
7/18	1100	A8	705	165	540	540	184	356	896	30	
7/18	1300	A9	790	165	625	510	120	390	1015	30	
7/18	1430	A10	680	150	530	500	150	350	880	30	
7/18	1540	A11	800	125	675	480	122	358	1033	30	
7/18	1645	A12	842	126	716	484	121	363	1079	30	
7/18	1810	A13	922	128	794	469	122	347	1141	30	
7/18	1900	A14	781	121	660	451	124	327	987	30	
7/18	2040	A16	828	198	630	524	122	402	1032	30	
7/18	2130	A17	961	128	833	492	124	368	1201	30	
7/18	2210	A18	733	136	597	445	121	324	921	30	
7/18	2250	A19	556	157	399	481	121	360	759	30	
7/18	2320	A20	900	127	773	500	121	379	1152	30	
7/19	300	A21	770	155	615	485	152	333	948	30	
7/19	450	A22	760	125	635	460	119	341	976	30	
7/19	800	A23	895	145	750	495	140	355	1105	30	

END OF BOM/FGT 013 PEAT PELLETS

APPENDIX I

Gas Chromatograph Data

The results of each successful gas chromatograph analysis are included here. Results from both the HP5880A (analysis for permanent gasses and hydrocarbons) and the HP5793 (analysis for gaseous sulfur species) are included in separate tables.

TEST BOM/FGT-010

DATE TIME	GAS CHROMATOGRAPH DATA														
	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW	S.G. WRT AIR

11/ 9/1984															
0:47	21.211	11.249	0.116	0.066	0.000	39.37	1.788	21.68	0.089	0.069	163.7	150.8	95.64	22.89	0.790
1: 5	21.615	11.909	0.110	0.070	0.000	39.10	1.750	21.02	0.080	0.065	162.2	149.1	95.72	22.91	0.791
2:16	19.847	10.233	0.137	0.048	0.000	41.12	1.714	22.11	0.085	0.065	159.7	147.6	95.35	23.00	0.794
2:34	20.372	10.824	0.139	0.053	0.000	39.83	1.774	22.19	0.096	0.067	162.8	150.3	95.35	22.96	0.792
2:52	20.754	10.872	0.138	0.054	0.000	39.17	1.837	22.41	0.094	0.067	165.3	152.5	95.40	22.87	0.789
3:10	20.647	10.832	0.131	0.063	0.000	38.67	1.901	22.94	0.094	0.067	167.4	154.6	95.34	22.87	0.789
3:27	20.711	10.915	0.109	0.056	0.000	38.31	1.853	23.32	0.083	0.059	167.3	154.7	95.42	22.89	0.790
3:45	20.400	10.891	0.093	0.046	0.000	38.55	1.727	23.58	0.067	0.051	164.9	152.5	95.40	22.97	0.793
4: 3	20.575	11.047	0.092	0.048	0.000	38.14	1.705	23.69	0.062	0.043	165.3	152.9	95.41	22.96	0.792
4:21	20.264	10.768	0.089	0.029	0.000	38.25	1.662	24.04	0.053	0.035	164.1	152.0	95.18	22.93	0.792
4:39	20.487	10.741	0.089	0.027	0.000	37.75	1.643	24.23	0.053	0.034	165.2	153.0	95.05	22.83	0.788
4:57	20.533	10.860	0.091	0.021	0.000	37.80	1.634	24.07	0.056	0.034	164.8	152.6	95.10	22.86	0.789
5:14	20.557	10.980	0.097	0.025	0.000	37.82	1.646	23.84	0.057	0.035	164.5	152.2	95.06	22.86	0.789
5:32	20.279	10.797	0.099	0.024	0.000	37.98	1.657	24.13	0.057	0.035	164.6	152.5	95.06	22.90	0.790
5:50	20.128	10.928	0.098	0.031	0.000	38.30	1.655	23.98	0.058	0.034	163.7	151.7	95.21	23.00	0.794
6:26	20.347	11.359	0.098	0.025	0.000	38.33	1.638	23.30	0.056	0.032	161.8	149.7	95.18	23.01	0.794
7:21	19.944	11.355	0.110	0.025	0.000	38.76	1.624	23.30	0.058	0.030	160.6	148.7	95.20	23.12	0.798
7:38	20.080	11.662	0.114	0.023	0.000	38.54	1.641	23.06	0.055	0.030	160.4	148.4	95.21	23.13	0.798
7:56	20.203	11.906	0.107	0.020	0.000	38.59	1.617	22.80	0.057	0.030	159.6	147.6	95.33	23.17	0.800
9:46	20.054	10.075	0.152	0.044	0.000	40.41	1.378	24.61	0.058	0.025	163.6	151.8	96.81	23.36	0.806
10: 3	19.377	10.255	0.148	0.038	0.703	41.76	1.370	23.04	0.049	0.025	155.9	144.4	96.76	23.58	0.814
10:21	20.460	10.764	0.140	0.040	0.000	39.87	1.440	23.83	0.061	0.027	162.9	150.8	96.62	23.31	0.805
10:39	19.877	11.206	0.154	0.042	0.000	41.18	1.462	22.45	0.061	0.027	157.0	145.2	96.46	23.48	0.811
10:57	20.335	11.302	0.154	0.041	0.000	40.10	1.482	22.94	0.064	0.028	160.4	148.3	96.44	23.37	0.807
11:15	20.479	11.396	0.173	0.059	0.000	39.91	1.540	22.83	0.063	0.029	161.7	149.5	96.48	23.36	0.806
11:33	20.649	11.417	0.165	0.055	0.000	39.74	1.536	22.89	0.069	0.029	162.3	150.0	96.54	23.33	0.805
11:51	20.446	11.107	0.149	0.041	0.000	39.87	1.512	23.31	0.066	0.030	162.2	150.1	96.54	23.34	0.806
12: 9	19.453	10.724	0.141	0.041	1.262	41.90	1.490	21.64	0.054	0.029	153.0	141.4	96.74	23.64	0.816
12:26	20.651	11.679	0.178	0.053	0.000	39.72	1.550	22.75	0.071	0.029	162.3	149.9	96.69	23.41	0.808
12:44	20.089	11.034	0.163	0.055	0.000	40.10	1.557	23.59	0.069	0.031	163.0	151.0	96.70	23.46	0.810
13: 2	21.271	10.156	0.137	0.050	0.000	38.28	1.584	25.18	0.057	0.031	171.4	158.8	96.74	23.02	0.795
13:20	20.469	10.997	0.165	0.058	0.000	39.71	1.527	23.84	0.067	0.030	164.8	152.5	96.86	23.40	0.808
13:38	20.881	11.424	0.143	0.048	0.000	39.69	1.463	22.95	0.061	0.028	161.9	149.6	96.69	23.32	0.805
13:56	21.350	10.532	0.145	0.044	0.000	38.46	1.464	24.54	0.058	0.028	168.4	155.9	96.62	23.04	0.795
14:14	20.587	11.656	0.160	0.062	0.000	40.34	1.447	22.60	0.068	0.028	160.3	148.1	96.95	23.51	0.812
14:32	20.600	11.663	0.143	0.053	0.000	40.27	1.436	22.67	0.069	0.035	160.3	148.1	96.94	23.51	0.812
14:50	21.308	10.928	0.160	0.059	0.000	38.78	1.456	24.15	0.065	0.034	167.8	155.2	96.94	23.20	0.801
15: 9	21.115	11.469	0.165	0.058	0.000	39.06	1.478	23.33	0.072	0.036	165.0	152.5	96.78	23.30	0.804
15:27	21.504	10.876	0.133	0.043	0.000	38.42	1.437	24.11	0.053	0.025	166.8	154.3	96.60	23.05	0.796
15:45	21.422	11.205	0.126	0.041	0.000	38.66	1.413	23.71	0.052	0.020	164.7	152.3	96.64	23.14	0.799
16: 3	20.924	11.452	0.148	0.057	0.000	40.07	1.395	22.55	0.051	0.024	159.9	147.7	96.67	23.32	0.805
16:20	21.819	11.066	0.137	0.041	0.000	38.11	1.425	24.08	0.056	0.027	167.8	155.1	96.76	23.04	0.795
16:38	21.143	12.173	0.141	0.058	0.000	39.56	1.421	22.13	0.062	0.029	159.8	147.4	96.71	23.39	0.807
16:56	21.619	11.324	0.121	0.045	0.000	38.66	1.445	23.61	0.058	0.030	165.8	153.2	96.91	23.18	0.800
17:14	21.575	11.669	0.122	0.045	0.000	38.88	1.425	23.06	0.057	0.030	163.6	151.1	96.87	23.23	0.802
17:32	21.845	11.454	0.129	0.046	0.000	38.66	1.443	23.31	0.056	0.029	165.6	152.9	96.97	23.16	0.799
17:50	21.384	11.224	0.133	0.050	0.000	38.78	1.443	23.71	0.059	0.029	165.6	153.1	96.81	23.20	0.801

 TEST BOM/FGT-010

DATE TIME	GAS CHROMATOGRAPH DATA													
	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW WRT AIR

11/ 9/1984														
18: 8	20.610	10.693	0.113	0.021	0.000	41.08	1.352	22.88	0.051	0.028	158.4	146.5	96.84	23.33 0.805
18:26	21.455	11.334	0.121	0.047	0.000	38.99	1.368	23.57	0.059	0.030	164.4	151.9	96.97	23.25 0.802
18:44	21.439	11.803	0.132	0.048	0.000	39.21	1.394	22.79	0.056	0.029	162.2	149.7	96.90	23.31 0.804
19: 2	21.292	12.857	0.146	0.051	0.000	39.68	1.433	21.34	0.065	0.031	158.0	145.5	96.90	23.51 0.811
19:20	21.486	12.613	0.144	0.049	0.000	39.10	1.514	21.81	0.058	0.032	160.7	148.1	96.81	23.38 0.807
19:38	21.483	12.201	0.139	0.048	0.000	39.13	1.513	22.20	0.059	0.030	161.9	149.2	96.81	23.32 0.805
19:56	21.304	11.332	0.131	0.044	0.000	38.81	1.463	23.60	0.056	0.059	165.8	153.2	96.80	23.23 0.802
20:14	21.536	11.539	0.128	0.042	0.000	38.74	1.447	23.24	0.059	0.030	164.4	151.8	96.76	23.19 0.801
20:32	21.607	11.685	0.126	0.038	0.000	38.68	1.458	23.17	0.060	0.030	164.5	151.8	96.85	23.22 0.802
20:50	21.341	11.936	0.129	0.044	0.000	39.25	1.476	22.66	0.060	0.031	162.3	149.8	96.93	23.35 0.806

TEST BOM/FGT-011

GAS CHROMATOGRAPH DATA

DATE TIME	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW	S.G. WRT AIR

6/ 5/1984															
14:44	13.355	9.973	0.016	0.005	0.052	50.10	0.091	20.10	0.004	0.001	109.2	102.4	93.70	24.36	0.841
15:02	14.504	10.806	0.011	0.004	0.010	48.70	0.089	19.15	0.003	0.001	109.7	102.3	93.28	24.08	0.831
15:58	14.123	10.264	0.002	0.003	0.156	50.87	0.080	20.71	0.001	0.001	113.2	106.0	96.21	24.92	0.860
16:17	13.845	10.156	0.002	0.003	0.511	51.22	0.075	20.33	0.001	0.001	111.0	104.0	96.14	24.97	0.862
16:36	14.077	10.248	0.002	0.002	0.000	50.59	0.070	20.96	0.001	0.001	113.7	106.6	95.95	24.85	0.858
16:55	14.012	10.218	0.002	0.002	0.000	51.02	0.069	21.06	0.001	0.001	113.8	106.7	96.39	24.99	0.862
17:13	14.017	10.035	0.006	0.004	0.000	50.86	0.076	21.24	0.003	0.001	114.6	107.5	96.25	24.92	0.860
17:32	13.895	9.881	0.004	0.003	0.000	50.86	0.066	21.38	0.002	0.001	114.5	107.5	96.09	24.88	0.859
17:51	14.014	9.853	0.002	0.003	0.000	50.72	0.075	21.54	0.001	0.001	115.4	108.4	96.21	24.88	0.859
18:09	14.042	9.482	0.002	0.003	0.459	50.69	0.083	21.41	0.001	0.001	115.2	108.1	96.18	24.82	0.857
18:28	14.638	8.926	0.004	0.003	0.041	49.59	0.079	22.91	0.002	0.001	122.0	114.6	96.19	24.56	0.848
18:47	14.324	9.491	0.002	0.002	0.117	50.37	0.074	21.69	0.001	0.001	116.9	109.6	96.07	24.70	0.853
19:06	14.375	9.159	0.003	0.002	0.312	50.08	0.084	21.95	0.001	0.001	118.0	110.8	95.96	24.61	0.850
19:24	14.096	9.298	0.001	0.001	0.486	50.64	0.071	21.25	0.000	0.000	114.6	107.5	95.83	24.68	0.852
19:43	14.123	9.435	0.001	0.001	0.520	50.91	0.070	20.95	0.001	0.000	113.8	106.6	96.01	24.75	0.854
20:01	14.540	9.165	0.002	0.002	0.187	49.84	0.070	21.98	0.001	0.001	118.5	111.2	95.79	24.52	0.846
20:20	14.006	9.137	0.003	0.002	0.509	50.69	0.065	21.29	0.002	0.001	114.5	107.5	95.71	24.65	0.851
20:39	14.910	10.685	0.009	0.004	0.089	50.24	0.090	19.60	0.004	0.001	112.5	104.9	95.64	24.62	0.850
20:57	15.073	11.130	0.002	0.002	0.149	50.05	0.075	18.76	0.001	0.001	109.9	102.3	95.24	24.54	0.847
21:16	14.887	11.347	0.004	0.002	0.232	50.95	0.078	18.50	0.002	0.001	108.6	101.0	96.00	24.84	0.857
21:34	15.093	11.642	0.010	0.005	0.100	50.63	0.107	18.52	0.005	0.001	109.8	102.2	96.11	24.86	0.858
21:53	14.813	11.924	0.014	0.007	0.141	51.00	0.137	17.99	0.006	0.002	107.7	100.1	96.03	24.95	0.861
22:12	13.265	12.732	0.048	0.010	0.056	53.29	0.202	16.28	0.012	0.002	98.6	91.7	95.91	25.44	0.878
22:30	11.034	13.445	0.045	0.005	0.025	56.78	0.188	14.21	0.011	0.002	84.4	78.6	95.75	26.09	0.900
22:50	8.551	14.757	0.051	0.009	0.034	60.85	0.173	11.15	0.011	0.002	66.5	62.0	95.58	26.90	0.928
6/ 6/1984															
13:28	9.997	12.069	0.087	0.033	0.419	54.24	0.496	15.88	0.023	0.008	91.1	85.4	93.25	25.42	0.877
13:47	10.087	11.977	0.091	0.035	0.274	52.94	0.522	15.70	0.024	0.009	91.2	85.5	91.66	24.93	0.860
14:05	10.152	12.388	0.069	0.038	0.298	53.05	0.538	14.98	0.025	0.010	89.0	83.2	91.54	24.94	0.861
14:24	10.562	12.387	0.095	0.040	0.271	52.62	0.610	15.16	0.027	0.011	92.2	86.1	91.78	24.89	0.859
14:43	10.674	12.435	0.095	0.041	0.264	52.49	0.631	15.08	0.027	0.011	92.5	86.4	91.75	24.86	0.858
15:01	10.921	12.512	0.090	0.043	0.279	52.04	0.634	15.13	0.028	0.011	93.5	87.2	91.69	24.79	0.856
15:20	9.287	11.657	0.091	0.038	2.489	54.98	0.522	12.83	0.026	0.012	79.5	74.2	91.93	25.25	0.871
15:39	11.148	12.273	0.114	0.042	0.212	51.65	0.591	15.56	0.032	0.032	96.1	89.7	91.65	24.69	0.852
15:57	12.173	11.683	0.132	0.046	0.167	49.77	0.712	17.03	0.035	0.036	106.0	98.9	91.79	24.35	0.841
16:16	11.840	11.330	0.130	0.046	0.100	50.08	0.709	17.56	0.035	0.029	106.3	99.4	91.85	24.40	0.842
16:35	12.543	11.042	0.133	0.048	0.117	49.37	0.765	18.43	0.037	0.025	112.0	104.7	92.51	24.34	0.840
16:53	12.599	10.686	0.137	0.050	0.049	48.34	0.783	18.87	0.038	0.023	113.8	106.4	91.57	24.01	0.829
17:12	12.175	10.716	0.138	0.051	0.335	48.97	0.776	18.15	0.039	0.023	110.1	103.0	91.37	24.08	0.831
17:31	12.210	11.136	0.147	0.052	0.098	49.02	0.795	17.95	0.040	0.024	110.0	102.8	91.48	24.15	0.834
17:50	12.210	10.974	0.145	0.051	0.101	49.63	0.806	18.16	0.040	0.024	110.7	103.5	92.15	24.31	0.839
19:19	12.414	11.510	0.203	0.052	0.060	50.56	0.902	17.97	0.043	0.013	112.5	105.0	93.73	24.77	0.855
19:38	12.548	11.761	0.201	0.056	0.071	51.06	0.868	18.08	0.050	0.024	113.4	105.9	94.72	25.07	0.865
19:57	11.022	11.776	0.172	0.050	1.234	54.05	0.766	15.80	0.044	0.024	99.4	92.8	94.94	25.59	0.883
20:16	11.401	12.538	0.184	0.052	0.072	53.10	0.843	16.31	0.049	0.024	103.4	96.5	94.57	25.45	0.878
20:35	11.121	12.549	0.181	0.051	0.070	53.63	0.793	16.15	0.047	0.023	101.3	94.6	94.61	25.54	0.882
20:54	10.920	12.462	0.200	0.048	0.042	53.80	0.788	16.10	0.046	0.022	100.7	94.0	94.43	25.53	0.881

TEST BOM/FGT-011

DATE TIME	GAS CHROMATOGRAPH DATA														
	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW WRT AIR	S.G. WRT AIR

6/ 6/1984															
21:12	11.195	12.307	0.203	0.049	0.040	53.19	0.803	16.46	0.047	0.023	103.0	96.2	94.32	25.40	0.877
21:31	12.054	12.082	0.209	0.052	0.038	51.89	0.844	17.19	0.049	0.024	108.8	101.5	94.44	25.17	0.869
21:50	12.191	11.885	0.205	0.053	0.037	51.59	0.849	17.66	0.050	0.025	110.7	103.4	94.54	25.13	0.867
22:09	11.432	11.616	0.200	0.049	1.338	53.34	0.809	16.27	0.047	0.023	103.2	96.3	95.13	25.50	0.880
22:28	12.060	12.146	0.216	0.054	0.035	52.00	0.877	17.36	0.049	0.015	109.6	102.3	94.82	25.28	0.873
22:47	11.085	11.974	0.217	0.053	0.023	53.36	0.844	17.21	0.048	0.014	105.6	98.8	94.83	25.51	0.881
23:05	10.878	12.317	0.214	0.049	0.035	53.95	0.827	16.47	0.048	0.015	102.2	95.6	94.80	25.61	0.884
23:24	11.364	12.215	0.215	0.051	0.028	53.07	0.851	16.77	0.050	0.024	105.4	98.4	94.64	25.42	0.878
23:43	10.933	12.238	0.207	0.051	0.076	53.83	0.822	16.46	0.051	0.037	102.9	96.2	94.71	25.57	0.883
6/ 7/1984															
0:02	10.225	12.235	0.204	0.047	0.600	55.14	0.782	15.43	0.047	0.030	96.5	90.2	94.74	25.78	0.890
0:21	10.680	12.411	0.223	0.050	0.029	54.02	0.846	16.19	0.054	0.027	101.5	94.9	94.53	25.60	0.884
0:40	10.466	12.507	0.232	0.051	0.019	54.52	0.853	15.95	0.053	0.024	100.2	93.7	94.67	25.71	0.888
0:59	10.467	12.430	0.235	0.051	0.015	54.36	0.854	15.99	0.054	0.024	100.4	93.9	94.48	25.65	0.885
1:18	10.920	12.185	0.240	0.052	0.022	53.79	0.873	16.55	0.055	0.024	104.0	97.2	94.71	25.55	0.882
1:37	9.855	12.475	0.244	0.048	0.019	55.51	0.829	15.52	0.055	0.023	96.7	90.5	94.58	25.84	0.892
1:56	10.023	12.196	0.227	0.048	0.510	55.51	0.868	15.20	0.053	0.024	96.4	90.1	94.66	25.79	0.890
2:15	9.139	12.492	0.262	0.050	0.000	56.31	0.865	15.01	0.057	0.023	93.5	87.6	94.21	25.92	0.895
2:33	9.573	13.201	0.250	0.047	0.013	56.23	0.809	13.99	0.054	0.022	90.7	84.7	94.19	25.93	0.895
2:52	8.884	13.499	0.247	0.045	0.014	57.38	0.797	13.15	0.054	0.022	85.6	79.9	94.10	26.13	0.902
4:08	9.659	13.705	0.260	0.049	0.000	57.13	0.824	13.78	0.054	0.012	90.4	84.4	95.47	26.34	0.909
4:26	9.386	12.754	0.226	0.047	0.673	56.79	0.779	13.53	0.053	0.021	87.9	82.1	94.26	25.95	0.896
4:44	9.756	12.991	0.257	0.050	0.009	55.65	0.848	14.22	0.054	0.022	92.6	86.5	93.86	25.75	0.889
5:03	9.812	13.088	0.256	0.050	0.010	55.86	0.838	14.17	0.056	0.023	92.6	86.4	94.16	25.84	0.892
5:21	9.168	13.455	0.274	0.050	0.010	56.82	0.831	13.37	0.058	0.023	88.2	82.3	94.06	26.03	0.899
6:02	8.709	13.746	0.235	0.046	0.404	58.50	0.750	12.08	0.071	0.013	81.1	75.6	94.55	26.36	0.910
6:20	7.912	11.768	0.220	0.043	4.029	59.80	0.688	10.30	0.053	0.024	71.8	66.7	94.83	26.48	0.914
6:39	8.910	14.265	0.264	0.052	0.015	57.36	0.814	11.99	0.062	0.022	82.7	77.0	93.75	26.14	0.902
6:57	8.853	14.231	0.251	0.052	0.029	57.92	0.851	11.74	0.059	0.000	81.3	75.6	93.99	26.21	0.905
7:16	8.941	14.145	0.262	0.052	0.036	57.81	0.862	11.90	0.062	0.022	83.0	77.2	94.09	26.21	0.905
7:34	8.700	14.159	0.255	0.051	0.127	58.29	0.835	11.03	0.061	0.022	79.0	73.3	93.53	26.12	0.902
7:53	8.614	14.554	0.262	0.054	0.107	58.43	0.815	10.91	0.063	0.021	78.3	72.7	93.83	26.30	0.908
8:11	8.179	13.673	0.238	0.048	1.072	59.37	0.770	10.76	0.061	0.020	75.4	70.1	94.19	26.41	0.912
8:30	9.122	14.132	0.272	0.054	0.017	57.17	0.867	12.05	0.060	0.022	84.2	78.3	93.76	26.07	0.900
8:48	13.595	12.627	0.257	0.074	1.469	50.33	1.087	15.23	0.070	0.029	111.7	103.3	94.77	24.98	0.862
9:07	16.192	12.136	0.234	0.079	0.036	46.19	1.176	18.91	0.073	0.033	132.7	122.9	95.06	24.24	0.837
9:25	16.802	11.752	0.236	0.082	0.019	44.92	1.200	19.66	0.075	0.036	137.5	127.4	94.78	23.94	0.826
9:44	16.198	12.215	0.289	0.081	0.024	45.70	1.158	18.80	0.077	0.036	133.3	123.4	94.58	24.12	0.833
10:02	15.206	12.031	0.266	0.073	1.045	47.67	1.048	17.04	0.071	0.033	122.6	113.4	94.48	24.37	0.841
10:21	15.983	7.476	0.245	0.076	0.768	51.18	1.071	18.15	0.053	0.034	128.2	118.7	95.04	23.58	0.814
10:39	15.361	13.052	0.305	0.077	0.053	48.01	1.074	17.43	0.073	0.024	125.1	115.8	95.45	24.72	0.853
10:57	15.779	12.896	0.313	0.081	0.040	47.30	1.137	17.78	0.076	0.022	128.4	118.8	95.42	24.57	0.848
11:16	15.906	12.561	0.301	0.078	0.055	47.11	1.108	18.20	0.074	0.030	129.8	120.2	95.42	24.49	0.845
11:34	14.496	12.009	0.295	0.080	0.082	48.60	1.080	18.49	0.075	0.050	126.4	117.4	95.26	24.73	0.854
11:53	15.130	12.216	0.298	0.078	0.488	48.12	1.098	17.79	0.073	0.041	126.1	116.8	95.32	24.63	0.850
12:12	15.213	12.415	0.276	0.078	0.064	48.26	1.106	17.85	0.076	0.036	126.2	116.9	95.37	24.64	0.850
12:31	15.313	12.414	0.258	0.078	0.286	47.97	1.077	17.84	0.071	0.038	125.9	116.6	95.35	24.62	0.850

TEST BOM/FGT-011

DATE TIME	GAS CHROMATOGRAPH DATA														
	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW	S.G. WRT AIR

6/ 7/1984															
12:49	16.356	11.858	0.250	0.082	0.187	46.04	1.137	19.18	0.066	0.037	134.0	124.1	95.19	24.20	0.835
13:08	15.965	12.471	0.282	0.084	0.073	46.90	1.156	18.16	0.073	0.036	130.3	120.6	95.20	24.40	0.842
13:26	15.590	13.035	0.253	0.081	0.082	47.83	1.095	17.07	0.074	0.038	124.5	115.1	95.14	24.58	0.848
13:45	16.352	12.951	0.233	0.084	0.022	46.61	1.126	17.76	0.067	0.038	129.1	119.3	95.25	24.39	0.842
14:03	15.654	12.224	0.208	0.078	1.444	48.01	1.060	16.52	0.068	0.037	121.7	112.3	95.30	24.53	0.847
14:22	14.990	12.488	0.241	0.073	0.064	48.77	1.072	17.16	0.067	0.034	122.1	113.0	94.96	24.59	0.849
14:40	17.019	12.167	0.221	0.086	0.091	45.28	1.158	18.95	0.074	0.038	135.4	125.2	95.09	24.04	0.830
14:59	16.627	12.927	0.249	0.083	0.059	46.36	1.123	17.69	0.070	0.036	130.0	120.0	95.22	24.31	0.839
15:17	17.692	12.951	0.223	0.090	0.055	44.78	1.238	18.26	0.074	0.039	136.3	125.7	95.40	24.07	0.831
15:36	17.953	12.267	0.251	0.087	0.026	44.18	1.294	19.26	0.070	0.023	140.8	130.0	95.41	23.88	0.824
15:54	17.951	12.291	0.232	0.086	0.110	44.22	1.181	19.10	0.077	0.038	139.4	128.7	95.29	23.88	0.824
16:13	17.927	12.208	0.256	0.038	0.038	44.16	1.249	19.45	0.082	0.056	141.2	130.5	95.47	23.91	0.825
17:16	15.756	11.146	0.277	0.072	0.681	46.87	1.040	18.72	0.082	0.031	130.0	120.6	94.68	24.13	0.833
17:35	15.666	12.528	0.273	0.077	0.298	46.94	1.118	17.31	0.082	0.040	126.3	116.7	94.33	24.26	0.837
17:54	15.584	11.625	0.205	0.073	0.361	46.64	1.044	18.71	0.069	0.040	128.3	119.0	94.35	24.15	0.834
18:31	16.537	12.585	0.279	0.078	0.046	46.05	1.172	18.05	0.077	0.033	131.8	121.8	94.90	24.18	0.835
6/ 8/1984															
12:01	16.637	14.126	0.313	0.081	0.021	48.81	1.287	17.87	0.074	0.018	132.9	122.7	99.24	25.60	0.884
12:20	16.487	13.584	0.296	0.082	0.063	48.56	1.103	17.43	0.072	0.018	128.8	118.9	97.69	25.14	0.868
12:39	16.775	13.093	0.288	0.081	0.010	47.74	1.153	18.22	0.070	0.017	132.6	122.5	97.45	24.91	0.860
12:57	15.946	13.739	0.300	0.079	0.029	49.17	1.134	16.87	0.065	0.024	125.6	115.9	97.36	25.21	0.870
13:16	16.713	12.875	0.251	0.079	0.042	47.97	1.107	18.36	0.065	0.030	132.0	122.0	97.50	24.91	0.860
13:35	16.849	13.072	0.266	0.080	0.028	47.99	1.131	18.09	0.065	0.025	131.9	121.8	97.59	24.93	0.861
13:54	16.999	13.496	0.270	0.078	0.022	47.86	1.142	17.54	0.064	0.023	130.7	120.5	97.50	24.93	0.861
14:12	16.766	13.411	0.262	0.078	0.278	48.15	1.127	17.07	0.055	0.021	127.9	117.9	97.22	24.91	0.860
14:31	17.089	13.410	0.253	0.081	0.024	47.82	1.166	17.49	0.065	0.023	130.9	120.6	97.42	24.87	0.859
14:50	16.496	13.155	0.277	0.079	0.047	48.41	1.128	17.69	0.067	0.024	129.6	119.7	97.37	24.98	0.862
16:38	16.934	13.418	0.248	0.077	0.063	47.06	1.096	16.92	0.065	0.017	127.5	117.5	95.90	24.49	0.845
16:57	16.343	14.225	0.240	0.079	0.082	47.95	1.099	15.34	0.061	0.022	120.5	110.8	95.45	24.65	0.851
17:15	16.780	13.971	0.259	0.079	0.124	47.28	1.118	15.84	0.062	0.021	124.0	114.0	95.53	24.52	0.846
17:34	17.392	14.075	0.234	0.080	0.100	46.77	1.108	15.87	0.058	0.020	125.5	115.2	95.71	24.43	0.843
17:53	17.212	13.820	0.217	0.078	0.507	46.79	1.095	16.08	0.056	0.021	125.1	115.0	95.88	24.50	0.846
18:40	18.074	14.625	0.249	0.083	0.038	46.61	1.092	16.18	0.064	0.017	128.9	118.3	97.03	24.71	0.853
18:59	17.246	13.380	0.223	0.076	0.283	46.58	0.992	16.66	0.060	0.015	126.1	116.0	95.51	24.32	0.839
19:18	17.244	13.581	0.232	0.080	0.092	46.50	1.038	16.66	0.060	0.022	126.9	116.8	95.50	24.34	0.840
19:36	17.315	13.822	0.264	0.082	0.071	46.27	1.140	16.45	0.064	0.030	128.3	118.0	95.51	24.35	0.840
20:52	16.435	14.403	0.237	0.080	0.017	47.13	1.032	14.83	0.069	0.018	118.5	108.8	94.26	24.33	0.840
21:11	16.771	13.374	0.221	0.075	0.077	46.25	0.971	16.29	0.058	0.022	123.2	113.4	94.11	24.04	0.830
21:30	15.637	14.895	0.253	0.074	0.113	48.27	0.939	13.70	0.067	0.022	111.6	102.4	93.97	24.55	0.847
21:49	15.417	15.620	0.207	0.074	0.168	49.04	0.913	12.33	0.060	0.023	105.3	96.3	93.85	24.69	0.852
22:07	15.896	14.533	0.216	0.077	0.484	48.10	0.947	13.84	0.064	0.024	112.4	103.0	94.18	24.50	0.846
22:26	15.989	14.849	0.184	0.081	0.275	48.38	0.966	13.21	0.058	0.024	110.3	100.9	94.02	24.47	0.845
22:45	16.659	13.892	0.209	0.080	0.191	46.96	0.997	15.15	0.063	0.024	119.5	109.7	94.23	24.19	0.835
23:04	16.738	13.768	0.227	0.080	0.121	46.53	1.028	15.45	0.061	0.023	121.3	111.4	94.03	24.09	0.831
23:23	14.768	14.756	0.218	0.071	0.138	50.13	0.895	13.07	0.057	0.021	105.4	96.7	94.12	24.80	0.856
23:42	15.455	14.288	0.209	0.075	0.070	48.60	0.921	14.35	0.058	0.023	112.1	103.0	94.05	24.52	0.846

TEST BOM/FGT-011

DATE TIME	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	GAS CHROMATOGRAPH DATA										HHV BTU/SCF	LHV	TMP %	MW	S.G. WRT AIR
						N2 %	CH4 %	CO %	C3H6 %	C3H8 %										

6/ 9/1984																				
0:01	16.328	13.950	0.191	0.079	0.182	47.36	0.971	15.19	0.061	0.025	118.0	108.4	94.34	24.32	0.839					
0:19	15.982	13.724	0.183	0.077	0.621	48.10	0.933	14.55	0.053	0.024	114.0	104.7	94.24	24.37	0.841					
0:38	16.317	13.451	0.230	0.077	0.177	47.10	0.974	15.85	0.064	0.023	120.7	111.1	94.26	24.22	0.836					
0:57	16.253	14.106	0.243	0.081	0.147	47.16	1.018	15.08	0.062	0.023	118.7	109.1	94.17	24.31	0.839					
1:16	17.381	13.357	0.241	0.090	0.018	44.89	1.121	16.89	0.071	0.027	129.6	119.3	94.08	23.86	0.824					
1:35	17.089	9.018	0.228	0.082	0.527	49.21	1.033	17.64	0.068	0.028	129.8	119.7	94.92	23.50	0.811					
1:54	16.032	14.274	0.262	0.083	0.029	47.71	1.022	15.23	0.065	0.018	118.8	109.2	94.72	24.54	0.847					
2:12	15.624	13.695	0.220	0.079	1.036	48.51	0.963	14.37	0.063	0.018	113.3	104.1	94.58	24.57	0.848					
2:31	12.210	10.974	0.145	0.051	0.101	49.63	0.806	18.16	0.040	0.024	110.7	103.5	92.15	24.31	0.839					
2:50	16.435	14.291	0.222	0.085	0.049	47.29	1.040	14.93	0.064	0.035	119.1	109.3	94.44	24.37	0.841					
3:09	16.174	14.875	0.237	0.088	0.034	47.68	1.074	14.21	0.066	0.031	116.5	106.9	94.48	24.53	0.847					
3:27	16.466	13.554	0.190	0.081	0.065	46.96	1.001	15.99	0.057	0.026	121.3	111.6	94.40	24.23	0.836					
3:46	16.736	12.886	0.235	0.082	0.049	46.00	1.082	17.27	0.063	0.025	127.9	118.0	94.43	24.05	0.830					
4:05	15.850	13.003	0.228	0.083	0.851	47.42	1.073	15.88	0.063	0.025	120.4	110.9	94.47	24.35	0.840					
4:24	16.378	13.182	0.229	0.083	0.044	46.57	1.017	16.75	0.066	0.025	124.4	114.7	94.34	24.17	0.834					
4:42	16.721	12.922	0.244	0.085	0.121	45.92	1.069	17.17	0.069	0.025	127.8	117.8	94.35	24.04	0.830					
5:02	16.714	13.051	0.235	0.089	0.015	45.87	1.092	17.26	0.075	0.029	128.4	118.4	94.43	24.08	0.831					
5:21	17.163	12.096	0.218	0.087	0.015	45.09	1.090	18.73	0.065	0.027	134.0	123.8	94.58	23.85	0.823					
5:40	16.958	12.633	0.248	0.087	0.018	45.33	1.090	18.03	0.063	0.025	131.4	121.3	94.48	23.96	0.827					
5:58	16.793	12.732	0.244	0.083	0.064	45.75	1.139	17.62	0.064	0.024	129.9	119.9	94.52	24.03	0.829					
6:17	16.493	12.623	0.226	0.082	0.021	46.13	1.018	18.02	0.063	0.024	128.7	118.9	94.70	24.15	0.834					
6:36	15.808	13.422	0.278	0.084	0.158	47.47	1.066	16.23	0.072	0.019	122.2	112.7	94.61	24.43	0.843					
6:55	16.652	13.638	0.255	0.087	0.093	46.31	1.096	16.24	0.070	0.019	124.9	114.9	94.46	24.20	0.835					
7:13	17.026	12.702	0.233	0.085	0.027	45.60	1.060	17.73	0.063	0.039	130.5	120.4	94.56	23.99	0.828					
7:32	16.556	13.159	0.255	0.085	0.048	46.45	1.123	16.74	0.065	0.032	126.6	116.7	94.52	24.16	0.834					
7:51	16.385	13.354	0.234	0.084	0.207	46.85	1.032	16.25	0.061	0.028	123.0	113.3	94.49	24.25	0.837					
8:10	15.625	12.922	0.232	0.082	1.024	47.27	1.004	15.49	0.055	0.026	117.6	108.3	93.73	24.20	0.835					
8:29	16.977	12.495	0.237	0.089	0.123	45.00	1.174	17.63	0.066	0.027	131.0	120.9	93.82	23.75	0.820					
8:47	16.537	12.668	0.263	0.082	0.015	45.49	1.108	17.49	0.060	0.024	128.6	118.7	93.73	23.87	0.824					
9:06	15.599	12.845	0.235	0.079	0.066	47.08	1.029	16.63	0.060	0.024	121.5	112.2	93.65	24.13	0.833					
9:25	16.125	12.626	0.256	0.080	0.072	46.08	1.071	17.22	0.059	0.023	125.8	116.1	93.60	23.94	0.826					
9:44	16.240	12.447	0.225	0.080	0.055	46.02	1.051	17.44	0.061	0.024	126.2	116.6	93.65	23.89	0.825					
10:02	15.227	13.321	0.251	0.076	0.726	47.88	1.020	14.86	0.062	0.022	114.7	105.6	93.44	24.27	0.838					
10:21	15.923	13.219	0.263	0.082	0.045	45.94	1.088	16.49	0.063	0.024	123.2	113.7	93.14	23.95	0.827					
10:40	16.531	13.550	0.270	0.083	0.032	45.41	1.127	16.10	0.071	0.019	124.5	114.6	93.19	23.86	0.824					
10:59	16.043	14.356	0.256	0.086	0.056	46.44	1.116	14.55	0.065	0.021	117.6	108.0	93.00	24.06	0.831					
11:18	17.182	12.983	0.237	0.087	0.084	44.35	1.156	16.98	0.059	0.036	129.5	119.2	93.16	23.59	0.814					
11:37	17.549	12.431	0.246	0.093	0.014	43.23	1.227	18.21	0.062	0.003	134.8	124.3	93.06	23.36	0.806					
11:56	17.822	12.616	0.262	0.093	0.015	42.84	1.247	18.02	0.067	0.031	136.4	125.7	93.01	23.31	0.805					
12:14	17.170	12.477	0.243	0.092	0.697	44.17	1.238	16.86	0.067	0.030	130.1	119.7	93.04	23.49	0.811					
12:33	17.298	12.721	0.242	0.090	0.024	43.75	1.199	17.61	0.062	0.028	132.3	121.9	93.03	23.47	0.810					
12:52	18.605	14.131	0.190	0.097	0.000	42.82	1.345	15.97	0.064	0.032	132.1	121.0	93.25	23.40	0.808					
13:45	16.209	12.643	0.226	0.100	0.036	45.95	1.328	17.87	0.086	0.027	131.3	121.4	94.47	24.14	0.833					
14:08	14.756	11.716	0.208	0.092	2.216	48.00	1.224	15.70	0.073	0.023	117.8	108.7	94.01	24.33	0.840					
14:27	15.904	12.064	0.213	0.095	0.636	45.62	1.284	17.23	0.055	0.025	126.8	117.1	93.13	23.77	0.821					
14:45	16.754	12.085	0.208	0.100	0.055	44.02	1.247	18.48	0.056	0.026	133.2	123.1	93.02	23.50	0.811					
15:03	16.749	12.547	0.244	0.086	0.115	44.64	1.086	17.32	0.058	0.021	128.1	118.2	92.86	23.55	0.813					

TEST BOM/FGT-011

GAS CHROMATOGRAPH DATA

DATE TIME	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW	S.G. WRT AIR

6/ 9/1984															
15:22	16.928	12.897	0.247	0.084	0.031	44.67	1.176	16.94	0.060	0.020	128.4	118.3	93.05	23.60	0.815
16:49	18.558	13.459	0.230	0.089	0.019	45.14	1.135	18.25	0.045	0.021	137.0	126.1	96.95	24.36	0.841
16:59	18.468	13.048	0.214	0.094	0.019	44.98	1.250	18.90	0.056	0.024	140.1	129.2	97.05	24.34	0.840
17:17	17.775	13.331	0.249	0.091	0.037	46.12	1.256	18.08	0.061	0.021	135.9	125.2	97.02	24.56	0.848
17:54	17.334	12.188	0.230	0.089	0.799	46.36	1.232	18.37	0.059	0.022	134.8	124.4	96.68	24.43	0.843
18:12	15.257	12.307	0.269	0.080	1.131	50.23	1.166	16.90	0.057	0.020	123.0	113.7	97.42	25.21	0.870
18:31	15.526	12.854	0.265	0.086	0.173	49.57	1.193	17.40	0.064	0.018	125.9	116.4	97.14	25.11	0.867
18:49	17.538	12.790	0.248	0.090	0.054	46.81	1.220	18.79	0.065	0.019	137.0	126.5	97.63	24.71	0.853
19:07	17.187	13.053	0.276	0.092	0.044	47.20	1.245	18.24	0.073	0.073	136.4	125.9	97.48	24.81	0.856
19:26	16.881	13.566	0.281	0.088	0.018	48.14	1.210	17.48	0.058	0.026	131.1	120.9	97.74	25.03	0.864
19:44	17.568	13.187	0.273	0.091	0.034	46.73	1.263	18.24	0.062	0.024	136.3	125.7	97.47	24.71	0.853
20:03	15.994	12.613	0.266	0.081	0.636	49.21	1.083	17.48	0.058	0.020	126.4	116.8	97.43	25.06	0.865
20:21	15.807	13.074	0.276	0.082	0.012	49.70	1.174	17.57	0.055	0.019	127.1	117.5	97.77	25.24	0.871
20:39	17.690	13.265	0.249	0.090	0.032	46.75	1.209	18.31	0.062	0.022	135.9	125.3	97.68	24.76	0.855
20:56	16.947	13.697	0.264	0.087	0.050	48.12	1.178	17.14	0.061	0.013	129.3	119.2	97.56	24.99	0.863
21:33	17.050	13.369	0.275	0.087	0.070	47.59	1.211	17.61	0.063	0.019	131.9	121.7	97.35	24.85	0.858
21:52	17.480	13.266	0.289	0.089	0.024	46.90	1.252	18.00	0.064	0.022	135.3	124.7	97.38	24.72	0.853
22:10	16.459	12.400	0.288	0.088	0.613	48.10	1.244	17.87	0.063	0.021	131.4	121.4	97.15	24.81	0.856
22:29	16.197	12.623	0.259	0.085	0.104	48.53	1.189	18.17	0.032	0.018	129.6	119.9	97.20	24.91	0.860
22:48	18.425	13.029	0.274	0.095	0.007	45.16	1.319	19.16	0.060	0.030	142.7	131.7	97.55	24.48	0.845
23:07	18.366	12.462	0.261	0.095	0.026	45.13	1.312	19.83	0.064	0.025	144.4	133.4	97.57	24.41	0.843
23:25	17.456	12.750	0.291	0.091	0.016	45.81	1.281	18.69	0.056	0.022	137.6	127.1	96.46	24.39	0.842
23:43	17.403	12.537	0.264	0.092	0.027	45.92	1.264	18.89	0.062	0.024	137.7	127.2	96.49	24.38	0.841
6/10/1984															
0:02	16.735	12.739	0.265	0.087	0.174	47.13	1.195	18.04	0.053	0.021	131.7	121.7	96.44	24.58	0.849
0:20	15.441	13.493	0.276	0.085	0.297	49.60	1.171	16.03	0.059	0.021	121.2	111.7	96.48	25.06	0.865
0:39	17.812	13.968	0.244	0.092	0.063	46.32	1.232	17.01	0.063	0.023	132.3	121.7	96.83	24.60	0.849
0:57	17.104	13.492	0.238	0.086	0.100	47.39	1.158	17.14	0.053	0.021	129.2	119.1	96.79	24.70	0.853
1:16	17.614	14.165	0.237	0.091	0.011	46.66	1.217	16.77	0.063	0.024	130.7	120.1	96.85	24.69	0.852
1:34	17.952	13.536	0.249	0.092	0.012	46.00	1.211	17.93	0.064	0.023	135.6	124.9	97.07	24.56	0.848
1:53	17.404	12.974	0.232	0.086	0.084	46.64	1.147	18.26	0.062	0.019	133.7	123.4	96.90	24.58	0.848
2:11	17.757	11.982	0.235	0.086	0.878	46.10	1.221	18.62	0.062	0.019	136.8	126.3	96.96	24.37	0.841
2:30	18.227	12.893	0.257	0.088	0.000	45.18	1.205	18.88	0.058	0.028	139.5	128.7	96.82	24.32	0.839
2:48	17.555	12.713	0.276	0.092	0.027	46.05	1.248	18.80	0.062	0.025	137.9	127.4	96.84	24.47	0.845
3:06	17.733	13.023	0.270	0.092	0.041	45.80	1.253	18.40	0.062	0.023	137.2	126.5	96.70	24.43	0.843
3:25	17.985	13.204	0.257	0.088	0.038	45.85	1.226	18.04	0.061	0.023	136.2	125.5	96.77	24.41	0.843
3:43	18.278	12.617	0.229	0.086	0.037	45.28	1.183	19.12	0.059	0.023	139.7	128.9	96.91	24.29	0.838
4:02	17.673	13.404	0.233	0.088	0.024	46.46	1.093	17.89	0.059	0.023	133.0	122.5	96.94	24.59	0.849
4:20	17.737	12.633	0.250	0.082	0.009	46.42	1.072	18.60	0.054	0.020	135.2	124.8	96.88	24.44	0.843
4:39	18.133	13.371	0.224	0.083	0.012	46.08	1.080	18.01	0.059	0.022	134.5	123.8	97.07	24.50	0.846
4:57	17.735	13.672	0.242	0.085	0.060	47.03	1.095	17.17	0.059	0.022	130.9	120.5	97.17	24.68	0.852
5:16	17.930	13.381	0.245	0.085	0.023	46.37	1.105	17.75	0.063	0.022	133.7	123.1	96.97	24.53	0.847
5:34	17.617	13.956	0.265	0.085	0.055	47.12	1.098	16.72	0.051	0.020	129.3	118.9	96.99	24.71	0.853
5:53	17.053	13.793	0.236	0.085	0.133	47.70	1.143	16.61	0.056	0.022	127.2	117.1	96.82	24.78	0.855
6:12	16.273	13.732	0.252	0.078	0.916	49.41	1.106	15.50	0.062	0.021	121.0	111.3	97.35	25.16	0.868
6:30	17.689	14.310	0.254	0.084	0.024	47.26	1.187	16.25	0.064	0.018	129.0	118.4	97.15	24.78	0.855
6:50	17.743	14.504	0.235	0.083	0.024	47.64	1.141	15.91	0.063	0.018	127.2	116.7	97.36	24.86	0.858

TEST BOM/FGT-011

GAS CHROMATOGRAPH DATA

DATE TIME	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW	S.G. WRT AIR
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
6/10/1984															
7:08	17.525	13.925	0.259	0.082	0.022	47.61	1.161	16.30	0.061	0.021	128.4	118.0	96.96	24.71	0.853
7:45	16.276	14.877	0.276	0.079	0.150	49.84	1.118	14.19	0.059	0.024	117.4	107.6	96.89	25.18	0.869
8:04	13.382	13.960	0.262	0.063	1.046	53.94	0.954	12.70	0.049	0.017	100.6	92.5	96.38	25.69	0.887
8:23	17.064	14.321	0.261	0.081	0.262	48.39	1.061	15.50	0.060	0.021	123.3	113.2	97.03	24.93	0.861
8:41	16.233	14.431	0.292	0.077	0.123	49.56	1.117	15.06	0.058	0.019	120.1	110.3	96.97	25.14	0.868
9:00	16.381	14.239	0.286	0.075	0.358	49.65	1.022	15.02	0.047	0.016	119.0	109.3	97.10	25.12	0.867
9:37	17.598	13.385	0.202	0.100	0.079	47.82	1.289	16.74	0.058	0.027	130.8	120.2	97.30	24.69	0.852
9:55	17.556	11.895	0.151	0.094	0.020	47.40	1.119	18.91	0.047	0.026	134.7	124.4	97.21	24.45	0.844
10:14	16.206	10.996	0.113	0.093	0.437	49.34	1.076	18.98	0.041	0.027	129.4	119.9	97.31	24.71	0.853
10:32	15.604	8.465	0.075	0.081	0.063	48.61	0.923	23.41	0.034	0.035	139.3	130.3	97.30	24.46	0.844
10:51	17.117	8.207	0.071	0.088	0.048	46.45	1.015	24.41	0.034	0.035	148.4	138.6	97.48	24.06	0.831
11:10	17.241	7.725	0.063	0.089	0.034	46.22	1.034	25.19	0.031	0.032	151.3	141.3	97.66	24.00	0.828
11:28	16.829	7.837	0.057	0.079	0.000	46.72	0.947	25.04	0.027	0.023	148.0	138.4	97.56	24.11	0.832
11:47	16.647	7.895	0.052	0.070	0.000	47.27	0.883	24.90	0.024	0.020	145.9	136.5	97.77	24.23	0.836
12:05	15.911	7.812	0.056	0.066	0.899	48.74	0.820	23.45	0.025	0.024	138.3	129.3	97.80	24.46	0.844
12:24	15.137	8.592	0.047	0.054	0.008	50.00	0.674	23.20	0.019	0.019	133.0	124.5	97.76	24.75	0.854
12:43	15.590	7.588	0.041	0.053	0.022	48.94	0.651	25.07	0.021	0.019	140.1	131.5	98.00	24.54	0.847
13:01	15.652	7.560	0.041	0.048	0.010	48.78	0.605	25.18	0.018	0.013	139.9	131.3	97.91	24.50	0.846
13:20	15.570	7.353	0.036	0.045	0.023	48.94	0.580	25.50	0.016	0.016	140.3	131.8	98.08	24.54	0.847
13:39	15.405	7.710	0.040	0.050	0.000	49.24	0.609	25.14	0.019	0.013	139.0	130.6	98.23	24.68	0.852
13:57	15.273	7.758	0.042	0.044	0.000	49.39	0.596	24.90	0.016	0.010	137.5	129.1	98.03	24.67	0.851
14:16	14.434	6.993	0.022	0.034	0.835	50.68	0.466	24.70	0.011	0.008	132.2	124.4	98.18	24.85	0.858
14:35	14.586	7.045	0.018	0.033	0.028	50.14	0.432	25.97	0.010	0.008	136.3	128.5	98.27	24.82	0.857
14:57	15.185	7.041	0.019	0.043	0.000	49.49	0.533	26.41	0.012	0.011	141.0	132.8	98.74	24.78	0.855
15:15	15.403	7.164	0.019	0.045	0.000	49.04	0.562	26.11	0.012	0.011	141.1	132.7	98.37	24.64	0.850
15:33	16.095	7.754	0.020	0.043	0.000	48.26	0.577	25.33	0.012	0.011	140.9	132.2	98.11	24.47	0.845
15:52	16.498	8.353	0.018	0.041	0.000	48.01	0.592	24.42	0.011	0.011	139.4	130.4	97.95	24.42	0.843
16:10	16.443	8.686	0.016	0.037	0.642	48.63	0.548	22.77	0.010	0.009	133.3	124.4	97.79	24.47	0.845
16:28	16.679	9.561	0.022	0.048	0.000	48.35	0.649	22.64	0.014	0.013	135.1	126.0	97.98	24.57	0.848
16:46	19.284	10.514	0.026	0.059	0.009	45.32	0.828	21.69	0.016	0.016	142.7	132.0	97.76	23.96	0.827
17:04	19.770	11.746	0.027	0.061	0.009	45.54	0.912	19.91	0.016	0.016	139.5	128.5	98.01	24.09	0.832
17:22	19.160	12.200	0.022	0.051	1.130	47.25	0.826	17.30	0.013	0.014	127.9	117.3	97.97	24.37	0.841
17:41	16.294	10.328	0.016	0.040	0.011	49.16	0.694	21.18	0.011	0.013	129.3	120.4	97.74	24.72	0.853
17:59	16.257	10.014	0.021	0.044	0.018	49.44	0.727	21.44	0.012	0.012	130.5	121.6	97.99	24.74	0.854

GAS CHROMATOGRAPH DATA

DATE TIME	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW	S.G. WRT AIR

7/16/1984

18:59	14.731	9.517	0.002	0.089	0.000	52.63	0.912	19.52	0.000	0.000	121.2	112.8	97.41	24.87	0.859
19:17	14.564	9.614	0.002	0.007	0.000	53.02	0.885	19.45	0.000	0.001	118.7	110.6	97.54	24.97	0.862
19:34	14.310	9.500	0.002	0.007	0.000	53.01	0.854	19.55	0.000	0.001	117.9	109.9	97.23	24.93	0.861
19:51	14.535	9.230	0.002	0.008	0.000	52.84	0.891	19.72	0.000	0.001	119.6	111.4	97.22	24.83	0.857
20:08	14.136	9.089	0.002	0.010	0.246	53.56	1.073	19.14	0.000	0.001	118.3	110.2	97.26	24.91	0.860
20:26	15.016	9.047	0.002	0.010	0.000	52.27	1.161	19.52	0.000	0.001	123.3	114.6	97.03	24.59	0.849
20:43	14.663	9.055	0.002	0.009	0.000	52.62	0.959	19.79	0.000	0.001	120.9	112.6	97.10	24.72	0.853
21:00	14.207	9.181	0.002	0.007	0.000	52.88	0.825	19.88	0.000	0.001	118.3	110.4	96.98	24.85	0.858
21:18	14.008	9.249	0.001	0.007	0.000	53.09	0.766	19.88	0.000	0.001	117.1	109.3	97.01	24.92	0.860
21:35	13.861	9.328	0.001	0.006	0.000	52.96	0.692	19.96	0.000	0.000	116.1	108.5	96.81	24.93	0.860
21:52	13.488	9.527	0.002	0.005	0.000	53.18	0.541	19.94	0.001	0.001	113.3	106.0	96.69	25.04	0.864
22:09	12.711	9.684	0.002	0.004	0.000	54.69	0.434	19.19	0.001	0.001	107.3	100.5	96.71	25.29	0.873
22:27	13.734	9.603	0.009	0.017	0.000	53.05	0.982	19.79	0.004	0.002	118.5	110.6	97.19	25.08	0.866
22:44	15.482	9.420	0.010	0.022	0.000	51.63	1.419	19.57	0.005	0.003	128.1	118.9	97.57	24.65	0.851
23:01	15.559	10.203	0.027	0.038	0.000	50.74	1.201	19.75	0.015	0.009	127.6	118.5	97.54	24.77	0.855
23:19	14.761	10.267	0.028	0.037	0.000	51.24	0.932	20.46	0.016	0.009	124.6	116.2	97.75	25.08	0.866
23:36	14.298	10.291	0.029	0.034	0.000	51.56	0.770	20.69	0.015	0.008	122.1	114.1	97.70	25.21	0.870
23:53	14.052	10.281	0.029	0.035	0.000	51.52	0.707	20.93	0.014	0.007	121.5	113.6	97.58	25.25	0.871

7/17/1984

0:11	12.685	9.838	0.029	0.037	1.730	53.86	0.677	19.10	0.015	0.008	110.9	103.8	97.98	25.72	0.888
0:28	13.860	10.449	0.031	0.041	0.000	51.38	0.720	21.22	0.016	0.009	122.1	114.3	97.72	25.36	0.875
0:46	13.627	10.426	0.032	0.042	0.000	51.39	0.689	21.40	0.016	0.009	121.7	114.0	97.63	25.40	0.877
1:03	13.623	10.403	0.031	0.042	0.000	51.29	0.680	21.56	0.016	0.009	122.0	114.4	97.65	25.40	0.877
1:20	13.537	10.432	0.032	0.044	0.000	51.28	0.705	21.72	0.017	0.010	122.6	115.0	97.78	25.46	0.879
1:38	13.584	10.430	0.032	0.045	0.000	51.04	0.724	21.76	0.017	0.010	123.1	115.5	97.64	25.41	0.877
1:55	13.549	10.451	0.032	0.046	0.000	50.97	0.723	21.83	0.017	0.010	123.2	115.6	97.63	25.42	0.877
2:13	13.604	10.635	0.034	0.050	0.000	51.00	0.770	21.63	0.018	0.011	123.4	115.7	97.75	25.46	0.879
2:31	13.774	10.492	0.033	0.050	0.000	50.67	0.789	21.98	0.020	0.021	125.5	117.7	97.82	25.41	0.877
2:49	13.737	10.437	0.033	0.049	0.000	50.70	0.786	22.08	0.017	0.011	125.4	117.6	97.85	25.42	0.878
3:06	13.809	10.379	0.034	0.050	0.000	50.51	0.795	22.17	0.018	0.011	126.0	118.2	97.78	25.37	0.876
3:23	13.770	10.348	0.033	0.049	0.000	50.55	0.778	22.19	0.017	0.010	125.8	118.0	97.75	25.37	0.876
3:41	13.766	10.383	0.033	0.049	0.000	50.54	0.772	22.21	0.017	0.010	125.7	118.0	97.78	25.39	0.876
3:58	13.855	10.305	0.033	0.048	0.000	50.48	0.776	22.33	0.017	0.010	126.4	118.6	97.85	25.37	0.876
4:16	13.757	10.570	0.035	0.051	0.000	50.44	0.796	22.11	0.015	0.011	125.7	117.9	97.78	25.42	0.877
4:33	13.900	10.453	0.033	0.049	0.000	50.54	0.786	22.22	0.017	0.011	126.4	118.5	98.01	25.43	0.878
4:50	13.904	10.291	0.033	0.048	0.000	50.32	0.779	22.43	0.017	0.010	126.9	119.1	97.83	25.35	0.875
5:25	13.907	10.404	0.033	0.049	0.000	50.28	0.781	22.55	0.020	0.013	127.5	119.6	98.04	25.43	0.878
5:43	13.937	10.372	0.032	0.047	0.000	50.31	0.766	22.56	0.019	0.013	127.4	119.5	98.05	25.42	0.877
6:00	13.901	10.232	0.033	0.048	0.000	50.36	0.763	22.62	0.019	0.013	127.5	119.6	97.99	25.39	0.876
6:00	13.901	10.232	0.033	0.048	0.000	50.39	0.763	22.62	0.019	0.013	127.5	119.6	98.01	25.40	0.877
6:18	13.946	10.426	0.033	0.050	0.000	50.19	0.785	22.53	0.020	0.014	127.6	119.7	97.99	25.41	0.877
6:35	13.959	10.321	0.033	0.049	0.000	50.35	0.779	22.62	0.015	0.009	127.7	119.8	98.14	25.43	0.878
6:53	13.903	10.313	0.033	0.047	0.000	50.36	0.764	22.56	0.020	0.019	127.5	119.6	98.02	25.41	0.877
7:10	13.942	10.279	0.033	0.047	0.000	50.15	0.758	22.70	0.015	0.085	129.5	121.5	98.01	25.40	0.877

GAS CHROMATOGRAPH DATA

DATE TIME	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW	S.G. WRT AIR

7/17/1984															
7:28	13.923	10.248	0.032	0.047	0.000	50.12	0.753	22.77	0.016	0.009	127.8	119.9	97.92	25.37	0.876
7:45	13.959	10.215	0.032	0.047	0.000	49.95	0.760	22.71	0.017	0.010	127.8	119.9	97.70	25.29	0.873
8:02	13.883	10.109	0.033	0.049	0.000	49.45	0.777	22.62	0.018	0.010	127.5	119.6	96.95	25.08	0.866
8:20	14.470	10.244	0.031	0.046	0.000	49.10	0.745	22.60	0.017	0.010	128.9	120.8	97.27	25.04	0.864
8:38	14.939	9.705	0.034	0.048	0.000	48.45	0.787	23.80	0.017	0.010	134.8	126.4	97.79	24.97	0.862
8:55	14.958	9.651	0.034	0.046	0.000	48.48	0.746	23.97	0.017	0.093	137.0	128.5	98.00	25.04	0.864
9:13	14.167	9.383	0.034	0.048	0.000	50.21	0.747	22.47	0.017	0.010	127.6	119.6	97.08	24.93	0.861
9:30	15.505	9.722	0.039	0.056	0.000	47.32	0.883	24.37	0.021	0.012	139.8	131.0	97.93	24.86	0.858
9:48	15.248	10.364	0.038	0.056	0.000	47.87	0.873	23.43	0.020	0.013	135.8	127.2	97.92	25.03	0.864
10:09	15.045	10.760	0.039	0.058	0.000	49.33	0.877	22.58	0.030	0.016	132.8	124.3	98.74	25.37	0.876
10:27	14.060	10.700	0.039	0.060	0.000	48.58	0.920	23.06	0.019	0.013	131.3	123.2	97.44	25.25	0.872
10:45	14.766	10.509	0.039	0.060	0.000	48.39	0.922	23.22	0.020	0.013	134.2	125.7	97.93	25.17	0.869
11:02	14.965	10.282	0.041	0.063	0.000	47.92	0.963	23.72	0.022	0.014	137.0	128.4	97.99	25.10	0.866
11:20	15.112	10.008	0.040	0.062	0.000	47.70	0.964	24.17	0.021	0.014	138.8	130.1	98.09	25.04	0.864
11:37	15.260	10.061	0.041	0.063	0.000	47.27	0.977	24.19	0.022	0.014	139.6	130.8	97.89	24.96	0.861
11:55	15.161	10.073	0.042	0.064	0.000	47.46	0.980	24.10	0.022	0.014	139.1	130.3	97.92	24.99	0.863
12:12	15.117	10.206	0.041	0.064	0.000	47.65	0.977	23.92	0.022	0.014	138.3	129.5	98.01	25.05	0.865
12:30	15.224	10.129	0.042	0.065	0.000	47.43	0.996	23.95	0.023	0.015	139.0	130.2	97.88	24.97	0.862
12:48	15.306	10.172	0.042	0.066	0.000	47.38	1.007	24.05	0.023	0.015	139.7	130.9	98.06	25.00	0.863
13:05	15.481	10.027	0.042	0.067	0.000	47.02	1.028	24.27	0.023	0.015	141.2	132.3	97.97	24.91	0.860
13:23	15.718	9.592	0.043	0.068	0.000	46.51	1.042	24.99	0.023	0.015	144.5	135.4	98.01	24.79	0.856
13:40	16.013	9.254	0.045	0.070	0.000	45.93	1.090	25.47	0.025	0.016	147.6	138.3	97.91	24.62	0.850
13:58	16.492	8.648	0.046	0.073	0.000	45.12	1.150	26.58	0.026	0.016	153.4	143.8	98.15	24.46	0.844
14:16	16.667	8.129	0.048	0.075	0.000	44.40	1.185	27.42	0.026	0.017	157.1	147.4	97.97	24.28	0.838
14:33	16.775	7.912	0.050	0.079	0.000	43.94	1.233	27.90	0.027	0.018	159.6	149.8	97.93	24.20	0.835
14:51	16.976	7.772	0.052	0.084	0.000	43.69	1.309	28.20	0.029	0.019	162.2	152.2	98.14	24.17	0.834
15:09	17.105	7.648	0.054	0.086	0.000	43.40	1.348	28.37	0.030	0.021	163.7	153.5	98.07	24.10	0.832
15:26	17.220	7.614	0.057	0.092	0.000	43.01	1.395	28.53	0.033	0.022	165.3	155.0	97.97	24.03	0.829
15:44	17.392	7.297	0.057	0.093	0.000	42.73	1.423	29.14	0.036	0.039	168.6	158.2	98.21	24.00	0.828
16:01	17.453	7.154	0.057	0.093	0.000	42.53	1.446	29.23	0.034	0.022	168.9	158.4	98.02	23.90	0.825
16:19	17.403	7.193	0.060	0.046	0.000	42.37	1.454	29.38	0.035	0.023	168.5	158.2	97.96	23.91	0.825
16:37	17.466	7.160	0.062	0.097	0.000	42.28	1.469	29.31	0.036	0.023	169.6	159.1	97.90	23.86	0.824
16:54	17.556	7.050	0.061	0.095	0.000	42.42	1.451	29.76	0.036	0.023	171.1	160.6	98.46	23.98	0.828
17:12	17.495	6.885	0.063	0.100	0.000	42.06	1.488	29.91	0.039	0.026	172.0	161.5	98.06	23.86	0.824
17:36	17.802	6.789	0.065	0.103	0.000	42.20	1.557	30.33	0.042	0.029	175.3	164.5	98.91	23.99	0.828
17:53	17.593	6.772	0.064	0.100	0.000	41.87	1.498	30.03	0.041	0.040	173.3	162.7	98.01	23.80	0.822
18:10	17.504	6.950	0.068	0.104	0.000	41.74	1.508	29.83	0.034	0.022	172.0	161.4	97.76	23.78	0.821
18:28	17.702	7.071	0.073	0.106	0.000	41.70	1.552	29.66	0.039	0.024	172.8	162.1	97.92	23.79	0.821
18:45	17.630	7.166	0.073	0.103	0.000	41.78	1.500	29.34	0.040	0.023	170.9	160.3	97.66	23.75	0.820
19:02	17.335	7.195	0.078	0.102	0.000	42.54	1.471	29.00	0.039	0.022	168.6	158.2	97.78	23.87	0.824
19:20	17.575	7.257	0.078	0.105	0.000	41.99	1.516	29.34	0.041	0.023	171.1	160.4	97.93	23.86	0.823
19:37	17.635	7.396	0.086	0.108	0.000	41.85	1.545	29.15	0.043	0.024	171.2	160.5	97.84	23.83	0.823
19:54	17.631	7.161	0.084	0.105	0.000	41.89	1.526	29.48	0.042	0.023	171.9	161.2	97.94	23.83	0.823
20:12	17.611	7.207	0.088	0.109	0.000	41.89	1.560	29.58	0.043	0.024	172.7	162.0	98.11	23.88	0.824
20:29	17.957	7.304	0.093	0.117	0.000	41.27	1.693	29.56	0.046	0.026	175.4	164.4	98.07	23.78	0.821
21:02	18.017	7.146	0.092	0.109	0.000	42.58	1.590	30.34	0.057	0.032	177.3	166.4	99.96	24.29	0.838

GAS CHROMATOGRAPH DATA

DATE TIME	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW	S.G. WRT AIR

7/17/1984

21:20	17.868	7.288	0.097	0.111	0.000	41.86	1.575	29.61	0.048	0.026	174.1	163.3	98.49	23.94	0.826
21:37	17.759	6.973	0.091	0.109	0.000	42.05	1.581	29.92	0.039	0.024	174.4	163.6	98.55	23.93	0.826
21:54	17.310	7.236	0.097	0.108	0.000	41.97	1.571	29.52	0.033	0.022	171.5	160.9	97.87	23.90	0.825
22:12	17.645	7.282	0.088	0.107	0.000	42.13	1.522	29.53	0.044	0.025	172.3	161.6	98.37	23.97	0.827
22:29	17.788	7.348	0.086	0.110	0.000	42.05	1.587	29.82	0.046	0.024	174.4	163.5	98.86	24.07	0.831
22:47	17.861	7.296	0.089	0.114	0.000	41.86	1.634	29.74	0.052	0.029	175.2	164.3	98.67	23.98	0.828
23:04	18.068	8.051	0.128	0.122	0.000	41.58	1.735	28.80	0.060	0.028	174.8	163.6	98.57	24.01	0.829
23:21	18.026	8.026	0.128	0.121	0.000	41.79	1.687	28.78	0.060	0.042	174.5	163.3	98.66	24.05	0.830
23:39	17.984	7.525	0.108	0.117	0.000	41.81	1.657	29.15	0.048	0.024	174.1	163.0	98.42	23.92	0.826
23:56	18.038	7.427	0.104	0.116	0.000	41.85	1.646	29.35	0.050	0.024	174.8	163.7	98.61	23.94	0.826

7/18/1984

0:14	18.058	7.810	0.116	0.125	0.000	41.69	1.757	28.95	0.053	0.027	175.1	163.9	98.59	23.98	0.828
0:31	17.874	7.624	0.116	0.119	0.000	42.00	1.711	29.03	0.049	0.025	174.1	163.0	98.55	23.99	0.828
0:48	17.749	7.693	0.129	0.117	0.000	42.29	1.677	28.81	0.051	0.024	172.8	161.9	98.54	24.03	0.830
1:06	17.870	7.523	0.118	0.123	0.000	41.81	1.748	29.37	0.051	0.026	175.7	164.6	98.64	23.99	0.828
1:13	18.381	7.824	0.140	0.118	0.000	40.86	1.683	28.88	0.054	0.029	175.6	164.3	97.97	23.73	0.819
1:24	17.860	7.444	0.127	0.120	0.000	41.90	1.726	29.41	0.057	0.054	176.5	165.4	98.70	24.01	0.829
1:42	17.776	7.448	0.127	0.116	0.000	42.10	1.650	29.49	0.051	0.024	174.8	163.8	98.78	24.06	0.830
1:59	17.730	7.407	0.120	0.121	0.000	41.80	1.683	29.57	0.051	0.026	175.2	164.3	98.50	23.98	0.828
2:17	17.743	7.530	0.123	0.123	0.000	41.86	1.715	29.49	0.051	0.027	175.5	164.5	98.66	24.04	0.830
2:34	17.705	7.245	0.121	0.121	0.000	42.06	1.717	29.49	0.050	0.026	175.3	164.3	98.54	23.97	0.827
2:52	17.863	7.452	0.126	0.122	0.000	41.60	1.722	29.65	0.052	0.026	176.5	165.4	98.61	23.98	0.828
3:09	17.904	7.267	0.118	0.126	0.000	41.35	1.768	29.83	0.050	0.028	177.6	166.5	98.44	23.89	0.825
3:26	17.952	7.019	0.114	0.125	0.000	41.22	1.762	30.11	0.049	0.028	178.5	167.3	98.38	23.82	0.822
3:44	17.621	6.779	0.113	0.120	0.000	42.01	1.697	29.92	0.049	0.026	176.0	165.1	98.34	23.86	0.824
4:01	17.709	6.947	0.120	0.123	0.000	41.48	1.724	30.29	0.049	0.027	177.9	166.9	98.47	23.90	0.825
4:19	17.846	7.108	0.123	0.125	0.000	41.41	1.753	30.11	0.051	0.028	178.2	167.1	98.56	23.91	0.825
4:36	17.661	6.677	0.113	0.120	0.000	41.58	1.674	30.53	0.049	0.027	177.8	166.9	98.43	23.86	0.824
4:54	17.537	6.824	0.110	0.120	0.000	41.64	1.659	30.42	0.048	0.027	176.9	166.1	98.39	23.91	0.825
5:11	17.551	7.136	0.113	0.119	0.000	41.97	1.664	30.35	0.049	0.026	176.8	166.0	98.99	24.12	0.833
5:29	17.515	7.026	0.116	0.113	0.000	42.15	1.603	30.14	0.053	0.029	175.5	164.7	98.74	24.05	0.830
5:46	17.414	7.063	0.119	0.112	0.000	42.26	1.577	30.01	0.053	0.028	174.5	163.8	98.64	24.06	0.831
6:04	16.019	6.607	0.105	0.109	1.986	45.43	1.515	27.27	0.049	0.039	160.5	150.5	99.13	24.58	0.848
6:21	17.517	7.259	0.127	0.116	0.000	42.10	1.653	29.64	0.041	0.022	174.2	163.4	98.48	24.01	0.829
6:39	17.443	7.209	0.128	0.114	0.000	42.34	1.610	29.79	0.051	0.024	174.2	163.5	98.71	24.09	0.832
6:56	17.478	7.199	0.125	0.121	0.000	42.01	1.694	29.93	0.051	0.026	175.8	164.9	98.64	24.05	0.830
7:14	17.709	7.134	0.131	0.120	0.000	41.80	1.703	29.80	0.050	0.026	176.3	165.3	98.48	23.93	0.826
7:31	17.538	6.968	0.124	0.114	0.000	42.05	1.625	30.11	0.049	0.024	175.6	164.8	98.60	24.00	0.828
7:49	17.606	7.098	0.125	0.120	0.000	41.82	1.686	30.08	0.049	0.026	176.5	165.6	98.61	23.99	0.828
8:06	16.266	6.616	0.123	0.110	1.519	44.98	1.555	27.38	0.046	0.023	161.9	151.8	98.62	24.34	0.840
8:24	17.231	6.857	0.123	0.119	0.000	42.23	1.654	29.45	0.048	0.025	172.8	162.2	97.74	23.81	0.822
8:41	17.085	7.021	0.127	0.122	0.000	42.35	1.681	29.34	0.048	0.026	172.5	161.8	97.79	23.89	0.825
9:00	16.926	6.710	0.124	0.123	0.000	43.21	1.713	28.74	0.054	0.054	171.1	160.5	97.65	23.84	0.823
9:17	16.073	6.776	0.136	0.113	1.551	45.07	1.588	27.07	0.047	0.024	160.9	150.8	98.44	24.37	0.841

GAS CHROMATOGRAPH DATA

DATE TIME	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW	S.G. WRT AIR

7/18/1984															
9:35	16.963	7.059	0.139	0.123	0.000	42.67	1.702	28.96	0.051	0.026	171.3	160.7	97.69	23.90	0.825
9:53	17.585	7.123	0.131	0.128	0.000	41.13	1.788	29.75	0.050	0.027	176.7	165.7	97.71	23.74	0.819
10:10	16.143	6.824	0.120	0.115	1.898	45.20	1.601	26.98	0.045	0.025	160.7	150.7	98.95	24.51	0.846
10:28	17.833	7.167	0.134	0.112	0.000	41.89	1.557	29.91	0.051	0.024	175.4	164.5	98.68	23.98	0.828
10:45	18.265	7.555	0.126	0.114	0.000	41.71	1.586	29.37	0.051	0.025	175.3	164.2	98.80	23.96	0.827
11:03	17.838	7.378	0.119	0.108	0.000	42.76	1.534	28.40	0.046	0.024	169.9	159.1	98.20	23.88	0.824
11:20	18.136	7.902	0.122	0.117	0.000	41.01	1.631	28.80	0.049	0.024	173.4	162.3	97.79	23.76	0.820
11:56	17.546	7.347	0.116	0.108	0.000	43.70	1.533	27.74	0.050	0.029	167.0	156.3	98.17	23.95	0.827
12:13	18.335	7.882	0.115	0.120	0.000	40.75	1.675	28.67	0.052	0.045	174.6	163.4	97.64	23.66	0.817
12:31	18.743	7.607	0.118	0.119	0.000	40.38	1.713	29.35	0.046	0.025	177.9	166.4	98.10	23.63	0.816
12:48	18.672	7.556	0.130	0.116	0.000	40.78	1.668	29.57	0.049	0.025	178.2	166.8	98.57	23.78	0.821
13:06	18.516	7.668	0.137	0.117	0.000	40.96	1.666	29.48	0.051	0.025	177.5	166.2	98.62	23.86	0.823
13:24	19.103	7.674	0.109	0.121	0.000	40.13	1.712	29.89	0.050	0.027	180.8	169.2	98.82	23.75	0.820
13:41	19.103	7.683	0.110	0.114	0.000	40.54	1.666	29.72	0.046	0.025	179.6	168.0	99.01	23.81	0.822
13:59	19.129	7.528	0.101	0.111	0.000	40.43	1.610	29.96	0.046	0.024	179.7	168.1	98.94	23.77	0.820
14:17	18.878	7.869	0.095	0.124	0.000	40.52	1.740	29.40	0.048	0.028	178.6	167.1	98.70	23.81	0.822
14:34	18.822	7.703	0.089	0.125	0.000	40.30	1.784	29.78	0.047	0.029	180.0	168.5	98.67	23.78	0.821
14:52	18.778	7.529	0.090	0.117	0.000	41.29	1.707	29.24	0.044	0.026	177.1	165.7	98.83	23.82	0.822
15:09	19.185	7.739	0.093	0.120	0.000	39.97	1.732	29.93	0.046	0.027	181.1	169.4	98.85	23.75	0.820
15:27	19.268	7.623	0.085	0.121	0.000	39.77	1.733	30.06	0.046	0.028	181.7	169.9	98.73	23.67	0.817
15:45	19.168	7.625	0.088	0.116	0.000	40.13	1.692	29.94	0.044	0.026	180.4	168.8	98.83	23.73	0.819
16:02	17.831	7.341	0.093	0.114	0.000	44.20	1.618	27.78	0.043	0.025	168.4	157.5	99.04	24.10	0.832
16:20	19.227	7.921	0.093	0.126	0.000	39.72	1.793	29.78	0.046	0.029	181.5	169.7	98.74	23.73	0.819
16:41	19.390	7.493	0.084	0.110	0.000	39.93	1.720	30.41	0.062	0.037	183.5	171.7	99.24	23.77	0.821
16:59	19.132	7.187	0.087	0.121	0.000	39.56	1.744	30.46	0.045	0.028	182.6	171.0	98.36	23.54	0.812
17:16	19.388	7.758	0.088	0.127	0.000	39.15	1.180	30.32	0.047	0.029	177.5	166.3	98.09	23.55	0.813
17:33	19.424	7.720	0.088	0.120	0.000	39.22	1.841	30.16	0.051	0.035	183.9	172.0	98.66	23.62	0.815
17:51	19.244	7.499	0.085	0.121	0.000	39.38	1.756	30.11	0.049	0.033	182.2	170.4	98.27	23.53	0.812
18:08	19.061	8.248	0.111	0.130	0.000	39.58	1.840	29.17	0.056	0.044	180.4	168.6	98.24	23.68	0.817
18:25	19.233	8.325	0.105	0.141	0.000	39.07	2.001	29.22	0.051	0.030	182.4	170.4	98.17	23.61	0.815
18:43	19.241	7.823	0.089	0.129	0.000	39.27	1.886	29.70	0.045	0.029	182.2	170.3	98.21	23.55	0.813
19:00	19.325	7.454	0.081	0.123	0.000	39.27	1.834	30.19	0.043	0.027	183.2	171.3	98.34	23.51	0.812
19:17	19.198	7.127	0.082	0.126	0.000	39.19	1.852	30.53	0.044	0.028	184.2	172.3	98.18	23.44	0.809
19:35	19.373	7.472	0.088	0.128	0.000	38.90	1.879	30.22	0.046	0.028	184.2	172.2	98.13	23.44	0.809
19:52	19.407	7.450	0.078	0.121	0.000	39.20	1.812	30.05	0.043	0.028	182.7	170.8	98.19	23.45	0.809
20:09	19.003	7.391	0.081	0.116	0.000	39.82	1.720	30.02	0.043	0.026	180.3	168.7	98.22	23.56	0.813
20:27	19.133	7.590	0.083	0.119	0.000	39.70	1.770	29.80	0.043	0.027	180.6	168.9	98.27	23.57	0.814
20:44	19.139	7.936	0.087	0.119	0.000	39.87	1.759	29.20	0.044	0.027	178.7	167.0	98.18	23.60	0.815
21:02	18.900	7.790	0.089	0.117	0.000	40.18	1.717	29.27	0.044	0.026	177.7	166.2	98.13	23.63	0.816
21:19	18.992	7.820	0.087	0.123	0.000	40.22	1.791	29.02	0.045	0.028	178.1	166.4	98.13	23.60	0.815
21:36	19.101	8.120	0.086	0.119	0.000	40.49	1.815	28.46	0.045	0.026	176.8	165.0	98.27	23.66	0.817
21:54	19.432	7.892	0.093	0.101	0.000	41.24	1.747	27.80	0.041	0.020	174.6	162.8	98.37	23.57	0.814
22:11	18.305	9.156	0.090	0.104	0.000	44.10	1.681	24.95	0.044	0.022	161.2	150.0	98.45	24.10	0.832
22:29	20.122	9.424	0.092	0.121	0.000	40.82	1.824	27.51	0.048	0.022	177.2	164.9	99.98	24.08	0.831
22:46	19.555	9.585	0.092	0.126	0.000	39.81	1.907	26.74	0.050	0.029	174.0	161.9	97.88	23.66	0.817
23:03	20.350	9.723	0.106	0.131	0.000	40.08	1.974	27.04	0.051	0.028	178.6	166.0	99.48	23.91	0.825

GAS CHROMATOGRAPH DATA

DATE TIME	H2 %	CO2 %	C2H4 %	C2H6 %	O2 %	N2 %	CH4 %	CO %	C3H6 %	C3H8 %	HHV BTU/SCF	LHV BTU/SCF	TMP %	MW	S.G. WRT AIR
7/18/1984															
23:21	19.397	10.330	0.009	0.125	0.000	40.57	1.500	25.72	0.049	0.026	164.7	153.2	97.73	23.82	0.822
23:56	19.173	9.298	0.074	0.114	0.000	40.45	1.722	27.21	0.043	0.024	171.6	160.0	98.11	23.79	0.821
7/19/1984															
0:14	18.798	5.953	0.050	0.112	0.000	45.69	1.703	26.13	0.028	0.049	166.6	155.2	98.52	23.47	0.810
0:31	19.150	9.129	0.073	0.113	0.000	40.67	1.740	27.77	0.044	0.025	173.6	161.9	98.72	23.94	0.826
0:49	19.332	8.592	0.071	0.110	0.000	40.70	1.757	28.07	0.045	0.029	175.3	163.5	98.71	23.80	0.822
1:24	18.199	7.725	0.067	0.101	0.000	40.81	1.655	29.22	0.035	0.040	174.1	163.0	97.85	23.73	0.819
1:41	18.199	7.134	0.064	0.095	0.000	39.95	1.589	29.22	0.023	0.000	172.0	161.1	96.27	23.19	0.801
1:59	18.761	7.166	0.076	0.094	0.000	40.76	1.537	29.28	0.042	0.024	174.8	163.5	97.75	23.48	0.810
2:16	18.858	7.611	0.094	0.089	0.000	41.32	1.438	28.88	0.038	0.018	172.7	161.6	98.34	23.70	0.818
2:34	18.425	7.750	0.120	0.006	0.000	42.43	1.382	28.55	0.040	0.016	168.6	157.9	98.72	23.95	0.827
2:51	18.209	7.731	0.113	0.083	0.000	43.13	1.322	28.58	0.040	0.017	168.7	158.0	99.22	24.15	0.834
3:09	16.875	7.912	0.173	0.082	0.000	44.23	1.361	27.60	0.050	0.017	162.8	152.6	98.30	24.26	0.838
3:26	14.069	9.824	0.292	0.081	0.000	47.01	1.426	23.18	0.056	0.015	142.2	133.2	95.95	24.63	0.850
3:44	14.705	9.057	0.241	0.079	0.000	48.60	1.325	24.54	0.052	0.022	146.8	137.7	98.62	25.11	0.867
4:01	14.633	9.000	0.259	0.083	0.000	47.88	1.410	24.84	0.054	0.015	148.6	139.4	98.17	24.98	0.862
4:19	14.806	9.328	0.271	0.082	0.000	47.65	1.422	24.72	0.051	0.015	149.0	139.7	98.34	25.03	0.864
4:37	14.128	9.696	0.306	0.084	0.000	48.73	1.448	23.70	0.057	0.017	144.6	135.6	98.17	25.22	0.870
4:54	14.906	9.617	0.267	0.095	0.000	48.20	1.594	23.22	0.056	0.022	146.7	137.2	97.98	24.93	0.861
5:12	12.505	9.131	0.234	0.082	0.000	52.48	1.400	22.10	0.053	0.018	132.4	124.3	98.00	25.51	0.881
5:29	12.211	9.862	0.260	0.086	0.000	52.22	1.441	22.44	0.015	0.091	134.5	126.3	98.63	25.88	0.893
5:47	12.316	9.953	0.299	0.081	0.000	51.58	1.436	22.33	0.065	0.019	134.3	126.2	98.08	25.71	0.887
6:22	11.952	10.598	0.333	0.082	0.000	51.82	1.430	21.75	0.061	0.015	131.6	123.6	98.04	25.90	0.894
6:40	12.188	10.368	0.317	0.087	0.000	52.25	1.393	21.88	0.063	0.020	132.4	124.3	98.56	25.95	0.896
6:57	14.110	8.425	0.173	0.099	0.000	48.94	1.407	25.87	0.058	0.026	149.5	140.6	99.11	25.29	0.873
7:15	17.871	7.516	0.096	0.119	0.000	41.39	1.610	29.22	0.054	0.031	173.6	162.7	97.91	23.81	0.822
7:32	17.819	7.298	0.097	0.117	0.000	41.34	1.566	29.81	0.055	0.047	175.3	164.4	98.15	23.86	0.824

SULFUR GAS CHROMATOGRAPH DATA

DATE	H2S	COS	C2H5SH	CH3SH	TOTAL	NOTES:
TIME	% TOT	% TOT	% TOT	% TOT	PPM	

11/ 9/1983						
3:22	85	9	0	6	2291	
3:58	72	10	0	18	1966	
4:31	72	11	6	11	1322	
5: 9	68	12	8	13	1357	
5:47	68	11	8	12	1383	
6: 3	67	11	9	13	1298	
6:34	68	12	9	11	1132	
7: 3	59	11	9	21	1127	
11: 1	49	11	18	23	1362	
11:34	68	13	9	10	1002	
12:12	63	12	9	16	1146	
13:28	53	12	10	26	967	
14: 6	55	12	11	22	931	
17: 1	40	8	25	27	1426	
17:19	53	12	12	23	896	
19:15	55	11	11	23	1079	
19:53	49	12	12	27	856	

MIFGA PROGRAM
TEST BOM/FGT-011

SULFUR GAS CHROMATOGRAPH DATA

DATE TIME	H2S PPM	COS PPM	C2H5SH PPM	CH3SH PPM	TOTAL PPM	NOTES:

6/10/1983						
4:49	515	508	386	174	1584	
5: 9	779	561	394	194	1928	
5:29	524	528	378	186	1616	
5:49	460	487	374	183	1503	
6: 9	489	490	367	194	1539	
6:29	502	501	360	179	1542	
6:49	592	497	0	152	1241	
7: 9	482	455	318	167	1422	
7:29	384	456	350	208	1398	
7:49	315	372	325	167	1179	
8: 9	605	491	347	202	1644	
8:29	991	684	487	227	2389	
8:49	382	429	316	187	1314	
9: 9	446	438	298	190	1371	
9:29	745	511	340	201	1798	
9:49	838	489	295	131	1754	
10: 9	801	448	229	99	1576	
10:29	858	508	191	72	1629	
10:49	777	476	176	61	1491	
11: 9	783	465	167	60	1475	
11:29	783	465	167	60	1475	
11:49	755	442	153	46	1396	
12: 9	717	442	125	42	1326	
12:29	885	526	124	52	1586	
12:49	905	540	108	0	1553	
13: 9	952	516	95	25	1588	
13:29	907	516	0	40	1463	
13:49	914	511	0	36	1461	
14: 9	743	503	0	29	1275	
14:29	922	710	37	56	1725	
14:49	840	525	56	0	1421	
15: 9	804	512	53	32	1400	
15:29	863	496	51	34	1445	
15:49	920	506	59	34	1519	
16: 9	848	510	56	33	1446	
16:29	938	450	78	40	1506	
16:47	1039	434	83	32	1587	

APPENDIX J

Continuous Output Transducer Data

These are averages of the continuous output transducer data averaged for the time periods over which material and energy balance calculations were made.

AVERAGE FROM PERIOD: 11/ 9/83 9: 0 TO 11/ 9/83 13: 0

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	-3.025	DEG C	0.149
T-702	10.226	DEG C	0.219
T-703	64.679	DEG C	0.350
T-710	8.198	DEG C	0.358
T-711	47.232	DEG C	1.127
T-712	8.176	DEG C	0.207
T-713	10.273	DEG C	0.469
T-705	92.239	DEG C	1.711
T-706	88.272	DEG C	7.933
T-707	89.379	DEG C	8.811
T-812	--OFF--	DEG C	0.673
T-813	--OFF--	DEG C	
T-814	--OFF--	DEG C	
T-815	--OFF--	DEG C	
T-816	--OFF--	DEG C	
T-817	--OFF--	DEG C	
T-818	--OFF--	DEG C	
T-819	333.261	DEG C	23.143
T-820	403.182	DEG C	8.384
T-823	--OFF--	DEG C	
T-822	63.591	DEG C	0.519
T-806	81.930	DEG C	5.720
T-811	--OFF--	DEG C	1619.383
F-701	877.292	SCFM	1.478
TT2-703	68.398	DEG C	0.134
P-703	9.035	IN WC	0.531
P-704	7.971	IN WC	0.502
P-705	1.064	IN WC	0.051
P-706	0.370	IN WC	0.106
F-707	--OFF--	SCFM	
WT-720	7.253	TONS	2.506
P-707	0.871	IN WC	0.122
P-810	0.042	IN WC	0.043
F-802	--OFF--	CFM	
F-803	8132.109	CFM	440.857
TT1-703	68.182	DEG C	0.136
CO	24.500	%	0.806
CO2	9.995	%	0.002
O2	-0.049	%	0.275
SIGMA	164.621	BTU/SCF	3.036
T-715	147.752	DEG C	0.464
T-821	59.290	DEG C	3.027
T-703A	18.574	DEG C	0.445
PH	--OFF--	PH	
AG VEL	-0.007	SPH	0.008
GR VEL	0.279	RPD/T	0.932
P-702	0.000	IN WC	0.000

AVERAGE BASE TEMPERATURE 15.422

AVERAGE FROM PERIOD: 11/ 9/83 14: 0 TO 11/ 9/83 21: 0

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	-0.682	DEG C	0.933
T-702	11.875	DEG C	1.463
T-703	67.291	DEG C	1.043
T-710	9.808	DEG C	1.173
T-711	46.849	DEG C	4.971
T-712	9.828	DEG C	1.107
T-713	12.280	DEG C	1.424
T-705	75.261	DEG C	3.104
T-706	72.165	DEG C	1.687
T-707	71.660	DEG C	1.093
T-812	--OFF--	DEG C	971.079
T-813	--OFF--	DEG C	250.028
T-814	--OFF--	DEG C	
T-815	--OFF--	DEG C	
T-816	--OFF--	DEG C	
T-817	--OFF--	DEG C	
T-818	--OFF--	DEG C	
T-819	276.547	DEG C	13.880
T-820	477.350	DEG C	13.862
T-823	--OFF--	DEG C	
T-822	68.283	DEG C	0.345
T-806	68.950	DEG C	0.707
T-811	1064.060	DEG C	3102.165
F-701	1023.906	SCFM	4.279
TT2-703	69.417	DEG C	0.121
P-703	8.291	IN WC	0.385
P-704	6.929	IN WC	0.394
P-705	1.361	IN WC	0.081
P-706	0.522	IN WC	0.067
F-707	--OFF--	SCFM	
WT-720	5.327	TONS	3.817
P-707	0.985	IN WC	0.071
P-810	-0.063	IN WC	0.014
F-802	--OFF--	CFM	
F-803	9068.985	CFM	0.833
TT1-703	69.213	DEG C	0.123
CO	24.375	%	0.854
CO2	9.950	%	0.202
O2	-0.068	%	0.277
SIGMA	165.225	BTU/SCF	2.955
T-715	156.462	DEG C	3.194
T-821	55.808	DEG C	1.573
T-703A	19.570	DEG C	2.129
PH	--OFF--	PH	
AG VEL	-0.238	SPH	0.363
GR VEL	2.760	RPD/T	0.527
P-702	0.000	IN WC	0.000

AVERAGE BASE TEMPERATURE 15.565

AVERAGE FROM PERIOD: 6/ 8/84 12: 0 TO 6/ 9/84 8: 0

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	19.825	DEG C	3.101
T-702	31.477	DEG C	2.796
T-703	60.001	DEG C	1.231
T-703A	40.926	DEG C	2.844
TT1-703	61.051	DEG C	0.544
TT2-703	60.471	DEG C	0.540
T-705	104.129	DEG C	28.722
T-706	92.768	DEG C	17.364
T-707	90.928	DEG C	14.627
T-710	15.660	DEG C	0.395
T-711	69.950	DEG C	10.223
T-712	17.575	DEG C	0.444
T-713	17.149	DEG C	0.479
T-715	139.914	DEG C	2.861
T-806	86.597	DEG C	11.780
T-811	-7.252	DEG C	7.867
T-812	57.275	DEG C	36.715
T-813	4.762	DEG C	7.793
T-814	--OFF--	DEG C	
T-815	--OFF--	DEG C	
T-816	--OFF--	DEG C	
T-817	--OFF--	DEG C	
T-818	--OFF--	DEG C	
T-819	313.166	DEG C	47.066
T-820	265.070	DEG C	46.843
T-821	142.128	DEG C	137.983
T-822	68.012	DEG C	1.898
T-823	--OFF--	DEG C	
F-701	901.562	SCFM	47.772
F-715	514.416	LBS/HR	252.693
F-802	2134.965	SCFM	283.751
F-803	2510.188	SCFM	70.114
P-703	5.698	IN WC	1.518
P-705	0.817	IN WC	0.211
P-704	5.882	IN WC	1.498
P-706	0.706	IN WC	0.207
P-707	-7.502	IN WC	0.000
P-810	-0.767	IN WC	0.063
CO	17.439	%	1.610
CO2	13.674	%	0.729
O2	0.029	%	0.403
SIGMA	76.285	BTU/SCF	11.742
AG VEL	20.420	SPH	7.310
GR VEL	1.464	RPD/T	0.328
T - 3	--OFF--	DEG C	
T - 8	--OFF--	DEG C	
T - 9	--OFF--	DEG C	

AVERAGE BASE TEMPERATURE 23.530

AVERAGE FROM PERIOD: 6/ 9/84 17: 0 TO 6/10/84 12: 0

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	19.200	DEG C	2.849
T-702	30.780	DEG C	3.294
T-703	60.451	DEG C	4.224
T-703A	37.292	DEG C	3.036
TT1-703	60.991	DEG C	1.555
TT2-703	60.429	DEG C	1.512
T-705	111.340	DEG C	46.305
T-706	103.918	DEG C	33.963
T-707	100.032	DEG C	26.896
T-710	15.849	DEG C	1.293
T-711	57.835	DEG C	5.579
T-712	17.694	DEG C	1.367
T-713	17.604	DEG C	1.407
T-715	139.166	DEG C	9.582
T-806	91.536	DEG C	21.868
T-811	41.524	DEG C	84.624
T-812	-265.838	DEG C	1120.576
T-813	-146.693	DEG C	822.760
T-814	--OFF--	DEG C	
T-815	--OFF--	DEG C	
T-816	--OFF--	DEG C	
T-817	--OFF--	DEG C	
T-818	--OFF--	DEG C	
T-819	422.189	DEG C	36.609
T-820	396.663	DEG C	33.927
T-821	64.026	DEG C	4.634
T-822	70.753	DEG C	5.051
T-823	--OFF--	DEG C	
F-701	902.343	SCFM	46.915
F-715	844.957	LBS/HR	123.986
F-802	2074.596	SCFM	323.557
F-803	2488.719	SCFM	213.890
P-703	7.408	IN WC	1.485
P-705	0.313	IN WC	0.541
P-704	7.095	IN WC	1.217
P-706	0.309	IN WC	0.538
P-707	-7.503	IN WC	0.000
P-810	-0.730	IN WC	0.194
CO	17.836	%	4.273
CO2	12.113	%	2.892
O2	0.819	%	3.131
SIGMA	98.172	BTU/SCF	20.025
AG VEL	21.181	SPH	9.367
GR VEL	0.990	RPD/T	0.249
T - 3	--OFF--	DEG C	
T - 8	--OFF--	DEG C	
T - 9	--OFF--	DEG C	

AVERAGE BASE TEMPERATURE 22.159

AVERAGE FROM PERIOD: 7/17/84 8: 0 TO 7/18/84 10: 0

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	17.259	DEG C	2.911
T-702	29.212	DEG C	3.263
T-703	58.923	DEG C	4.267
T-703A	35.206	DEG C	5.016
TT1-703	59.320	DEG C	1.620
TT2-703	58.586	DEG C	1.567
T-705	121.425	DEG C	40.309
T-706	101.998	DEG C	25.801
T-707	109.461	DEG C	28.854
T-710	19.134	DEG C	1.458
T-711	51.281	DEG C	12.703
T-712	19.261	DEG C	1.474
T-713	24.050	DEG C	1.858
T-715	137.266	DEG C	10.215
T-806	103.610	DEG C	26.929
T-811	--OFF--	DEG C	
T-812	--OFF--	DEG C	
T-813	--OFF--	DEG C	
T-814	--OFF--	DEG C	
T-815	--OFF--	DEG C	
T-816	--OFF--	DEG C	
T-817	--OFF--	DEG C	
T-818	--OFF--	DEG C	
T-819	636.113	DEG C	93.443
T-820	475.847	DEG C	77.629
T-821	68.535	DEG C	5.942
T-822	70.803	DEG C	6.307
T-823	71.500	DEG C	6.816
F-701	794.582	SCFM	36.005
F-715	1308.280	LBS/HR	934.585
F-802	1395.043	SCFM	197.761
F-803	3125.523	SCFM	479.379
P-703	4.300	IN WC	1.039
P-705	0.461	IN WC	0.616
P-704	3.839	IN WC	0.530
P-706	0.285	IN WC	0.594
P-707	-7.503	IN WC	0.000
P-810	-0.335	IN WC	0.155
CO	28.245	%	3.182
CO2	7.831	%	0.945
O2	-0.135	%	0.424
SIGMA	177.089	BTU/SCF	25.264
AG VEL	-0.014	SPH	0.004
GR VEL	0.933	RPD/T	0.293
T - 3	--OFF--	DEG C	
T - 8	--OFF--	DEG C	
T - 9	--OFF--	DEG C	

AVERAGE BASE TEMPERATURE 21.206

APPENDIX K

Stack Sampling Report

This is the report submitted by Interpoll, Inc., Circle Pines, Minnesota to the University of Minnesota Particle Technology Laboratory. The appendices to the stack sampling report have not been included here. The appendices include raw data and calculations.

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Circle Pines, Minnesota 55014

Telephone (612)786-6020

RESULTS OF THE JUNE 8, 1984,
MINNESOTA PEAT SOD BURN
EMISSION TESTS ON THE
WELLMAN-GALUSHA GASIFIER AT THE
TWIN CITIES RESEARCH CENTER
IN MINNEAPOLIS, MINNESOTA

Submitted to:

UNIVERSITY OF MINNESOTA
Room 130 Mechanical Engineering Building
111 Church Street S.E.
Minneapolis, Minnesota 55455

Attention: David Y.H. Pui, Ph.D.

Approved by:

Perry Lonnes, Ph.D.
President

Report Number 4-1796
July 27, 1984

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APPENDICES:

- A - Results of Preliminary Measurements
- B - Location of Test Ports and Traverse Points
- C - Methods 2-5 Field Data Sheets
- D - Method 9 Field Data Sheets
- E - Laboratory Data Sheets
- F - Operating Conditions of Gasifier and Fuel Composition
- G - Calculation of the Dry F-Factor
- H - Procedures
- I - Calculation Equations
- J - Sampling Train Calibration Data

ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (°F)	degrees Fahrenheit
DIA.	diameter
FT/SEC	feet per second
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g	gram
HP	horsepower
HRS	hours
IN.	inches
IN. HG.	inches of mercury
IN. WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10 ⁶ BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
MW	megawatt
mg/DSCM	milligrams per dry standard cubic meter
microns (µm)	micrometer
MIN.	minutes
ohm-cm	ohm-centimeter
PPH	pounds per hour
PPM	parts per million
PSI	pounds per square inch
SQ. FT.	square feet
v/v	percent by volume
w/w	percent by weight

Standard conditions are defined as 68 °F (20 °C) and 29.92 IN. of mercury pressure.

On June 8, 1984, Interpoll Inc. personnel conducted a series of flow rate and emission tests on the pilot low BTU Gasifier at the Bureau of Mines Twin Cities Research Center, Minneapolis, Minnesota. On-site testing was performed by a two-man team under the direction of D. Stock. Coordination between testing activities and gasifier operation was provided by Dave Thimsen and Dick Pooler of Black, Sivalls and Bryson (BSB).

The unit tested is a six-foot, six-inch Wellman-Galusha, single stage, fixed-bed gasifier with an agitator. This gasifier has a nominal operating capacity of 30 10⁶BTU/HR (bituminous coal). A combustion test chamber is attached to the gasifier and it also has a nominal capacity of 30 10⁶BTU/HR. The combustion test chamber is a horizontal, cylindrical chamber, seven feet I.D. by 21 feet long, and exhausts through an impingement tray-type scrubber and an induced draft fan to a three-foot diameter stack. Most of the testing in this work was performed at the combustion test chamber outlet, however, flow determinations were performed at the forced draft fan outlet to allow assessment of the combustion air usage and in the stack to ascertain the total volumetric flow rate of the combustion products. During this test, Minnesota peat sod was gasified.

Particulate and sulfur dioxide determinations were performed in accordance with EPA Methods 1-6, CFR Title 40, Part 60, Appendix A (Revised July 1, 1983). A preliminary determination of the gas velocity profile was made before the first particulate run to allow selection of the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll sampling train which meets or exceeds specifications in the above-cited reference was used to collect particulate samples by means of a heated inconel-lined probe. A single diameter traverse was used in this work due to the high cost of installing a second test port at 90 degrees to the existing port.

The back half of the EPA Method 5 particulate sampling train was used to collect sulfur dioxide samples. This is the large impinger version specified in EPA Method 6 and provides for a complete stack traverse during sample collection. Collected sulfur dioxide samples were returned to the laboratory for sulfate analysis by the standard barium/Thorin I titration technique.

Nitric oxide concentrations in the flue gas were measured by means of a Monitor Labs chemiluminescent nitric oxide analyzer. Nitric oxide concentrations were read at each traverse point in the particulate determination. The nitric oxide concentrations were determined on a dry basis using the exhaust gas stream from the EPA Method 5 sampling train.

An integrated flue gas sample was extracted simultaneously with each particulate and sulfur dioxide sample using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags. After sampling was complete, the bags were sealed and returned to the laboratory for Orsat analysis. The integrity of the sample bags was insured by reading the oxygen concentration of the bag in the field immediately after sampling and again in the laboratory immediately prior to Orsat analysis using a Teledyne Model 320P oxygen analyzer.

Testing at the combustion chamber outlet test site was conducted from one test port on the combustion chamber outlet duct (see Appendix B). Each traverse point was sampled five minutes to give a total sampling time of 50 minutes per run. Test port and traverse port locations for the flow determinations are also given in Appendix B.

The important results of the tests are summarized in Section 2. Detailed results are presented in Section 3. Results of preliminary measurements, field data and all other supporting information are presented in the appendices.

The important results of the particulate determinations performed at the combustor outlet are summarized in Table 1. As will be noted, the particulate concentrations varied substantially from run to run ranging as high as 0.51 to as low as 0.16 LB/10⁶BTU.

The heat input to the combustion test chamber was estimated to average 12.6 10⁶BTU/HR using the F-factor calculated from the producer gas composition together with the particulate emission factor and the particulate mass rates. This heat input rate was verified by the SO₂ emission factors and rates.

The results of the SO₂ determinations are given in Table 2. As will be noted, the SO₂ concentrations ranged from 156 to 197 ppm actual. The SO₂ emission rate was approximately 13.3 LB/HR and the SO₂ emission factor 1.07 LB/HR. The SO₂ emission factor calculated from the sulfur content and the heating value of the typical fuel analysis was 1.35 LB/HR. A fuel sample from the actual fuel gasified was not provided for analysis. If the difference between the measured and calculated emission factors is considered to be due to ash fixation, the ash fixation rate for this fuel and these burning conditions was 20.7%.

Nitric oxide concentrations averaged 962 ppm (dry). Plume opacity was zero. Volumetric flow rate determinations were performed at three different locations. The results of the flow rate determinations at the combustor outlet averaged 6653 DSCFM. The flow rate at the combustion fan inlet duct was measured at 3993 DSCFM. The flow rate at the stack test site was 9782 DSCFM.

No difficulties were encountered in the field or in the laboratory evaluation of the flyash and flue gas samples. On the basis of this fact and a complete review of the entire data and results, it is our opinion that the particulate, sulfur dioxide, and oxides of nitrogen

Table 1. Summary of the Results of the June 8, 1984, Particulate Emission Test on the Combustor Outlet at the Bureau of Mines Coal Gasifier Plant Located in Minneapolis, Minnesota.

ITEM	RUN 1	RUN 2	RUN 3
Time of test (HRS)	1355/1455	1535/1635	1710/1810
Estimated gas burning rate (DSCFM)	1828	1586	1680
Estimated heat input (10^6 BTU)*	13.6	11.8	12.5
Estimated percent of rated capacity	45.3	39.3	41.7
Volumetric flow			
ACTUAL (ACFM)	27800	28200	29900
STANDARD (DSCFM)	6430	6710	6820
Gas temperature (DEG-F)	1335	1316	1379
Moisture content (% v/v)	17.36	16.29	16.94
Gas composition (% v/v dry)			
carbon dioxide	8.30	7.40	8.20
oxygen	11.60	13.00	12.80
nitrogen	79.60	79.60	79.00
Isokinetic variation (%)	101.3	96.7	99.9
Particulate concentration**			
ACTUAL (GR/ACF)	.029	.008	.015
STANDARD (GR/DSCF)	.126	.034	.064
Particulate mass rate (LB/HR)**	7.0	1.9	3.3
Particulate emission factor **			
(LB/ 10^6 BTU)			
F-factor method (Orsat)	.51	.16	.30

*To combustor from producer gas

**Dry catch only

K-8

Table 2. Summary of the Results of the June 8, 1984 Sulfur Dioxide Emission Test on the Combustor Outlet at the U of M/BOM-Coal Gasification Plant located in Minneapolis, Minnesota

ITEM	Run 1	Run 2	Run 3
Time of test (HRS)	1355-1455	1535-1635	1710-1810
SO ₂ concentration (PPM/dry)	239	187	192
(PPM/wet)	197	156	159
SO ₂ mass rate (LB/HR)	15	12	13
SO ₂ emission factor (LB/MMBTU) F-factor method	1.13	1.04	1.04

concentrations, emission rates and emission factors reported herein are accurate and closely reflect the actual values which existed at the time the tests were performed.

The results of all field and laboratory evaluations are presented in this section. Gas composition results (Orsat and moisture) are presented first followed by the computer printout of the particulate, sulfur dioxide, oxides of nitric, and visible emission data. Preliminary measurements including traverse point description are given in Appendices A and B.

The results have been calculated on a DEC PDP-11 Computer using standard Fortran programs. EPA-published equations have been used as the basis of the calculation techniques in these programs. It should be noted in interpreting these results that the particulate emission rates have been calculated by both the "concentration x flow" and the "ratio of areas" methods and the average reported. The average is the best estimate of the true value, since the bias introduced by anisokinetic sampling is approximately equal but of opposite sign in the two calculation techniques and thus cancels in the average.

3.1 Results of Orsat and Moisture Analysis

Test No. 1
Combustor Fan Inlet

Results of Orsat & Moisture Analysis -- Methods 3 & 4 (% v/v)

Run 1

Date of run 06/08/84

Dry basis (Orsat)*

carbon dioxide	.03
oxygen	20.90
carbon monoxide	.00
nitrogen	79.07

Wet basis (Orsat)*

carbon dioxide	.03
oxygen	20.49
carbon monoxide	.00
nitrogen	77.51

Moisture content 1.97

Dry molecular weight 28.84

Wet molecular weight 28.63

Specific gravity
(relative to air) .9888

Teledyne oxygen
analyzer (velocity &
time weighted avg.) 13.40

* Ambient air; sample not measured.

Test No. 1
Combustor Outlet

Results of Orsat & Moisture Analysis -- Methods 3 & 4 (% v/v)

	Run 1	Run 2	Run 3
Date of run	06/08/84	06/08/84	06/08/84
Dry basis (orsat)			
carbon dioxide	8.80	7.40	8.20
oxygen	11.60	13.00	12.80
carbon monoxide	.00	.00	.00
nitrogen	79.60	79.60	79.00
Wet basis (orsat)			
carbon dioxide	7.23	6.19	6.81
oxygen	9.53	10.88	10.63
carbon monoxide	.00	.00	.00
nitrogen	65.39	66.63	65.62
Moisture content	17.86	16.29	16.94
Dry molecular weight	29.87	29.70	29.82
Wet molecular weight	27.75	27.80	27.82
Specific gravity (relative to air)	.9586	.9602	.9610
Teledyne oxygen analyzer (velocity & time weighted avg.)			
	11.86	13.41	12.49
FO	1.06	1.07	.99

Test No. 1
Scrubber Stack

Results of Orsat & Moisture Analysis -- Methods 3 & 4 (% v/v)

Run 1

Date of run 06/08/84

Dry basis (orsat)

carbon dioxide	6.64
oxygen	13.38
carbon monoxide	.00
nitrogen	79.98

Wet basis (orsat)

carbon dioxide	4.52
oxygen	9.11
carbon monoxide	.00
nitrogen	54.44

Moisture content 31.93

Dry molecular weight 29.60

Wet molecular weight 25.89

Specific gravity
(relative to air) .8945

Teledyne oxygen
analyzer (velocity &
time weighted avg.) 13.40

FO 1.13
K-15

Test No. 1
Combustor Outlet

3.2 Results of Particulate Loadings Determinations -- Method 5

	Run 1	Run 2	Run 3
Date of run	06/08/84	06/08/84	06/08/84
Time run start/end (HRS)	1355/1455	1535/1635	1710/1810
Pitot tube coefficient	.850	.850	.850
Water in sample			
condensate (ml)	97.0	92.0	101.0
silica gel (grams)	14.0	7.0	8.0
Total particulate material collected (grams) *	.1960	.0527	.1046
Meter correction coefficient	1.0065	1.0065	1.0065
Volume through gas meter			
at meter conditions...(CF)	25.53	25.61	27.01
standard conditions...(SCF)	24.04	23.95	25.16
Total sampling time (min)	60.0	60.0	60.0
Nozzle diameter (IN)	.502	.502	.502
Average stack gas temperature during determination (DEG-F)	1335	1316	1379
Volumetric flow			
actual.....(CFM)	27839	28214	29939
standard.....(DSCFM)	6426	6709	6821
Isokinetic variation (%)	101.3	96.7	99.9
Particle concentration			
actual.....(GR/ACF)	.0292	.0081	.0147
dry standard.....(GR/DSCF)	.1258	.0339	.0641
Particle mass flow (LB/HR)	6.98	1.92	3.75
Water mass flow (KLB/HR)	4.0	3.6	3.9
Emission factor (LB/MMBTU)			
by F factor (320-F)	.527	.172	.289
by F factor (orsat)	.512	.163	.300

* Dry catch only
F factor: Run 1 =12680.0 Run 2 =12680.0 Run 3 =12680.0
mAmCR/2
K-16

Test No. 1
Combustor Outlet

3.3 Results of Sulfur Dioxide Determinations -- Method 6

	Run 1	Run 2	Run 3
Date of run	6/ 8/84	6/ 8/84	6/ 8/84
Time run start/end (HRS)	1355/1455	1535/1635	1710/1810
Average stack gas temperature during determination (DEG-F)	1335	1316	1379
Barometric Pressure (IN.HG.)	28.67	28.67	28.67
Meter Temperature (DEG-F)	81.3	85.0	87.2
Meter correction coefficient	1.0065	1.0065	1.0065
Volume through gas meter			
at meter conditions...(CF)	25.53	25.61	27.01
standard conditions...(SCF)	24.04	23.95	25.16
Total sampling time (MIN)	60	60	60
Moisture content (% v/v)	17.86	16.29	16.94
Oxygen content (% v/v dry)	11.60	13.00	12.80
Milliequivalents of SO2 in gas sample	13.5326	10.5131	11.3396
Sulfur dioxide concentration			
(GR/DSCF)	.2782	.2169	.2227
(MG/DSCM)	637	496	510
(PPM-dry)	239	187	192
(PPM-wet)	197	156	159
Dry standard volumetric flow (DSCFM)	6426	6709	6821
Sulfur dioxide mass rate (LB/HR)	15.32	12.47	13.02
Sulfur dioxide emission factor (LB/MMBTU)			
F-factor method*	1.132	1.039	1.041

* F factor: Run 1 =12680.0 Run 2 =12680.0 Run 3 =12680.0

Test No. 1
Combustor Outlet

3.4 Results of NO Measurement--Monitor Labs Chemiluminescent NO
Analyzer

NO Concentration (PPM-DRY)			
Run 1	Run 2	Run 3	
980	840	940	
1005	860	960	
1005	920	1080	
1010	950	1160	
1005	880	1170	
1020	860	1000	
1020	720	970	
1200	680	990	
1200	790	1040	
1120	800	1090	
1240	860	1100	
1160	880	1080	
Average:	1080	837	968

Test No. 1
Combustor Outlet

3.5 Results of Opacity Observations - EPA Method 9

Percent Opacity	Optical Density	Relative Frequency (%)
0	.0000	.00
5	.0223	.00
10	.0458	.00
15	.0706	.00
20	.0969	.00
25	.1249	.00
30	.1549	.00
35	.1871	.00
40	.2219	.00
45	.2596	.00
50	.3010	.00
55	.3468	.00
60	.3979	.00
65	.4559	.00
70	.5229	.00
75	.6021	.00
80	.6990	.00
85	.8239	.00
90	1.0000	.00
95	1.3010	.00
99	2.0000	.00
.00	.00000	Time Average

Observer: D. Stock
Cert. Date: 04-26-84
Date of Observation: 06-8-84
Time of Observation: 1405-1411

APPENDIX L

Retort Pressure and Temperature Probe Data

Reference: Thimsen, Maurer et al (1984)

RETORT TEMPERATURE AND PRESSURE PROBE DATA

TEST: BOM/FGT-013

COAL: PEAT PELLETS

DATE: 07/18/84

RETORT ACCESS PORT NUMBER:

5

DATA: INCHES ABOVE GRATE	PRESSURE (inwc)	TEMPERATURE (deg C)	TIME (hrs)	815	840
0			Blast Air (scfm)	800	790
6					
12					
18	1.0		Saturation Temperature (deg C)	60.0	60.0
24	1.8				
30	2.0				
36	2.2	899			
42	2.4	860	Ashpit Pressure (inwc)	5.3	5.3
48	2.8	804			
54	2.8	777			
60	2.8	727			
66	3.0		Offtake Temperature (deg C)	105	100
72	3.2	193			
78	3.2	138			